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Lot No. 2: Adverse Fisheries Impacts on Cetacean Populations in the Black Sea

FINAL REPORT

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Black Sea Commission (Ukraine)

Brema Laboratory (Ukraine)

Institute of Fisheries Resources (Bulgaria)

National Institute for Marine Research and Development Grigore Antipa (Romania)

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Background and general objectives

The cetacean fauna of marine mammals in the Black Sea includes three species/subspecies – the Black Sea harbour porpoise (*Phocoena phocoena relicta*), the Black Sea common dolphin (*Delphinus delphis ponticus*) and the Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*). All Black Sea coastal states have, directly or indirectly, pledged to protect and conserve cetaceans. Bulgaria, Georgia, Romania, the Russian Federation, Turkey and Ukraine have ratified or acceded to international treaties that stipulate a commitment to protecting biodiversity (e.g., the Convention on Biological Diversity, 1992) and protection of endangered marine species through responsible fishing practises (e.g., the Code of Conduct for Responsible Fisheries, FAO, 1995). All coastal states also have national legislation in place that prohibits killing or injuring cetaceans. Bulgaria and Romania, by virtue of accession to the European Union, are obliged to take requisite measures to establish a system of strict protection in their natural range, as the Black Sea cetacean species are listed in Annex IV of Directive 92/43/EEC. Species listed in Annex IV of Directive 92/43/EEC (Habitats Directive) are, in view of threats to certain types of habitat and species, defined as having priority to favour the early implementation of measures to conserve them.

Until the total regional ban on hunting was enacted in 1983, commercial hunting was the principal anthropogenic threat to Black Sea cetacean populations. Although Black Sea cetaceans face a number of threats (habitat degradation, pollution, introduction of alien species, over-exploitation of fishery resources, and a live-capture fishery), incidental catch in fishing nets constitutes the most important threat ([1],[2]). Existing cetacean bycatch records indicate that all three species are incidentally caught in fishing gear throughout the waters of all coastal countries of the Black Sea ([3],[4],[5],[6],[7]). Bycatch records also suggest that the mortality associated with incidental capture in fishing gear may be unsustainable; for example, in 2006-2008 in Ukraine, an on-board observer programme found 163 porpoises and two bottlenose dolphins were taken per 100 km of turbot nets and 195 porpoises per 100 km of dogfish nets ([8]). Similar CPUE statistics were presented recently for Bulgarian, Romanian and Turkish waters at the

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[1] *Birkun A., Jr. 2002b. Interaction between cetaceans and fisheries: Black Sea. Pp. 98-107 in: Cetaceans of the Mediterranean and Black Seas: State of knowledge and conservation strategies (Ed. by G. Notarbartolo di Sciara), ACCOBAMS Secretariat, Monaco. 219 p*

[2] *Notarbartolo di Sciara G., Birkun A., Jr. 2010. Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas. ACCOBAMS, Monaco. 232 p.*

[3] *BLASDOL. 1999. Estimation of human impact on small cetaceans of the Black Sea and elaboration of appropriate conservation measures: Final report to EC Inco-Copernicus (contract No. ERBIC15CT960104). C.R. Joiris (Coord.), Free University of Brussels, Belgium; BREMA Laboratory, Ukraine; Justus Liebig University of Giessen, Germany; Institute of Fisheries, Bulgaria; and Institute of Marine Ecology and Fisheries, Georgia. Brussels, 113 p.*

[4] *Mikhailov K. 2008. Overview on the current status of cetacean-fisheries conflicts including bycatch and depredation with a critical review of historical data: Bulgaria. International Workshop on Cetacean Bycatch within the ACCOBAMS Area (Rome, Italy, 17-18 September 2008). Working paper, 10 p. (Unpublished).*

[5] *Öztürk B., Tonay A.M. 2008. Turbot fisheries and its impact on dolphin by-catch in the Black Sea. International Workshop on Cetacean Bycatch within the ACCOBAMS Area (Rome, Italy, 17-18 September 2008). PowerPoint presentation. (Unpublished).*

[6] *Radu G., Anton E., Dumitrache C. 2008. National overview on the current status of cetacean-fisheries conflicts including bycatch and depredation: Romania. International Workshop on Cetacean Bycatch within the ACCOBAMS Area (Rome, Italy, 17-18 September 2008). Working paper, 14 p. (Unpublished).*

7 Gönener S., Bilgin S. 2009. The effect of pingers on harbour porpoise, Phocoena phocoena, bycatch and fishing effort in the turbot gill net fishery in the Turkish Black Sea coast. Turkish J. of Fisheries and Aquatic Sci. 9: 151-157.

[8] *Birkun A., Jr., Krivokhizhin S., Masberg I., Radygin G. 2009. Cetacean bycatches in the course of turbot and spiny dogfish fisheries in the northwestern Black Sea. Pp. 15-16 in: Abstr. 23rd Annual Conf. of the European Cetacean Society (Istanbul, Turkey, 2-4 March 2009). 194 p.*

2nd Meeting of the GFCM Transversal Working Group on Bycatch (Antalya, December 2011). Unmanaged fishing in the Black Sea is also considered to be a widespread issue and, by virtue of being unreported and unrecorded, may be a significant source of mortality in addition to mortalities estimated to occur in the managed fisheries.

To determine the current status of cetacean populations in the Black Sea and the impact of incidental capture in fishing gear, an overview of cetacean population densities/abundance and distribution throughout the entire Black Sea is needed, including in waters under the jurisdiction of the two Black Sea Member States, Bulgaria and Romania. Prior to this study, no accepted population estimates were available. Secondly incidental catch in fishing gear, which is believed to be a significant cause of mortality in Black Sea cetacean populations, is unquantified. Monitoring programmes involving at sea observations of fishing activity exist in only a few countries and are limited in scope. The frequency of bycatch events remains unknown. This information gap is exacerbated by the paucity of information on fishing effort in all coastal states of the Black Sea.

In light of the background to the study, the objective of the contract was to provide an analysis of the historical and current status of cetacean populations in the Black Sea and qualitative and quantitative assessments of their by-catch in Black Sea fisheries by fishery and fishing gear. Finally the contract required recommendations for mitigation measures for fisheries identified as having the highest adverse impacts or by-catch rates.

Executive summary of work achieved

Four tasks were completed to achieve the objective of providing the European Commission with: an analysis of historical and current status of cetacean populations in the western Black Sea; qualitative and quantitative assessments of their by-catch in Black Sea fisheries by fishery and fishing gear; and the provision of recommendations for measures to reduce by-catch in fisheries identified as having high rates of by-catch. A summary of work achieved for each task follows.

A review and analysis of all national and international legislation aiming at the protection and conservation of cetaceans in the Black Sea was completed, including the identification of gaps in the legislation. A rapid assessment of the capacity of existing national fisheries legislation in Bulgaria, Romania, Turkey and Ukraine in context of cetacean conservation was also completed. Questionnaires were distributed to national authorities and experts to develop a list of domestic legal tools. To determine the awareness of fishermen regarding national legislation designed to protect cetaceans, a questionnaire was distributed to leaders of fishing cooperatives in Bulgaria, Romania, Turkey and Ukraine. Recommendations regarding improvement of national legislation and its implementation in the Black Sea were developed.

New data from Bulgaria, Romania, Turkey and Ukraine was collected and a review of existing information from all coastal States on harbour porpoises, common dolphins, and bottlenose dolphins in the Black Sea was completed. Information was reviewed to determine the existing state of knowledge of Black Sea cetaceans and their interactions with fisheries historically and currently. This involved the consolidation of existing datasets on cetacean abundance and distribution, and by-catch records from Black Sea coastal states. To provide information on fishing capacity and effort, surveys were conducted at representative fishing harbours in Bulgaria, Romania, Turkey and Ukraine. In conjunction with the surveys, interviews were held with fishermen to provide information about perceptions of by-catch, by-catch rates in different gear types and seasonality of by-catch. This information was combined with the historical information to enable the assessment of fisheries and fishing gears associated with adverse impacts on cetacean populations. Estimation of bycatch rates were developed and are presented in this report. The virtual absence of information on smaller fishing vessels in Black Sea coastal states surveyed necessitated a change in approach to surveying and leads to uncertainties about the accuracy of fleet effort estimates. Together with the paucity of observed by-catch records, estimates of by-catch are subject to significant caveats are should be used with caution in the absence of further data to improve confidence in the estimates.

Surveys of cetacean population distribution and abundance were completed for the western Black Sea, including the waters of Bulgaria, Romania and Ukraine. Aerial and boat surveys were completed using the accepted double-platform method of observation. Both the aircraft and vessel underwent modifications prior to surveying to support this method of surveying. An additional opportunistic survey was completed using ferry routes between Ukraine and Georgia to provide a snapshot of populations in the eastern waters. National permits were obtained for surveying after a lengthy process and an international team of observers was recruited and trained. Records of cetacean sightings, distances, angles and concomitant data were collected and stored prior to analysis using Distance 6.0 to derive estimates of cetacean abundance and distribution in the western Black Sea and to provide crude estimates for the Black Sea.

Finally, to provide a draft regional strategy for improving cetacean conservation in the Black Sea, a critical review of global existing approaches and methods to prevent and mitigate cetacean by-catch was completed, measures were identified in context of the Black Sea to reduce the problem, and a draft strategy was developed, which is presented in this report.

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Participating Fishing Cooperatives, Associations and Companies[9]

Bulgaria:

- Nessebar Fish Ltd
- Ribex Group Ltd
- SD Ding
- Platerina Ltd
- Mena fish association-Nessebar
- Odessoss 2011 fish association
- Local Fishery Initiative Group Shabla-Kavarna-Balchik
- Local Fishery Initiative Group Biala-Avren-Dolen chiflik
- Local Fishery Initiative Group Primorsko Sozopol Tzarevo
- Local Fishery Group Promori Nessebar
- Harisimov Ltd
- ET G.Peychev
- BG FISH
- Dalboka Ltd
- Black Sea Sunrise association
- Black Sea storm
- Black Sea shipping enterprise
- Alex ships Ltd

Romania:

- Fereration RO-Pescador Marea Negra
- SC Romfish Marina
- Federation Black Sea

Turkey:

[9] Some interviewees were not specified and the list of respondents to questionnaires is incomplete.

- Zonguldak - Kozlu Fisheries Co-op
- Trabzon - Akcakale Fisheries Co-op
- Sinop - Abali Fisheries Co-op
- Samsun - İlkadım Fisheries Co-op
- Sakarya - Karasu Fisheries Co-op
- Rize - Çayeli Fisheries Co-op
- Ordu - Persembe Fisheries Co-op
- Kocaeli - Kefken Fisheries Co-op
- Kirklareli - Limankoy Fisheries Co-op
- Kastamonu -Inebolu Fisheries Co-op
- Istanbul Rumeli Feneri Fisheries Co-op
- Giresun - Bulancak Fisheries Co-op
- Düzce - Akcakoca Fisheries Co-op
- Artvin - Hopa Fisheries Co-op

Ukraine

- Association "Interregional North Azov rybaksoyuz"
- Association - BONDARENKO Renata
- "Golden Fish" LTD
- Association fishing enterprises "Breeze"

Executive summary of results

Review of current legislation

The Black Sea is culturally and politically diverse, and the corresponding regional and national legislative environment is complex. Each state has an exclusive economic zone and related arrangements in respect of environmental protection and fisheries management. All coastal states have ratified or acceded to international treaties that stipulate a commitment to protecting biodiversity and the protection of endangered marine species through responsible fishing practises. All coastal states have national legislation in place that prohibits killing or injuring cetaceans. Legislation or instruments to enact legislation to conserve and protect cetacean populations in the Black Sea therefore exist, but the overall network of legislative provisions, requirements and obligations is not sufficiently coordinated – regionally and nationally – to provide an effective legislative environment for the strict protection of cetacean species.

Critically, given the transboundary nature of cetacean populations and of the threats impacting cetacean populations, the ratification by all Black Sea coastal states of a single legally enforceable framework for the protection of cetaceans and for the management of activities that adversely impact cetaceans in the Black Sea is crucial. Implementation of any measures would ultimately fall within the competence of national authorities, and improvements to national legislation – notably the coordination of fisheries objectives and legislation with biodiversity protection objectives and legislation – would be beneficial.

The development of national marine strategies that take into account the specificities of national waters and that reflect the overall perspective of the Black Sea marine environment would be one approach that would coordinate fisheries and marine environmental strategic priorities. Regardless of these shortcomings or weaknesses, the review of legislation indicates that there is sufficient legislation in place, particularly within Member State jurisdictions, to research, assess and manage pressures and threats to cetacean species, and to designate SACs. Strengthening the capacity of the Member States and the coordination and capacity of regional bodies to implement legislation and to conduct the required research would appear to be more appropriate than the determination and enactment of additional legislative instruments.

Implementation of existing legislation is hampered by insufficient collective political will to shore up implementation and enforcement efforts, both in terms of the conservation of marine biodiversity and fisheries management, and this remains the region's greatest challenge.

Review of existing information on Black Sea cetacean populations

The historical status of cetacean populations (including *P. p. relicta*, *D. d. ponticus* and *T. t. ponticus*) is not clear. Various surveys have been conducted, primarily within Ukrainian/Russian Federation waters and Turkish waters, but the compatibility of survey results is not always clear and the limited geographical coverage restricts the extrapolation of results to basin-wide level. This lack of information extends to the understanding of population abundance, distribution, migrations, critical habitats, anthropogenic and natural threats as well as some basic aspects of lift history and pathology.

The three cetacean species are recognised as endemic to the Black Sea and exhibit genetic differences to the Mediterranean populations of harbour porpoises, common dolphins and bottlenose dolphins. The habitats of all three species overlap, but the principle habitats differ, for example harbour porpoises and bottlenose dolphins are principally associated with the circumlittoral area over the continental shelf, whereas the common dolphin is principally associated with the open sea and is present in the circumlittoral areas as a secondary habitat. The range of all three species includes the entire Black Sea. Harbour porpoises are also associated with the Marmara Sea, Kerch Strait and Azov Sea. Common dolphins are also associated with the Marmara Sea, but are not known in the Azov Sea and are

infrequently observed in the Kerch Strait. Bottlenose dolphins are also associated with the Marmara Sea, Kerch Strait and the waters of the Azov Sea near the Kerch Strait.

Information relating to critical habitats is incomplete and although migrations or seasonal movements are known to occur in all three species, it is unclear to what extent particular areas constitute critical habitat. There is basic information available on 'hotspots', but these are at best incomplete. The identification of important parts of their habitat may be difficult and costly to identify or misguided. The application of strict protection systems for the species throughout their range (rather than of critical habitats or of the species within critical habitats) is particularly relevant given the transboundary and migratory nature of Black Sea cetaceans.

The population sizes and trends of the three species are not clear. In the 20th century, the number of Black Sea harbour porpoises was dramatically reduced by direct hunting, which only ceased in 1983. Although historical population estimates are not available, it is beyond reasonable doubt to conclude that hunting had a significant adverse impact on the populations of harbour porpoises in the Black Sea. Determining trends since 1983 is difficult, but the numbers of incidentally caught animals recorded by observers of fishing activity strongly suggests that the population has further declined as a result of interactions with fishing gear. Direct hunting of common dolphins and bottlenose dolphins also continued until 1983 and, as with harbour porpoises, it is assumed that the population trend for these species was decreasing until this point. Subsequently it is unclear what the population trend is: mass mortality events and concerns relating to the depletion of stocks of prey species may have prevented a recovery in the populations since 1983. Incidental catches in fishing gear may also play a role in the current population trend, but without accepted estimates of abundance and of by-catch rates, it is not possible to determine the current conservation status of any of the Black Sea cetacean species.

Review of existing information on interactions between Black Sea cetacean populations and fisheries

For most of the 20th century, mass commercial killing remained the principal human activity affecting Black Sea cetaceans. In the 19th century Black Sea cetaceans were killed almost exclusively for the oil obtained by the melting of their blubber and sold as lamp-oil for home lighting. From a commercial perspective, the common dolphin (*D. d. ponticus*) was known as a main target, while the bottlenose dolphin (*T. t. ponticus*) represented the rarest prey and the harbour porpoise (*P. p. relicta*) of intermediate commercial importance. All riparian countries pursued their commercial interests for many years and contributed to the direct depletion of dolphin and porpoise populations in the region.

Another reason for the direct killing of cetaceans was their piscivorous nature, in some areas they were considered as undesirable rivals of pelagic and coastal fisheries. Pseudoscientific estimations of enormous fish volumes allegedly consumed by Black Sea cetaceans were used in the USSR as a justification for mass dolphin killing.

Purse-seining and shooting were the two principal methods used to capture and kill cetaceans in the Black Sea cetacean fisheries. Between these two fishery methods, it is commonly acknowledged that the Black Sea cetacean populations were strongly reduced and that perhaps they have not recovered until recently.

Eventually, governments and intergovernmental organizations began to notice the effects of over-exploitation and legal killing was stopped in April 1983. However, cetacean populations were still affected by poaching and capture of wild animals for dolphinaria.

Poaching (illegal, unreported or unregulated – IUU – fishing) is one of the major environmental, economic and social problems concerning the entire Black Sea region. The scale of the unauthorized fisheries is not evaluated officially at the national and international level, but at present it possibly exceeds the combined value of all legal coastal fisheries. Fortunately, unlawful direct take of cetaceans seems to be limited by the lack of adequate markets in the riparian countries. By contrast, cetacean by-catches due to the illegal

Black Sea turbot (*Psetta maeotica*) and sturgeon (*Acipenser spp*.) gill-net fishery may have considerable magnitude.

More generally, by-catches in fishing gear constitute the major source of human-induced mortality of Black Sea cetaceans. In terms of geographical location of these by-catch events, higher rates are reported from concentrated areas of bottom set gillnet fisheries, in the western waters off the Crimea, in concentrated areas off the Bulgarian coast, beyond Romania's territorial waters and in the southwest corner of the Black Sea. By species, porpoises almost always dominate by-catches (often >90% of annual estimates) when compared to by-catches of common and bottlenose dolphins. With regards to fishing gear type, bottom set gillnets for turbot are always recorded as the greatest threat to cetaceans although spiny dogfish set nets are also reported to be a problem. In Turkey, most published cases of cetacean by-catch have occurred in turbot bottom-set gillnets from March to June, with a prominent peak of the records in May and June. It should be underlined that 75% of by-catches occur during May and June when turbot fishing is banned in Turkey.

Currently we are presented with a limited number of anecdotal reports and estimates of cetacean by-catch for the Black Sea which, while providing an indication of the fishing gears and species most likely to interact, are of little use in providing quantitative estimates of cetacean by-catch. For that purpose we must rely on more rigorously collected data. Some of this is presented in Section 6.

Review of the fishing fleet and fishing gears active in the Black Sea

Characterisation of the fishing fleets (i.e. obtaining information on capacity and effort) in Romania, Bulgaria, Ukraine and Turkey is key to the study of fisheries interactions with cetaceans, as it allows quantification of the risks posed to these animals, by specific fishery. Initially national statistics (i.e. power, tonnage, length and number of vessels (capacity) and details of fishing metiers) were collected from each country, through national team members and country's data collection systems. This information provides a relatively low level of detail alone but becomes very useful when combined with data from interview responses of fishermen who were asked specific questions relating to their fishing effort, (including dimensions and properties of fishing gear used), and experiences of cetacean by-catch. The fishermen's survey provides a detailed snapshot of fishing effort and in each country and when extrapolated with information from national statistics (i.e. the size of the full active fleet), an idea of full, detailed operating capacity can be obtained.

National statistics were easily obtained from Bulgaria and Romania, managed and published online by the European Commission's Data Collection Framework. Generally there was an absence of data available for Ukraine and national team members provided estimates of capacity based on data from YugNIRO and the UFFS[10]. Fleet capacity information was also provided by annual Fisheries Statistics publications and by national team members but information relating to gear types was lacking. Recent data (2006-current) show that the capacity of all fleets has been in decline, either in terms of fleet size, horse power and tonnage. Turkey has the largest fishing fleet (5113 vessels), followed by Bulgaria (2030), Ukraine (766) and Romania (194). Most fleets appeared to be dominated by small vessels (5-9.9m in length) and by vessels operating set gillnets.

For the fishermen's survey, data collection forms were designed and distributed to data collectors, who interviewed fishermen from various sectors of the four national fishing fleets. Harbours surveyed were large, being home ports to broad variety of vessels in terms of size and gears deployed. To characterise fishing fleets by fleet segment, metiers (a fishing activity targeting a specific assemblage) were identified in the data. For example, if several vessels reported to be using demersal gillnets of similar mesh size, targeting similar species, then this was chosen as a unique fleet segment. Gear types were selected based

[10] Ukrainian Fishing Fleets Fleets Survey

on EU metier classifications. The main fleet segments defined in the Black Sea include the turbot gillnet fishery (mesh size >280mm), the mixed demersal gillnet fishery (mesh size <150mm), the pelagic gillnet fishery (mixed mesh sizes), the trawl fisheries (mid-water and bottom otter trawls, and beam trawl), the long line fishery and the purse seine fishery (large and small pelagic fish).

To quantify fishing effort in the four countries, maximum dimensions and quantities of fishing gear, and soak times, and the number of annual days spent fishing were calculated and analysed by fleet segment. The values obtained from the fishermen's survey were then extrapolated using national statistics to give total fishing capacity and fishing effort. The largest amount of net was reported from Turkish and Bulgarian gillnet fleets, some fleets operating up to 15,000 km. The longest time spent fishing annually was reported from Bulgaria and Ukraine in the mid-water otter trawl fisheries, fishing over 200 days a year on average with this metier per vessel. Other fishing segments with over 100 days on average fishing a year per vessel include the Turkish, Bulgarian and Ukrainian gillnet fisheries. In general, Turkish and Bulgarian fishing capacity far exceeds that of other countries. Fishing effort was also analysed spatially to identify fishing hotpots along the coasts of the Black Sea.

The data obtained from the fishermen's survey has provided, for the first time, a detailed picture of the various fisheries operating within the Black Sea but due to the lack of robust quantitative data on the numbers of vessels fishing, days absent and net quantities used, it is suggested that this study should be extended.

Cetacean abundance and distribution in the Black Sea

The survey completed for the study represents the first dedicated line transect cetacean survey in the inshore and offshore waters of the western Black Sea. A double platform line transect methodology was adopted for both the vessel and aerial components of the surveying. The methodology was documented in detail and has been included as an electronic annex to the final report with the intention that the methodology is adopted by future cetacean surveys in the Black Sea. Data was treated as a single platform survey by combining the sightings from each observation platform or window and removing duplicate sightings. The processing and analysis was done using the Distance 6.0 program package.

Over the course of 24 days, the vessel traversed the territorial sea and internal maritime areas of Bulgaria and Romania and, partially, of Ukraine. 573 sightings of cetaceans of all three species were recorded and analysed from a surveyed area of 31,781km^2. Sightings of all species were fairly irregular and occasional clusters were recorded.

The aerial survey covered the Exclusive Economic Waters of Bulgaria, Romania and Ukraine using a modified Partenavia P68 aircraft. A total of 512 sightings of cetaceans of all three species were recorded and analysed from a surveyed area of 88,015km^2. As might be expected, the number of observed common dolphins was significantly higher than of the other two species. Sightings were scattered and clusters of animals of all species observed.

The density of harbour porpoises and bottlenose dolphins varied significantly in the two survey strata (essentially nearshore – territorial – waters and offshore – EEZ – waters). The density of common dolphins in the different strata was statistically insignificant. Estimated numbers of all three species in national, EU and western Black Sea waters were calculated and are presented in section 5.1 of this report. The estimates produced are correct for the period of time when surveying was undertaken (mid-summer). This period correlates to the annual maximum presence of cetaceans in the western-northwestern Black Sea.

Drawing the results of the surveying together, differences in abundance and distribution of species within national boundaries and within EU waters were assessed. No significant difference was found between the values of cetacean density nor cetacean numbers in the EU Black Sea represented by waters under

the jurisdiction of Bulgaria and Romania. While the survey results present a snapshot of abundance and distribution, the result has implications for species protection, as it indicates the natural range and distribution of populations of cetaceans encompasses the waters of multiple states.

Estimates of total population abundance using historical and project survey data are subject to significant caveats about their accuracy and caution is advised when referring to the numbers presented in this report until the southern borders of the geographic range of each species is known and until a basin-wide cetacean survey is completed. Sadly, due to the current geopolitical situation, is seems unlikely that a basin-wide survey will be possible until political will is generated that overrides existing tensions and disputes over national waters. In addition to these caveats, historical data from preceding line transect surveys are out of date. Estimates of total population abundance are, therefore, very rough and possible strongly biased. The estimates are the product of expert judgement based more on common sense and speculative inferences than on rigorous calculations.

Adverse fisheries impacts on cetacean population in the Black Sea: current estimates

Characterising the severity of cetacean by-catch in the Black Sea, without collecting data from a long term by-catch monitoring programme is difficult, but this study has examined several sources of information. These include data collected from sporadic observer programmes in the past and data collected by the fishermen's survey from questions relating to fishermen's experiences of cetacean by-catch.

Strikingly, the observer data reveals that from all four countries, relatively high rates of by-catch were observed, some data revealing up to 10 harbour porpoises being observed per haul. These values are much higher than those observed in many other studies of by-catch of this species. Reasons for this may be due to samples being taken from a biased samples of vessels (i.e. turbot gillnet boats with high by-catch rates), biased seasons of high by-catch, and net length and soak time not being accounted for in some data sets. Bootstrapping – assigning measures of accuracy to sample estimates - was used on the data obtained from observer programmes to estimate mean by-catch rates for harbour porpoises and bottlenose dolphins. The by-catch rate estimate for porpoises was 4.67 per haul and that for 0.05 bottlenose dolphins was 0.05 per haul. When locations of observed by-catch rates were mapped spatially, by-catch 'hot-spots' might be associated with certain areas off the Western Crimean Peninsula and off the Romanian coast. More importantly, our maps show just how few areas of the Black Sea have been sampled so any identification of 'hot-spots' in this study is premature. Observer by-catch rates (particularly those of porpoises) have been reported in the same areas as high observed abundances in this study and the overlap between various fisheries and aggregations of cetaceans is clearly a cause for conservation concern.

Interview data were examined to identify fleet segments that reported cetacean by-catch, and then focusing on the highest risk fishery to cetaceans (assumed to be turbot gillnet fisheries), rough estimates of by-catch rates were estimated. It is of note that other gillnets, purse seines, pound nets and mid-water trawls are also associated with cetacean by-catch. An attempt was made to address biases in interview data resulting from either negative or positive attitudes towards cetaceans.. Stated by-catch rates of porpoises in gillnets were generally highest in turbot gillnet fisheries and were nearly 1.5x higher in turbot nets than other gillnets. Regionally, rates were highest in Sinop on the central Turkish coast, and the most variable in Crimea. By-catch rates for dolphins are generally lower than those for porpoises but dolphins tend to be caught more frequently in trawl gear.

Before by-catch totals were calculated for the Black Sea cetaceans, by-catch limits (maintaining populations at sustainable levels) were calculated for the Black Sea cetacean populations based on the abundance estimates obtained in this study, and on various limit values in the literature (IWC, ASCOBANS). The most conservative sustainable limits for Black Sea harbour porpoise are: 247 per year, 225 bottlenose per year and 513 common dolphin per year. These estimates represent the western Black Sea only as

abundance surveys only covered this area in detail. The most liberal sustainable take limits, based on crude estimates of Black Sea abundance, may be around 1300, 1700 and 5800 animals, respectively.

Fishing effort (e.g. the estimated number of hauls, estimated number of trips or the number of vessels) was then incorporated into by-catch rates from observer and interview data to give by-catch totals. The limited existing observer data yielded estimates that are implausibly high. Even the lowest observed values of 1.9 animals per trip suggests an annual take of 66,000 animals in the Black Sea overall which is greater than the estimated population size. Biases are likely present in these data but no major outliers were identified. The fishermen's survey yielded much lower estimates of cetacean by-catch rates when compared to the observer data, with overall mean stated rates of around 4 animals per vessel, per year in the turbot gillnet fishery and expected totals in the region of around 11,000 porpoises and 7000 dolphins per year in this fishery alone. This is not consistent with a sustainable catch based on our abundance estimates. Abundance estimates are consistent with expectations of animal density from other regions for these species. These results raise a general concern that by-catch rates are likely exceeding conservation limits and further work is required to quantify cetacean by-catch, cetacean abundance and fishing fleet structure in the Black Sea.

Strategy for improving cetacean conservation in the Black Sea

Strategies and plans for the conservation of cetaceans in the Black Sea have already been proposed under ACCOBAMS and the Black Sea Commission, and while these priorities still stand, the present study highlights the need for development of a strategy for reducing cetacean by-catches as the single most important overarching action. Black Sea cetaceans, as individual species, are recognised as requiring a stringent protection regime to achieve their favourable conservation status, yet this is not a priority at national or regional level in the Black Sea (the region is geopolitically unstable) and national governments are not fulfilling commitments to cetacean conservation.

In the development of the strategy, existing methods for reducing or preventing cetacean by-catch were reviewed for their potential application to the Black Sea. Generally, by-catch mitigation measures are most practicable if targeted at a small target group, using the support of a robust enforcement and compliance system, underpinned by rigorously drafted legislation, the involvement of fishermen, and the involvement of detailed research and trials before implementation. Generally there was too little spatially explicit information on by-catch rates to establish geographical 'hot-spots' with any degree of certainty, nevertheless, the results obtained do suggest higher cetacean by-catches in the late spring and early summer, off Crimea, central Turkey and Romania, in the turbot gillnet fisheries and for harbour porpoises.

Experts from the national teams have collectively proposed by-catch and general management measures for the Black Sea which were used (in addition to the information given above) in developing a Conservation Action Plan for Black Sea cetaceans. This is placed within an institutional framework centered on the Black Sea Commission that would rely on internationally agreed conservation goals. The Conservation Plan also draws on various recommendations from regional forums. Generally, five broad approaches are required, in parallel which encompass specific conservation actions. These approaches include: 1) Refinement of information on spatial, temporal and metier specific by-catch rates to further identify areas, seasons and fishery types for focused by-catch mitigation, including a better understanding of the rates at which each species is taken by each fishery. 2) Improved information of fleet dynamics and effort. 3) Implementation of by-catch mitigation strategies where there are already obvious requirements. 4) Further investigation of the population dynamics, distribution, density and migration patterns of the three species of concern. 5) The building or improvement of a management organisation to deliver on conservation goals, shared management, fleet documentation, training and outreach. The most urgent action was identified as eliminating illegal fishing for turbot with gillnets.

1. Review of current legislation

1.1. Introduction

All Black Sea coastal states have signed, acceded or ratified global, regional, sub-regional and national conventions, agreement, treaties and acts that put obligations on coastal states to preserve, protect and improve the environment, including biodiversity. All Black Sea coastal states are also party to various agreements and codes that, in combination, require governments to fish responsibly and to protect endangered species. By extension, coastal states have assumed international obligations to protect Black Sea cetaceans, as contracting parties to numerous international conventions, agreements and treaties. Various provisions have been incorporated into national legislation over time that are relevant to the protection of cetaceans and which, in part, support progress towards meetings international obligations.

The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and neighbouring Atlantic Area (ACCOBAMS) is the only regional agreement that is specifically designed to protect and conserve cetaceans in the Black Sea, but not all Black Sea coastal states are parties to the Agreement. The majority of relevant international, regional and sub-regional agreements (and national laws) aim to preserve biodiversity in general.

To determine how appropriate the existing legislative environment is with regard to protecting and conserving Black Sea cetaceans, an analysis of national and relevant international legislation was completed. The following activities were completed to inform the analysis:

- A review of international law (see section 1.1 below) based on the development of a list of international and regional treaties, including identification of provisions requiring implementation by Black Sea coastal states;
- A review of national law (see section 1.2 below) based on a list of national legal tools developed from returned questionnaires sent to national authorities and experts;
- A survey of fishermen's awareness of national legislation concerning cetaceans, based on interviews held with leaders of fishing cooperatives in Bulgaria (BU), Romania (RO), Turkey (TU) and Ukraine (UA);
- A gap analysis of national legislation in comparison with international obligations; and
- An assessment of existing fisheries legislation in BU, RO, TU and UA.

The outputs of the activities are presented in the following sections, which precedes the presentation of recommendations designed to improve national legislation and its implementation in Black Sea coastal states (see section 1.6). Recommendations have been taken forward and integrated into the strategy for improving cetacean conservation in the Black Sea presented in section 7.

1.1. International and regional agreements

The legal regime that applies to Black Sea cetaceans in light of international commitments was reviewed and considered with regard to adverse impacts from interactions with fishing activities. The existing legal framework concerning the protection and conservation of Black Sea cetaceans includes a number of international and regional treaties (including a series of conventions and the ACCOBAMS), EU directives and numerous national instruments (laws, governmental decrees, ministerial orders, regulations, operational guidelines, etc.). Legislation in each coastal country relevant to cetacean protection and developed in response to international obligations varies significantly and is examined in section 1.4.

1.1.1. Summary of international and regional treaties

International and regional treaties, acts and Commissions/organisations relevant to the protection of Black Sea cetaceans are summarised in table 1.1 below. These include tools, agreements and similar

instruments that address the various threats that concern cetaceans, as well as fishing Treaties, and are listed chronologically (in order of creation/adoption); geographic coverage is specified and the nations that are party to the treaty, act or body are identified. Key treaties and primary obligations are outlined in the subsequent paragraphs that follow the summary table. Relevant key subsidiary tools of international and regional importance that stem from the treaties, acts and organisations/commissions are listed in Annex 1.

Table 1.1 International and regional treaties, acts and Commissions/organisations having relevance to the protection of Black Sea cetaceans

Treaties, acts and bodies (chronologically, in order of the adoption/creation)	Geographic coverage	Ratification/accession by parties possessing Black Sea cetaceans in their waters							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Mediterranean Science Commission (CIESM, 1910)	Mediterranean and Black Seas	NO	NO	YES	YES	NO	YES	YES	NO
United Nations General Assembly (UNGA, 1945)	Global	YES (1955)	YES (1992)	YES (1945)	YES (1955)	YES (1945)	YES (1945)	YES (1945)	NO*
Food and Agriculture Organization of the United Nations (FAO, 1945)	Global	YES	YES	YES	YES	YES	YES	YES	YES**
International Convention for the Regulation of Whaling and the International Whaling Commission (IWC, 1946)	Global	YES (2009)	NO	YES (2007)	YES (2008)	YES (1948)	NO	NO	NO
International Maritime Organisation (IMO, 1948)	Global	YES (1960)	YES (1993)	YES (1958)	YES (1965)	YES (1958)	YES (1958)	YES (1994)	NO*
General Fisheries Commission for the Mediterranean (GFCM, 1949)	Mediterranean and Black Seas, and connecting waters	YES	NO	YES	YES	NO	YES	NO	YES
Convention Concerning Fishing in the Black Sea (1959)***	Black Sea waters of the USSR (present Russia, Georgia and Ukraine), Bulgaria and Romania	YES (1960)	YES (1960)	NO	YES (1960)	YES (1960)	NO	YES (1960)	NO

Treaties, acts and bodies (chronologically, in order of the adoption/creation)	Geographic coverage	Ratification/accession by parties possessing Black Sea cetaceans in their waters							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention, 1971)	Global	YES (1976)	YES (1997)	YES (1975)	YES (1991)	YES (1977)	YES (1994)	YES (1991)	NO
Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972)	Global	YES (1974)	YES (1992)	YES (1981)	YES (1990)	YES (1988)	YES (1983)	YES (1988)	NO
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973)	Global	YES (1991)	YES (1996)	YES (1992)	YES (1994)	YES (1992)	YES (1996)	YES (1999)	NO
International Convention for the Prevention of Pollution From Ships (MARPOL, 1973 as modified by the Protocol of 1978)	Global	YES (1984)	YES (1994)	YES (1982)	YES (1993)	YES (1983)	YES (1990)	YES (1993)	NO
Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention, 1976)	Mediterranean Sea region	NO	NO	YES (1979)	NO	NO	YES (1981)	NO	YES (1978)
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979)	Europe	YES (1991)	YES (2009)	YES (1983)	YES (1993)	NO	YES (1984)	YES (1999)	YES (1982)
Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention, 1979)	Global	YES (1999)	YES (2000)	YES (1999)	YES (1998)	NO	NO	YES (1999)	YES (1983)
United Nations Convention on the Law of the Sea (UNCLOS, 1982)	Global	YES (1996)	YES (1996)	YES (1995)	YES (1996)	YES (1997)	NO	YES (1999)	YES (1998)

Treaties, acts and bodies (chronologically, in order of the adoption/creation)	Geographic coverage	Ratification/accession by parties possessing Black Sea cetaceans in their waters							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Convention on Biological Diversity (CBD, 1992)	Global	YES (1996)	YES (1994)	YES (1994)	YES (1994)	YES (1995)	YES (1997)	YES (1995)	YES (1993)
Convention on the Protection of the Black Sea against Pollution (Bucharest Convention, 1992) and the Black Sea Commission	Black Sea region	YES (1993)	YES (1993)	NO	YES (1993)	YES (1993)	YES (1994)	YES (1994)	NO
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive, 1992)	EU Member States	YES (2007)	NO	YES (1992)	YES (2007)	NO	NO	NO	YES (1992)
Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS, 1996)	Mediterranean and Black Seas, and partly NE Atlantic	YES (1999)	YES (2001)	YES (1996)	YES (2000)	NO	NO	YES (2003)	NO
Council Regulation (EC) No. 2371/2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy (2002)	EU Member States	YES (2007)	NO	YES (2004)	YES (2007)	NO	NO	NO	YES (2004)
Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for Community action in the field of marine environmental policy (Marine Strategy Framework Directive, 2008)	EU Member States	YES (2008)	NO	YES (2008)	YES (2008)	NO	NO	NO	YES (2008)

* – EU possesses observer status in the UN GA and IMO.
** – EU is an associate member of FAO.
*** – No longer active since collapse of USSR in 1991.

Mediterranean Science Commission (1910)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
NO	NO	YES	YES	YES	YES	YES	NO

The Mediterranean Science Commission (CIESM, www.ciesm.org) supports a network of several thousand marine researchers to apply the latest scientific tools and to share information to better understand, monitor and protect the Mediterranean and Black Seas. CIESM communicates scientific information, including sampling and analytical protocols applied by 60 coastal institutes within the member countries. CIESM draws upon its experts and the current scientific knowledge to deliver impartial and authoritative advice on a variety of issues, focused on the dynamics, processes, biodiversity, pollution and lasting protection of the Mediterranean and Black Sea ecosystems. Since 2001, CIESM has hosted an Expert Panel on Cetaceans and every three years nominates five members for the Scientific Committee of ACCOBAMS.

United Nations General Assembly (1945)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1955)	YES (1992)	YES (1945)	YES (1955)	YES (1945)	YES (1945)	YES (1945)	NO*

* – EU possesses observer status in the UN GA

The United Nations General Assembly (UNGA, www.un.org/en/ga), is the main deliberative, policymaking and representative organ of the United Nations. One of UNGA roles is to make recommendations in the form of General Assembly Resolutions guiding all nations in the world. Resolutions are non-binding towards member states. A number of UNGA Resolutions, produced since the early 1990s, identify and stipulate basic policy and actions that are relevant to the protection and conservation of the marine wild life, including cetaceans.

Food and Agriculture Organization of the United Nations (1945)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES	YES	YES	YES	YES	YES	YES	YES**

** – EU is an associate member of FAO

The Food and Agriculture Organization of the United Nations (www.fao.org) is an agency of the United Nations that leads international efforts to defeat hunger. FAO acts as a neutral forum where all nations meet to negotiate agreements and debate policy. The FAO Fisheries and Aquaculture Department has a defined mission to strengthen global governance and the managerial and technical capacities of members and to lead consensus building towards improved conservation and utilization of aquatic resources. FAO works with governments and regional fisheries bodies, cooperatives and communities to implement the Code of Conduct for Responsible Fisheries and the Ecosystem Approach to Fisheries.

Recognising that sustainable fishing is essential to safeguard the benefits fisheries provide, more than 170 members of the FAO – including all Black Sea coastal states – adopted the Code of Conduct for Responsible Fisheries in 1995. The code is voluntary, but represents a global consensus or agreement on a wide range of fisheries issues, “including the international standards for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the

ecosystem and biodiversity" (FAO, 2010-2014[11]). Governments are responsible for implementation of the code, technically supported by FAO; national fisheries policies are the sole responsibility of governments, although the importance of regional and international cooperation is highlighted. Relevant to the protection of cetaceans, the Code of Conduct states that:

"Selective and environmentally safe fishing gear and practices should be further developed and applied, to the extent practicable, in order to maintain biodiversity and to conserve the population structure and aquatic ecosystems and protect fish quality" and "States and users of aquatic ecosystems should minimize … catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species" (6.6)

"Recognizing that long-term sustainable use of fisheries resources is the overriding objective of conservation and management, States and subregional or regional fisheries management organizations and arrangement should, inter alia, adopt appropriate measures based on the best scientific evidence available…" (7.2.1). *"Such measures should provide inter alia that… biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected…"* (7.2.2)

"Research on the environmental and social impacts of fishing gear and, in particular, on the impact of such gear on biodiversity and coastal fishing communities should be promoted" (8.4.8)

"States should carry out studies on the selectivity of fishing gear, the environmental impact of fishing gear on target species and on the behavior of target and non-target species in relation to such fishing gear as an aid for management decisions and with a view to minimizing non-utilized catches as well as safeguarding the biodiversity of ecosystems and the aquatic habitat" (12.10).

What is particularly relevant in the context of this study is that the Code recognizes the interrelatedness of the protection of biodiversity, including endangered species, and responsible fishing practices, a fact which is rarely represented in national fisheries law, as will explored later in this report.

In addition to the Code and relevant to this study, FAO has published a World Review of interactions between marine mammals and fisheries (FAO, 1984, Fish. Tech. Pap. 251) and produced the International Guidelines on By-catch Management and Reduction of Discards (2011). Another important tool prepared by FAO is the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2001). Finally, the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem (2001) included a declaration of signatories' intent to incorporate ecosystem considerations into fisheries management. The Reykjavik Declaration includes, *inter alia*, elements on: conserving ecosystem biodiversity, structure and functioning; avoiding irreversible ecosystem impacts from fisheries and reduce reversible, undesirable impacts to the minimum practically possible (e.g., by-catch and discards); and, ensuring an appropriate balance between conservation and responsible use.

International Convention for the Regulation of Whaling (1946)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (2009)	NO	YES (2007)	YES (2008)	YES (1948)	NO	NO	NO

The International Convention for the Regulation of Whaling itself is not concerned with small cetaceans (dolphins and porpoises) whereas the coordinating and executing body, the International Whaling Commission (IWC, http://iwc.int/home) has adopted a number of resolutions relating to small cetaceans and the IWC

[11] *Implementation of the 1995 FAO Code of Conduct for Responsible Fisheries - Web site. Code of Conduct for Responsible Fisheries. FI Institutional Websites.In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 28 May 2014.*

Scientific Committee can study and provide advice on small cetaceans. Under Agenda 21 (the Action programme adopted in Rio de Janeiro by the 1992 UN Conference on Environment and Development), States recognized "the work of the IWC Scientific Committee in carrying out studies of large whales in particular, as well as of other cetaceans" (para. 17.62 b). As part of the IWC Programme on Small Cetaceans, the Scientific Committee has investigated many species worldwide and carried out analytical reviews of directed and incidental catches of small cetaceans, and the mortality of cetaceans in different fishing gear. IWC has encouraged countries to seek scientific advice on small cetaceans from its Scientific Committee and also invited IWC member nations to provide technical or financial assistance to countries with threatened small cetaceans stocks. IWC has also established a voluntary fund to assist participation by developing countries in these matters. Each year the Scientific Committee, through its Sub-Committee on Small Cetaceans, identifies priority species and regions for consideration by a review. Topics considered include distribution, stock structure, abundance, seasonal movements, life history, ecology, directed and incidental takes, and other threats to the populations. Reviews conducted during last 30 years have considered the status of Black Sea cetaceans twice, in 1982 and 2003 (IWC, 1983[12]; IWC, 2004[13]).

Although initially established by nations engaged in whaling, the IWC agreed to establish a Conservation Committee in 2003 to strengthen the conservation agenda of the IWC. The first Conservation Committee meeting was convened in 2004 and focussed on *inter alia*: habitat protection for cetacean conservation; human impacts; reporting systems for strandings, entanglements and by-catch; and legal and regulatory arrangements for cetacean conservation.

The IWC Scientific Committee (IWC SC) has considered by-catch and the threat it poses to small cetaceans and recommended (IWC, 2001):

- that information on the by-catch of cetaceans in fisheries and mariculture operations be collected, preferably using independent observers;
- that particular effort be devoted to developing strategies for reducing the by-catches of small cetaceans in the developing world;
- that if time-area restrictions are to be used as a by-catch mitigation measure, the following conditions should be met: extensive information should be available on the spatial and temporal distribution of small cetaceans, rates of by-catch, and fishing effort; proper enforcement must occur, as without it, any effectiveness is undermined; and a monitoring scheme must be developed and continue even after management goals appear to have been achieved; and
- further research to identify alternative fishing gear and methods, other than acoustic approaches, that could serve as long-term solutions to the by-catch of small cetaceans.

International Maritime Organization (1948)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1960)	YES (1993)	YES (1958)	YES (1965)	YES (1958)	YES (1958)	YES (1994)	NO*

* – EU possesses observer status in the UN GA

International Maritime Organization (IMO, http://www.imo.org) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. IMO has prepared a number of documents aimed in the protection of the marine environment, marine biota and

[12] *IWC 1983 Annex H. Report of the sub-committee on small cetaceans. In: Rep. Int. Whal. Comn. 33 152-170*

[13] *IWC 2004: Report of the Scientific Committee. Small Cetaceans Annex L. J. Cetacean Res and Manage. 6 (suppl.) p34-36*

cetaceans including the Work Programme on Minimizing the Introduction of Incidental Noise from Commercial Shipping Operations into the Marine Environment to Reduce Potential Adverse Impacts on Marine Life (2008); the Guidance Document for Minimizing the Risk of Ship Strikes with Cetaceans (2009); and the 2012 Guidelines for the Implementation of MARPOL Annex V (2012). The latter tool, in particular, includes paragraphs regarding lost and abandoned fishing gears that pose a threat to cetaceans. The IMO Guidelines for the Designation of Special Areas under MARPOL 73/78 and Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (2001) should also be considered, if the specially protected area in question involves measures relating to shipping activities (also see the summary relating to the International Convention for the Prevention of Pollution from Ships, below)

General Fisheries Commission for the Mediterranean (1949)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES	NO	YES	YES	NO	YES	NO	YES

Consisting of 23 Member countries along with the European Union, the GFCM's objectives are to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the Mediterranean, Black Sea and connecting waters. Membership is open to both Mediterranean coastal states and regional economic organizations as well as to United Nations member states whose vessels engage in fishing in Mediterranean waters. The GFCM has the authority to adopt binding recommendations for fisheries conservation and management in its Convention Area and plays a critical role in fisheries governance in the region.

The purpose of the Commission shall be to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the Region. Among its responsibilities, GFCM is responsible for:

- keeping under review the state of living marine resources, including their abundance and the level of their exploitation, as well as the state of the fisheries based thereon
- formulating and recommending appropriate measures: (i) for the conservation and rational management of living marine resources; and (ii) for the implementation of these recommendations
- encouraging, recommending, coordinating and, as appropriate, undertaking research and development activities, including cooperative projects in the areas of fisheries and the protection of living marine resources

GFCM holds regular sessions, including a session on compliance, and typically includes observers from Russia, Ukraine and ACCOBAMS. GFCM and ACCOBAMS discussions on the collection of data on incidental catches of cetaceans have been ongoing for some time and a working group on by-catch was jointly organised in 2008. Resolution GFCM/37/2013/1 specifically references the memorandum of understanding between GFCM and ACCOBAMS in the elaboration of measures contributing to the conservation of cetaceans in the Mediterranean and Black Sea.

In addition, fisheries management measures for the mitigation of marine mammals' by-catch are addressed by GFCM. Recommendation GFCM/37/2013/2, adopted in 2013, included in its scope that:

- members and cooperating non-members of GFCM shall adopt fisheries management measures in the Black Sea region to ensure adequate conservation of turbot

- members and cooperating non-members of GFCM shall adopt fisheries management measures to study, monitor, prevent, reduce and, to the extent possible, eliminate incidental taking of cetaceans during fishing operations.

The recommendation also calls upon members and cooperating non-members to set up adequate monitoring of the impact of bottom-set gillnets targeting picked dogfish on cetacean populations in the Black Sea.

Convention Concerning Fishing in the Black Sea

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES*** (1960)	YES*** (1960)	NO	YES*** (1960)	YES*** (1960)	NO	YES*** (1960)	NO

*** – No longer active since collapse of USSR in 1991

The Convention Concerning Fishing in the Black Sea (1959) was a trilateral agreement between the USSR, Bulgaria and Romania. Since the collapse of the USSR in 1991, the Convention is assumed to be defunct, although this has not been formally announced by the parties. Its working organ – the Joint Commission on Black Sea Fisheries – was established to work out measures aimed to regulate fisheries, coordinate research and exchange information. The commission made a decision regarding the temporary ban on Black Sea cetacean fisheries for 10-year period in the USSR (from March 1966), Bulgaria and Romania (from May 1966). Subsequent sessions of the commission extended the period of the prohibition for the following decades up to 1991 when the Convention is assumed to have dissolved. According to the recommendation of the Joint Commission, temporary bans on turbot fishery were established in the three contracting parties at various times: in the USSR (1986-1991), Bulgaria (1990-1994), and Romania (1989-1990).

Convention on Wetlands of International Importance (1971)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1976)	YES (1997)	YES (1975)	YES (1991)	YES (1977)	YES (1994)	YES (1991)	NO

The Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention, http://www.ramsar.org) is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the sustainable use of all of the wetlands in their territories. Ramsar is the oldest of the modern global intergovernmental environmental agreements. Contracting parties commit to ensure effective management of the "Ramsar List" and to cooperate internationally on transboundary wetlands, shared wetlands and shared species.

The Ramsar List of Wetlands of International Importance (updated in September 2012) includes 14 sites that are identified in the list as providing habitat protection to cetaceans in Cambodia, Jamaica, Sudan, Nicaragua, India, China, Morocco, Mexico and Brazil. The list also includes sites known to be inhabited or visited by Black Sea cetaceans: the Danube Delta (since 1991; 647,000 ha) in Romania; Kilia Mouth of the Danube Delta (1995; 32,800 ha), Dnieper Delta (1995; 26,000 ha), Yagorlyk Bay (1995; 34,000 ha), Tendra Bay (1995; 38,000 ha), Karkinitsky and Dzharylgach Bays (1995; 87,000 ha), Aquatic-cliff complex of Karadag (2004; 224 ha), Aquatic-coastal complex of Cape Opuk (2004; 775 ha), Aquatic-cliff complex of Cape Kazantip (2004; 251 ha), Eastern Sivash Lake (1995; 165,000 ha), Obitochnaya Bay (1995; 2,000 ha), Belosaraiskaya Bay (1995; 2,000 ha), Krivaya

Bay (1995; 1,400 ha) in Ukraine; and the Kuban Delta (1994; two sites of 173,000 ha in total) in the Russian Federation.

Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1974)	YES (1992)	YES (1981)	YES (1990)	YES (1988)	YES (1983)	YES (1988)	NO

The Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention, http://whc.unesco.org/en/conventiontext) defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List and thus protected on the global level within the framework of UNESCO. To date one site within the Black Sea where cetaceans species are known to occur – the Danube Delta Biosphere Reserve (312,440 ha) in Romania – is included in the World Heritage List since 1991 as a site of natural heritage.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1991)	YES (1996)	YES (1992)	YES (1994)	YES (1992)	YES (1996)	YES (1999)	NO

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a voluntary international agreement between governments. With regard to endangered species, CITES aims to protect endangered species by strict regulation of their international trade and transboundary transportation. Although CITES is adhered to voluntarily, States that have agreed to be bound by the Convention (States that have "joined" CITES) are referred to as parties. CITES is legally binding on parties, i.e., they have to implement the Convention. CITES does not take the place of national laws, rather it provides the framework to be respected by each party, which has to adopt its own domestic legislation to ensure CITES is implemented at national level.

CITES possesses a system based on the exchange of export, re-export and import permits/certificates. These documents are granted by the national CITES authorities when certain conditions are met and, in particular, when the trade is not detrimental to the survival of the species, subspecies or population. CITES is supplemented with three Appendices listing the animal and plant taxons of concern, international trade in which is regulated by the convention. Inclusion in Appendix I, II or III depends on the different level of endangerment of species. Most cetacean species, including the harbour porpoise (*Phocoena phocoena*), the common dolphin (*Delphinus delphis*) and the bottlenose dolphin (*Tursiops truncatus*), are listed in Appendix II. This means that these species are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. International trade in specimens of Appendix II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). No provision of CITES expressly prohibits the taking or killing of specimens belonging to the protected species. This means that any activity that does not lead to the trade of protected species does not infringe CITES. The text of CITES states that its provisions "in no way affect the right of parties to adopt ... stricter domestic measures regarding the conditions for trade, taking, possession or transport of specimens of species included in Appendices I, II and III, or the complete prohibition thereof..." (Art. XIV, para. 1). This provision allows the parties to a regional agreement (*e.g.*, ACCOBAMS) to adopt, jointly or unilaterally,

measures restricting or prohibiting trade in the species which are already protected under the regional agreement itself (Scovazzi, 2002[14]).

At its 11th meeting (2000), the Conference of the Parties to CITES adopted two decisions (No. 11.91 and No. 11.139) regarding the Black Sea bottlenose dolphin, *Tursiops truncatus ponticus*, to collect all available information and review the issues relevant to the conservation and trade of this subspecies, and to examine the genetics of this population and evaluate its distinctiveness. At its 12th meeting (2002), the Conference of the Parties to CITES amended Art. 3g of Appendix II of the convention with following decision: "CETACEA spp. in Appendix II is annotated to state that a zero annual export quota has been established for live specimens from the Black Sea population of *Tursiops truncatus* removed from the wild and traded for primarily commercial purposes."

International Convention for the Prevention of Pollution from Ships (1973, modified 1978)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1984)	YES (1994)	YES (1982)	YES (1993)	YES (1983)	YES (1990)	YES (1993)	NO

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the basic convention aimed at combatting pollution from shipping. The Revised MARPOL Annex V Regulations for the Prevention of Pollution by Garbage from Ships (2011, in force since 1 January 2013) prohibit the disposal of almost all forms of rubbish at sea including any discard of fishing gear. The disposal at sea of any plastics (including but not limited to synthetic ropes and synthetic fishing gear which may result in "ghost fishing" and incidental catch of cetaceans) is also prohibited.

Relevant to the protection of habitat of importance to cetaceans, MARPOL establishes Special Areas (habitat and feeding ground degradation) which, because of their oceanographical and ecological condition and owing to their sea traffic, require the adoption of special mandatory methods for the prevention of sea pollution. The IMO Assembly has also established Particularly Sensitive Sea Areas which need special protection through action by IMO because of their significance for recognized ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities. The criteria for the identification of Particularly Sensitive Sea Areas and the criteria for the designation of Special Areas are not mutually exclusive. In many cases a Particularly Sensitive Sea Area may be identified within a Special Area and vice versa for their oceanographic and ecological condition and requires the adoption of special mandatory methods for the prevention of sea pollution. MARPOL also established Particularly Sensitive Sea Areas which need special protection through action by IMO because of their significance for recognized ecological, socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities (Prideaux, 2011[15]).

The guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas were adopted by the IMO Assembly in 1991 and, following a revision in 2004, the revised guidelines were adopted as Resolution A.982(24) in 2005. Ecological criteria relevant to feeding ground and habitat that are recognised by the guidelines include:

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[14] *Scovazzi, T. 2002. ACCOBAMS and the relevant provisions of domestic and international law. Document MOP1/Inf9, First Meeting ot the Parties to ACCOBAMS, Monaco, Feb-Mar 2002. 40p*

[15] *Prideaux, M. 2011. Towards a CMS Global Programme of Work for Cetaceans: Implementing CMS Resolution 8.22: Adverse Human Induced Impacts on Cetaceans (UNEP/CMS/Inf 10.15), Convention on the Conservation of Migratory Species of Wild Animals, Bonn*

- critical habitat as sea areas that may be essential for the survival, function, or recovery of fish stocks or rare or endangered marine species, or for the support of large marine ecosystems.(IMO 2005, in Annex at 4.4.2);
- dependency as area where ecological processes are highly dependent on biotically structured systems (e.g. coral reefs, kelp forests, mangrove forests, seagrass beds). Such ecosystems often have high diversity, which is dependent on the structuring organisms … [including] the migratory routes of fish, reptiles, birds, mammals, and invertebrates (IMO 2005, in Annex at 4.4.3); and
- spawning or breeding grounds as areas that may be a critical spawning or breeding ground or nursery area for marine species which may spend the rest of their life-cycle elsewhere, or is recognized as migratory routes for fish, reptiles, birds, mammals, or invertebrates. (IMO 2005, in Annex at 4.4.7)

Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (1975)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
NO	NO	YES (1979)	NO	NO	YES (1981)	NO	YES (1978)

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and its protocols and annexes constitute one of the main pillars of the Mediterranean Action Plan (MAP) adopted in 1975 by an intergovernmental meeting convened by the United Nations Environment Programme (UNEP). Parties to the MAP have adopted action plans to conserve certain species considered to be especially threatened, such as the Action Plan for the Conservation of Cetaceans in the Mediterranean Sea (1991). In 1996, the MAP was replaced by the Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II). The structure of the present legal framework includes, in particular, the Protocol Concerning Mediterranean Specially Protected Areas (1982), which is replaced by the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (1995; SPAMI Protocol). The SPAMI Protocol provides for the establishment of a List of Specially Protected Areas of Mediterranean Interest (SPAMI List). The SPAMI List may include sites which "are of importance for conserving the components of biological diversity in the Mediterranean; contain ecosystems specific to the Mediterranean area or the habitats of endangered species; are of special interest at the scientific, aesthetic, cultural or educational levels" (Art. 8, para. 2). Once the areas are included in the SPAMI List, all the parties agree "to recognize the particular importance of these areas for the Mediterranean" and "to comply with the measures applicable to the SPAMIs and not to authorize nor undertake any activities that might be contrary to the objectives for which the SPAMIs were established" (Art. 8, para. 3). The SPAMI Protocol is annexed with the List of Endangered or Threatened Species (Annex II; 1996) that includes among other species the harbour porpoise, *Phocoena phocoena*. The latter is represented by the Black Sea subspecies, *P. p. relicta*, in the northern Aegean Sea. However, so far there is no SPAMI Aegean or interconnecting seas.

Convention on the Conservation of European Wildlife and Natural Habitats (1979)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1991)	YES (2009)	YES (1983)	YES (1993)	NO	YES (1984)	YES (1999)	YES (1982)

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) entered into force in 1982 and is a binding international legal agreement in the field of nature conservation. The Bern Convention pre-dates the Habitats Directive and had an important influence on the Habitats Directives conception and drafting. The Convention covers most of the natural heritage of the European continent and extends to some States of Africa. The aims of the Bern Convention are to conserve wild flora and fauna and their natural habitats and to promote European cooperation in that field.

The Convention places a particular importance on the need to protect endangered natural habitats and endangered vulnerable species, including migratory species. All countries that have signed the Bern Convention must take action to:

- promote national policies for the conservation of wild flora and fauna and their natural habitats;
- have regard to the conservation of wild flora and fauna in their planning and development policies, and in their measures against pollution;
- promote education and disseminate general information on the need to conserve species of wild flora and fauna and their habitats; and
- encourage and co-ordinate research related to the purposes of the Bern Convention.

Signatories must also co-operate to enhance the effectiveness of these measures through: co-ordination of efforts to protect migratory species; and, the exchange of information and the sharing of experience and expertise.

Parties are obliged to take appropriate and necessary legislative and administrative measures to ensure the conservation of the habitats of the wild flora and fauna species, especially those specified in Appendices I (Strictly Protected Flora Species) and II (Strictly Protected Fauna Species) and the conservation of endangered natural habitats (Art. 4, para. 1). The parties should devote also special attention to the protection of areas that are of importance for the migratory species listed in Appendices II and III (Protected Fauna Species) and which are appropriately situated in relation to migration routes, as wintering, staging, feeding, breeding or moulting areas (Art. 4, para. 3). The harbour porpoise, common dolphin and bottlenose dolphin are listed in Appendix II. Art. 6 of the Convention prohibits the possession and internal trade of species listed in its Appendix II. Art. 9 of the Convention provides exceptions concerning taking these species in the wild.

For Appendix II species, parties are required to enact appropriate legislative and administrative measures to:

- conserve these species and to prohibit the deliberate capture, keeping and/or killing of Appendix II species;
- deliberate damage to or destruction of breeding or resting sites;
- deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation; and
- the possession of and international trade in these animals, dead or alive, including stuffed animals and any part or derivative thereof.

The Bern Convention has developed an innovative system of treaty compliance that offers a potential avenue to challenge particular projects and incidents affected the conservation status of the various species subject to its regulatory purview (WDCS, 2012)[16]. The mechanisms are increasingly being seen as applicable in the context of cetaceans in individual instances of anthropogenic degradation of habitats or in addressing emerging threats that have not been successfully mitigated in other fora (Scott, 2007, in WDCS, 2012).

[16] *WDCS. 2012. Looking forward to a 'strict protection': a critical review of the current legal regime for cetaceans in UK waters. (Eds) M. Green, R. Caddell, S. Eisfeld, S. Dolman and M. Simmonds. WDCS, 2012. 54pp*

The Convention on the Conservation of Migratory Species of Wild Animals (1979)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1999)	YES (2000)	YES (1999)	YES (1998)	NO	NO	YES (1999)	YES (1983)

The Convention on the Conservation of Migratory Species of Wild Animals (CMS; http://www.cms.int), often referred to as the Bonn Convention was adopted by Bulgaria, Georgia, Romania and Ukraine, which became parties to the Convention in 1999, 2000, 1998 and 1999 respectively. The EU became party to the Bonn Convention in 1983. The CMS encourages signatories to develop multilateral agreements for species that cross national jurisdictional boundaries. CMS has helped progress regional conservation agreements for cetaceans in the Mediterranean and Black Seas (ACCOBAMS).

CMS is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. Migratory species threatened with extinction are listed on Appendix I of the Convention and CMS parties strive to protect these animals, by conserving or restoring their habitats or mitigating obstacles that might endanger them. Migratory species that need or would significantly benefit from international co-operation are listed in Appendix II of the Convention. The Agreements may range from legally binding treaties (called Agreements) to less formal instruments, such as Memoranda of Understanding, and can be adapted to the requirements of particular regions. ACCOBAMS is one such Agreement (see Annex 1 for relevant ACCOBAMS subsidiary instruments). The Agreement requires Parties to prohibit any deliberate taking of cetaceans, with few clearly-defined exceptions, and to create and maintain a network of specially protected areas to conserve cetaceans. A Conservation Plan specifies the actions, which Parties shall take in the following areas: adoption and enforcement of national legislation, habitat protection, research and monitoring, training and education, responses to emergency situations. The harbour porpoise, bottlenose dolphin and common dolphin are specific examples included in this agreement.

The CMS has a two-tier approach that distinguishes between endangered (Annex I to the CMS) species and those considered to have an unfavourable conservation status (listed appendix II to the CMS). Within the Black Sea, *Tursiops truncatus ponticus* is an Appendix I species (Prideaux, 2011[17]), i.e., it is a migratory species for which reliable evidence, including the best scientific evidence available, indicates that the species is endangered. The remaining two species are Appendix II species, i.e., migratory species that have an unfavourable conservation status and that require international agreements for their conservation and management, and which would significantly benefit from the international cooperation that could be achieved by an international agreement.

Numerous relevant Resolutions relevant to the Black Sea have been passed following CMS Conferences of Parties (COPs). Particularly relevant among these, Resolution 8.22 *Adverse Human Induced Impacts on Cetaceans* (2005) was passed acknowledging that human induced impacts on cetaceans are increasing and urging parties and non-parties which exercise jurisdiction over any part of the range of cetacean species listed on the appendices of CMS to cooperate as appropriate with relevant international organisations and to promote the integration of cetacean conservation into all relevant sectors.

By-catch is one of the main concerns of CMS and its agreements. The 7th and 8th CMS COP emphasized that by-catch remains one of the major causes of mortality from human activities in the marine environment. The

[17] *Prideaux, M. 2011. Towards a CMS Global Programme of Work for Cetaceans: Implementing CMS Resolution 8.22: Adverse Human Induced Impacts on Cetaceans (UNEP/CMS/Inf 10.15), Convention on the Conservation of Migratory Species of Wild Animals, Bonn*

rapid implementation of Resolution 6.2 *By-catch*, requesting all parties to strengthen measures to protect the species against by-catch, including to continue and strengthen measures within fisheries under their control, to minimise as far as possible the incidental mortality of migratory species list in Appendices I and II. Additionally, Resolution 7.2 *Implementation of Resolution 6.2 on By-catch* (passed at the 7th COP, 2002) encourages the implementation of Resolution 6.2 in the shortest possible period of time and an adequate assessment of its outcomes. The recommendation also urges Parties to compile information, implement schemes and encourage research proposals to mitigate by-catch and to minimise discarded gear in domestic jurisdictions and on the high seas.

The United Nations Convention on the Law of the Sea (1982)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1996)	YES (1996)	YES (1995)	YES (1996)	YES (1997)	NO	YES (1999)	YES (1998)

The United Nations Convention on the Law of the Sea (UNCLOS), popularly considered "*a constitution for the Oceans*", established a global framework for the exploitation and conservation of marine resources, and provides for the general obligation to protect and preserve the marine environment (art. 192). UNCLOS defines marine territorial boundaries and the legal rights of coastal states to adjacent waters. Under UNCLOS, a country has sovereignty over territorial waters (within 12 nautical miles from the low water mark and the boundaries of internal waters), and exclusive rights (but not sovereignty) over waters within 200 nautical miles from the coastline. Cetaceans can be considered a marine living resource under UNCLOS, which explicitly mentions migratory marine mammal conservation, stating that member States must cooperate to conserve, manage and study marine mammals in the EEZs and the high seas. Member States should also cooperate to conserve marine mammals and, in the case of cetaceans, shall in particular work through appropriate international organisations for their conservation, management and study (Davis, 1985[18]).

As noted, UNCLOS provides for the general obligation to protect and preserve the marine environment (art.192). States are required to take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source. They are also required to take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights. The measures taken shall include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life (art.194). 251. Article 65 of UNCLOS requires States to cooperate with a view to the conservation of marine mammals and in the case of cetaceans to work in particular through the appropriate international organizations for their conservation, management and study. This is also applicable to the conservation and management of marine mammals in the high seas (art.120). 252. Annually, the General Assembly of the United Nations undertakes a review of developments in ocean affairs and the law of the sea, including matters related to the implementation of UNCLOS and its implementing Agreements. In doing so, the Assembly, through its resolutions on oceans and the law of the sea and on sustainable fisheries, has called for a number of actions to address, *inter alia*: by-catch; the impacts of climate change; pollution from all sources, including from ships, land-based sources and marine debris; physical degradation and destruction of marine habitats; and ocean noise (see, for example, UNGA A/RES/61/105, 2006; A/RES/61/222,

18 Davis, K. S. (1985), International Management of Cetaceans under the New Law of the Sea Convention. Boston University International Law Journal 3 B.U. Int'l L. J. 477 42 pages, 477-518

2006; A/RES/62/177, 2007; A/RES/62/215, 2007; A/RES/63/111, 2008; A/RES/63/112, 2008; UNGA A/RES/64/71, 2009; A/RES/64/72, 2009; A/65/37A, 2010; A/RES/65/38, 2010).

Under Part 5 (Articles 61-65), within the relevant EEZ, parties must ensure that living resources are not endangered by over-exploitation, consider effects on species associated with or dependent on harvested species and, more relevantly, ensure conservation and promote optimum utilization of highly migratory species. For marine mammals, stricter protective measure exists under Article 65 which states that parties shall cooperate with a view to their conservation and in the case of cetaceans, shall work through appropriate international organizations for their conservation, management and study. Under this article, it is also highlighted that nothing should prevent a coastal state or international organization in acting more strictly to prohibit, limit or regulate the exploitation of marine mammals.

The Convention on Biological Diversity (1992)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1996)	YES (1994)	YES (1994)	YES (1994)	YES (1995)	YES (1997)	YES (1995)	YES (1993)

The Convention on Biological Diversity (CBD) was developed under the auspices of the UN Conference on Environment and Development in Rio de Janeiro in 1992. The CBD has been legally binding since 1994. It is the most widely supported of all international agreements committing to protect the Earth's biological resources through the conservation and sustainable use of biodiversity. The CBD, in Article 8, calls on parties to "*as far as possible and as appropriate, establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity*". Parties are encouraged to monitor biodiversity in their territories, to identify and take measures for the control of destructive activities, and to integrate consideration of biodiversity within national decision-making. While recognising the sovereign right of States to exploit their own resources pursuant to national environmental policies, such rights are intertwined with the responsibility to ensure that activities conducted within their jurisdiction do not cause damage to other States (Article 3).

The CBD applies in areas within national jurisdiction, the EEZs, as well as beyond the limits of national jurisdiction for processes and activities carried out by a member state, regardless of where their effects occur, such as on the high seas (Article 4). States must also cooperate with other contracting States in areas beyond national jurisdiction (Article 5). In Article 6, parties are primarily required to develop national strategies, plans and policies for the conservation and sustainable use of biodiversity and to integrate such strategies into relevant sectoral policies. The CBD's role is to provide direction, to coordinate shared information and to facilitate capacity and financing of conservation activities. CBD is not an implementing treaty. Parties to the treaty are, however, required to develop National Biodiversity Strategies and Action Plans (NBSAP), which are intended to act as the principle instruments for implementing the CBD at national level.

In 1995, the Jakarta Mandate developed a programme of action for implementing the CBD in terms of marine and coastal biodiversity. One aspect of this was to create marine and coastal protected areas (MPAs) to protect marine biodiversity. This CBD presents a strong mandate for their establishment on the high seas, constrained only by the need to negotiate with other parties in areas beyond national jurisdiction.

More recently, at the tenth meeting of the COP in 2010, countries were called upon to implement the *2011-2020 Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets*, which included calls to integrate national targets into revised and updated NBSAPs, to integrate biodiversity targets into national development strategies, and to monitor and review NBSAP implementation in accordance with the Strategic Plan and national targets.

The Convention on the Protection of the Black Sea against Pollution (Bucharest Convention, 1992) and the Black Sea Commission

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1993)	YES (1993)	NO	YES (1993)	YES (1993)	YES (1994)	YES (1994)	NO

The Convention on the Protection of the Black Sea against Pollution (the Bucharest Convention) and the Black Sea Commission (BSC) was signed in Bucharest in April 1992, and ratified by all 6 legislative assemblies of the Black Sea countries in 1994. The Bucharest Convention provides a basic framework of agreement and three specific Protocols, which are:

- the control of land-based sources of pollution;
- the dumping of waste; and
- joint action in the case of accidents (such as oil spills).

The Implementation of this framework is managed by the Commission for the Protection of the Black Sea Against Pollution (commonly referred to as the Black Sea Commission), with a Permanent Secretariat in Turkey. The Bucharest Convention is a legal convention whose implementation is promoted by the Black Sea Commission. The Convention was backed up by a Ministerial Declaration on the Protection of the Black Sea (the Odessa Declaration, 1993), which adopted *inter alia*:

- to encourage the development of comprehensive and coordinated plans for the restoration and conservation of biodiversity in the Black Sea in the spirit of the 1992 Biodiversity Convention (8);
- to take appropriate measures for the restoration and conservation of biodiversity in the Black Sea in the spirit of the 1992 Biodiversity Convention (9);
- to establish and improve nature conservation areas in the coastal zone of each coastal State before 1996 (10); and
- to take action to ensure prompt ratification of the Convention on the Protection of the Black Sea against Pollution and its Protocols by all Black Sea coastal states (18).

The Commission's environmental strategy (BSC, 2009) sets out a series of ecological quality objectives that include a commitment towards integrated management, elimination of eutrophication and, as a priority, sustainable use of commercial fish stocks and other marine living resources.

A Memorandum of Understanding exist between ACCOBAMS and the Black Sea Commission Secretariats, which articulates the converging goals on marine mammal conservation and confirming the potential synergies between the ACCOBAMS Conservation Plan and the Black Sea Commission Strategic Action Plan for the Rehabilitation and Protection of the Black Sea. As part of the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea, the Bucharest Convention calls for the reduction of the risk of extinction of threatened species, including the development of a stranding network, by catch network and network of MPAs suitable for cetacean conservation. Additionally, the commission co-operates with other intergovernmental organizations involved in marine pollution affairs at the global and regional level, including ACCOBAMS, which has a Sub-regional Coordination Unit for the Black Sea (BSSRCU) established within the Black Sea Commission Permanent Secretariat. It has been agreed that in consultation with the Scientific Committee and the Permanent Secretariat of the Agreement, the BSSRCU:

- will facilitate the preparation of a series of international reviews or publications, to be updated regularly including:

  - reports on the status and trends of populations, as well as gaps in scientific knowledge;
  - a sub-regional directory of important areas for cetaceans;
  - a sub-regional directory of national authorities, research and rescue centres, scientists and non-governmental organisations concerned with cetaceans.
- will cooperate with ACCOBAMS to prepare guidelines dealing with:
  - the reduction or elimination, as far as possible of adverse human/cetacean interactions;
  - habitats protection and natural resources management methods as they relate to cetaceans;
  - emergency in case of massive stranding, major pollution event or epizootics;
  - rescue methods for wounded or sick animals (ACCOBAMS/Black Sea Commission, 2002)

Two key draft documents that are have been developed but are not yet in force are the Black Sea Biodiversity and Landscape Conservation Protocol (BSBLCP-SAP) and the Legally Binding Document for Fisheries and Conservation of Living Resources of the Black Sea. Negotiations for the biodiversity protocol and the fisheries convention have been slow, with the latter having continued over the past two decades (O'Higgins *et al*., 2014). Both, if ratified by coastal states would mark a significant step forward, as they would result in regionally agreed, legally binding measures that specifically deal with cetacean conservation in the Black Sea and the minimisation of by-catch of marine mammals in the Black Sea.

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (1992)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (2007)	NO	YES (1992)	YES (2007)	NO	NO	NO	YES (1992)

The enlargement of the European Union (EU) in 2007 to include two new Member States – Bulgaria and Romania – led to the Black Sea waters under the sovereignty or jurisdiction of these Members States becoming the responsibility of the EU within the framework of various Directives, including Council Directive 92/43/EEC. Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive) was adopted in 1992 and forms a central pillar of Europe's nature conservation policy. The Habitats Directive helps achieve the aims of relevant international nature conservation conventions, such as CITES, the Bern Convention, the Bonn Convention and the Convention of Biological Diversity. The Bern Convention is particularly relevant, having had an important influence on the conception and drafting of the Habitats Directive. The primary objective of the Habitats Directive is to '*maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest*' through the establishment of different conservation instruments.

The maintenance or restoration of favourable conservation status (FCS) is the overall objective for all habitat types and species of community interest. All cetacean species are listed in the Annexes to the directive, including cetacean species present in the Black Sea. FCS is described as a situation where a habitat type or species is doing sufficiently well in terms of quality and quantity and has good prospects of continuing to do so in future (Directive 92/43/EEC guidance document, 2007). The assessment of conservation status includes both diagnosis based on current conditions and prognosis, i.e., foreseeable future based on influences.

Directive 92/43/EEC lays down a set of obligations and procedures that aim to meet the primary objective defined in Article 2. The two main concepts are: the conservation of natural habitats and the habitats of species through the establishment of the Natura 2000 network of protected areas (Articles 3-10); and the protection of animal and plant species (Articles 12-16).

The network of protected areas (Natura 2000 sites, with the central provision through Article 6) targets the conservation of habitats of species through establishing a coherent ecological network made up of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), for species listed in Annex II to the Directive. The second 'concept' (the protection of species) deals with direct influences on the species themselves, as well as (for animals), their eggs, breeding sites and resting places. This concept is more applicable to marine mammals, as they apply to the whole of the territory to which the Directive applies. In contrast, protection afforded under Article 6 is limited to the Natura 2000 network. Under the pillar of species protection, there are provisions that call for a '*system of strict protection*' for Annex IV species (Articles 12 and 13). While the first 'pillar' involves active maintenance, restoration and improvement actions, the second 'pillar' is more preventative, requiring Member States to avoid and prevent situations that could negatively impact a species.

All cetaceans are listed in Annex IV, with both harbour porpoises (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) also listed in Annex II. Species listed in Annex IV may be less suited to conservation by establishing protected areas, requiring instead physical protection of the species, as well as protection of important parts of their habitat. This is true for the cetacean species, which are highly mobile, are scattered and because the adverse impacts on cetacean populations occur throughout their range.

Directive 92/43/EEC obliges Members States to:

- have good factual knowledge on a species
- implement long-term systematic observation to track trends in conservation status, with domestic law setting out the statutory duties of national authorities to undertake surveillance systematically and on a permanent basis
- determine species status at biogeographical level in Member States and with consideration to their overall natural range
- establish a system to monitor incidental capture and killing of Annex IV species and, in the light of information gathered, to take further research or conservation measures if required.

The Directive does not define in detail what measures are needed to fulfil the obligations arising from its provisions, and the definition, adoption and implementation of measures falls within the competence of national authorities. However, Article 10 of the EC Treaty states: "*Members States shall take all appropriate measures, whether general or particular, to ensure fulfilment of the obligations arising out of this Treaty or resulting from action taken by the institutions of the Community. They shall facilitate the achievement of the Community's tasks*". Consequently the maintenance or restoration of FCS should be taken into consideration when establishing adequate measures for species protection and surveillance to demonstrate the effectiveness of the measures.

Where measures required are obligatory under the Directive for a specific species, the Member State shall implement sufficient and verifiable measures to maintain or restore FCS, which is confirmed by surveillance results. In this case, measures and surveillance should be continued. If the Member State does not implement sufficient and verifiable measures to maintain or restore FCS, this is a breach of obligations and normally constitutes an infringement of the Directive.

Looking specifically at Article 12 in context of Black Sea cetaceans, Member States are obliged to establish a system to monitor the incidental capture and killing of these species, being listed in Annex IV. Article 12 emphasises the direct threats faced by cetaceans, including incidental catch in fishing gear, rather than the broader question of the conservation of their habitats. Effective implementation of Article 12 of Directive 92/43/EEC requires "*the provisions of the Directive must be implemented with unquestionable binding force and with the specificity, precision and clarity necessary to satisfy the requirements of legal certainty*". It is worth highlighting that merely replicating the text of Article 12 in national legislation may not – and in the case of cetaceans is unlikely to – satisfy the requirements of species protection and guarantee the effective implementation of Article 12. Further implementing provisions may be required to ensure strict protection

taking into consideration the specific problems, threats and characteristics of the species or group of species being afforded strict protection. Strict protection therefore requires both a coherent legal framework involving specific laws, regulations and administrative measures, and the application of concrete measures to protect Annex IV species. Needless to say, meeting the requirements of Article 12 of the Directive requires that measures are enforced. There is also an element of the precautionary principle in Article 12, whereby Member States are bound by their obligations under Article 12 before a reduction in number of the species has been confirmed or the risk of a protected species disappearing has become a reality.

Article 16 of the Directive enables the system of strict protection to be bypassed through derogations in a limited number of circumstances. Derogations must be justified in relation to the overall aim of the Directive and are subject to three conditions, the first of which is that there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range. Member States may derogate from the provisions of Article 12:

1. in the interest of protecting wild fauna and flora and conserving natural habitats;
2. to prevent serious damage (including to fisheries);
3. in the interests of public health or public safety, or for other imperative reasons of overriding public interest;
4. for the purpose of research and education;
5. to allow, under strictly supervised conditions on a selective basis and to a limited extent, the taking or keeping of certain specimens of Annex IV species by the national competent authorities.

Based on the above, it is difficult to imagine that derogations could be successfully entered for Black Sea cetacean species, suggesting that Article 12, that is strict protection, applies to the cetaceans of the Black Sea.

Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (1996)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (1999)	YES (2001)	YES (1996)	YES (2000)	NO	NO	YES (2003)	NO

The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) is the second Agreement for cetaceans under CMS[19], and concluded in 1996 and entered into force in 2001. The aim of the Agreement is to promote close cooperation amongst Parties with a view to reducing threats to, and achieving and maintaining a favourable conservation status for species of cetaceans present in the Agreement area. ACCOBAMS applies to all cetaceans that have a range which lies entirely or partly within the Agreement area or that accidentally or occasionally frequent the Agreement area, which includes the whole of the Black and Mediterranean seas and the Atlantic coastal waters of North Morocco and South Portugal. In 2010, a resolution was adopted to extend the Agreement Area to the Atlantic waters of continental Portugal and Spain.

Within its area, participating States are required to implement a detailed conservation plan for cetaceans to maintain or restore a favourable conservation status, based on legislation that bans the deliberate capture of cetaceans in fishing zones by their flag vessels or those within their jurisdiction, on measures for minimizing incidental capture and, finally, on the creation of protected areas to conserve cetaceans. Parties are required to prohibit and take all necessary measures to eliminate any deliberate taking of cetaceans. Interactions between cetaceans and fisheries affect cetacean conservation within the agreement area in 3 key ways

[19] *The first being ASCOBANS*

including accidental mortality, direct killing and depletion of cetacean resources through over overfishing and illegal fishing practices.

During the 2nd ACCOBAMS Meeting of Parties (MOP) the Agreement Secretariat was directed to establish and reinforce relations with relevant organizations and in particular General Fisheries Commission for the Mediterranean, Black Sea Commission, European Commission, FAO Co-ordination to Support Fisheries Management in the Western and Central Mediterranean, Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea, Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily and MEDISAMAK (Resolution 2.21 Assessment and Mitigation of the Adverse Impacts of Interactions Between Cetaceans and Fishing Activities in the ACCOBAMS Area). The main objectives of Resolution 2.21 included the following:

- To collect historical data about cetacean by-catch in the project area;
- To provide assistance to national authorities at their request to enable independent observers to sample fishing vessels;
- To collect data about current cetacean by-catch in the project area;
- To test the most appropriate mitigation measures;
- To help Countries undertaking information campaigns directed at fishermen with a special focus on the handling procedures in case of incidental catch of cetaceans

During the 2nd ACCOBAMS MOP Parties acknowledged that habitat protection is fundamental to cetacean conservation and that in the ACCOBAMS area co-operation was needed to create and maintain a network of specially protected areas. The ACCOBAMS Parties also were among the first to consider highly migratory species needing protected areas of a sufficient extent and as such require frequently transboundary cooperation (Resolution 2.14 Protected Areas and Cetacean Conservation). They urged Mediterranean Parties, separately or jointly, to make a wide use of the Specially Protected Areas of Mediterranean Importance (SPAMI) concept to protect areas having importance for cetacean conservation, particularly in transboundary areas or areas beyond their jurisdictions; and for the Black Sea Parties to explore transboundary cooperation through the Black Sea Biodiversity and Landscape Conservation Protocol to the Bucharest Convention in order to establish protected areas devoted to cetaceans conservation. At the same meeting drew attention to ecological role of the exploited marine living resources and the need for prey protection for cetaceans in the Agreement area (Resolution 2.20 Conservation Plan for Short-Beaked Common Dolphins (Delphinus delphis) and Resolution 2.25 Prey Depletion)

The 3rd ACCOBAMS MOP once again drew attention to general threats compounded by habitat loss for Black Sea cetaceans and once again reinforced the need for habitat protection, identifying 18 separate areas of species importance to cetaceans in the Mediterranean and Black Seas as well as repeating their call for urgent action to be taken to protect common dolphin prey and habitat (Resolution 3.11: Conservation Plan for Black Sea Cetaceans, Resolution 4.13: Conservation of the Mediterranean Short-Beaked Common Dolphin and Resolution 3.22: Marine Protected Areas for Cetaceans).

The 4th ACCOBAMS MOP further reinforced the need for regional coordination and for the Scientific Committee to concentrate efforts on gather necessary data for progressing Marine Protected Areas (MPAs) in the future (Resolution 4.15: Marine Protected Areas of Importance for Cetaceans Conservation).

Council Regulation (EC) No. 2371/2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy (2002)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (2007)	NO	YES (2004)	YES (2007)	NO	NO	NO	YES (2004)

Council Regulation (EC) No. 2371/2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy (CFP) sets out the economic, environmental and social basis of the Common Fisheries Policy (CFP) and was adopted in Common Fisheries Policy Reform in 2002. Its objective is to guarantee sustainable exploitation of living aquatic resources by providing coherent measures concerning conservation, management and exploitation. The measures adopted under this Regulation are based on applying the precautionary principle and sound scientific advice that should act to minimize the impact of a fishery on the surrounding marine ecosystem. They concern the conservation and protection of fish stocks and marine ecosystems, access to waters and resources, the fleet, control of activities, decision-making and the involvement of stakeholders at all stages of the policy. Measures are taken to govern the sustainability of fishing activities, zones and resources to limit fishing mortality and environmental impact. This is done by adopting technical measures to promote selective fishing, fishing that has a smaller impact on the wider marine ecosystems and non-target species. Emergency measures lasting periods of up to six months may be taken if a serious threat to resources or an ecosystem exists.

Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for Community action in the field of marine environmental policy (2008)

Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
YES (2008)	NO	YES (2008)	YES (2008)	NO	NO	NO	YES (2008)

Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for Community action in the field of marine environmental policy (Marine Strategy Framework Directive, MSFD) establishes a common framework and objectives for the protection and conservation of the marine environment. Initial Commission proposals for a thematic marine strategy were unveiled in October 2005 (COM (2005) 504), which identified a series of deficiencies within the pre-existing legislative and policy framework. In this regard, particular concerns were raised by the inadequate institutional framework and a deficient knowledge base, identifying a need to proceed with a dual EU-regional approach, based on ecosystem consideration and Member State interaction in framing future marine policy. Following a lengthy process of consultation, the MSFD was adopted in June 2008 establishing a framework for community action in the field of marine environmental policy. The MSFD is intended to operate as an “environmental pillar” to a distinct Maritime Policy, for which a Green Paper was adopted in June 2006 (SEC (2006) 689).

Member States are required to take the necessary measures to achieve objectives to maintain good environmental status in the marine environment for which they are responsible by the year 2020 at the latest (Article 1(1)). A “good environmental status” involves the provision of “ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations” (Article 3(5)). Implicit in this optimal condition is that constituent marine ecosystems can withstand anthropogenic change, and habitats and species are protected, while the anthropogenic impact of substances and energy into the marine environment does not cause pollution effects.

In ascertaining the environmental status of Community seas, a series of indicators and qualitative descriptors are established in the Annexes to the Directive.

Member States must draw up their own strategies, in cooperation with other Member States and third countries within each region which include the Baltic Sea, the North-East Atlantic, the Mediterranean and the Black Sea. The focus on regional approaches within the MSFD should also provide opportunities for ASCOBANS and ACCOBAMS to contribute to the envisaged framework of marine environmental governance in Community waters. ACCOBAMS has established a designated Working Group on this issue. The MSFD could help with a number of issues including over-exploitation of fish, cetacean by-catch, prey depletion and chemical pollution. The MSFD also places particular emphasis upon the problem of ocean noise in a far more comprehensive manner than has previously been achieved at Community level.

The strategies aim to protect and restore Europe's marine ecosystems and to ensure the ecological sustainability of economic activities linked to the marine environment. Firstly member states must assess the ecological status of their waters and the impact of human activities by covering essential characteristics of the waters such as cetacean populations that exist there, main impacts and pressures and economic and social analysis. In implementing these commitments, national assessments should examine essential features and characteristics of these areas, the predominant pressures upon them and their primary economic and social uses (Article 8(1)). From this appraisal a series of environmental targets shall be identified (Article 10), as well as coordinated monitoring programmes for the ongoing assessment of these waters (Article 11). A detailed programme of measures is then to be developed (Article 13(1), including contributing to protected areas under the EU nature conservation directives (Article 13(4)).

1.1.2. Relevant subsidiary instruments

With the multilateral environmental agreements, treaties and directives described above there are provisions, or subsidiary instruments, that are directly or indirectly relevant to the protection and conservation of Black Sea cetaceans. These instruments are listed in Table 1.2 below.

Table 1.2: Chronological list of subsidiary instruments derived from international treaties and organisations, of relevance to the protection of cetaceans in the Black Sea

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Res. (77) 7 of the Committee of Ministers of the Council of Europe on the protection of threatened mammals in Europe (1977)	Council of Europe	YES	NO	YES	YES	NO	NO	NO	YES
Res. 1977:6 on reporting requirements for 'small-type' whaling, called on member Governments to submit statistics on all direct and incidental catches of small cetaceans (1977)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1990:3 on small cetaceans (1990)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1990:6 in Support of the United Nations General Assembly Initiative Regarding Large-Scale Pelagic Driftnet Fishing and its Impact on the Living Marine Resources of the World's Oceans and Seas (1990)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1991:5 on small cetaceans (1991)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
A/RES/46/215. Large-scale pelagic drift-net fishing and its impact on the living marine resources of the world's oceans and seas (1991)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Res. 1992:9 on small cetaceans (1992)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1993:11 on harbour porpoises (1993)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1994:2 on small cetaceans (1994)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
A/RES/49/116. Unauthorized fishing in zones of national jurisdiction and its impact on the living marine resources of the world's oceans and seas (1994)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/50/25. Large-scale pelagic drift-net fishing and its impact on the living marine resources of the world's oceans and seas; unauthorized fishing in zones of national jurisdiction and its impact on the living marine resources of the world's oceans and seas; and fisheries by-catch and discards and their impact on the sustainable use of the world's living marine resources (1995)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Code of Conduct for Responsible Fisheries (1995)	FAO	YES	YES	YES	YES	YES	YES	YES	YES
Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA Protocol, 1995)	Barcelona Convention	NO	NO	NO*	NO	NO	YES	NO	YES
Agreement on the Conservation and Management of Straddling and Highly Migratory Fish Stocks (1995)	UNCLOS	YES	NO	YES	YES	YES	NO	YES	YES
Recommendation of the Standing Committee No. 43 on the conservation of threatened mammals in Europe (1995)	Bern Convention	YES	YES	YES	YES	NO	YES	YES	YES
Res. 1996:4 on small cetaceans (1996)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1996:8 on environmental change and cetaceans (1996)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
A/RES/51/36. Large-scale pelagic drift-net fishing; unauthorized fishing in zones of national jurisdiction; and fisheries by-catch and discards (1996)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Annex II to the SPA Protocol: List of endangered or threatened species (1996, amended 2009)	Barcelona Convention	NO	NO	NO*	NO	NO	YES	NO	YES
Res. 1997:4 on cetacean by-catch reporting and by-catch reduction (1997)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1997:7 on environmental change and cetaceans (1997)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 1997:8 on small cetaceans (1997)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
A/RES/52/29. Large-scale pelagic drift-net fishing; unauthorized fishing in zones of national jurisdiction and on the high seas; fisheries by-catch and discards; and other developments (1997)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
REC.CM-GFCM/22/1997/1 Limitation of the use of driftnets in the Mediterranean (1997)	GFCM	YES	NO	YES	YES	NO	YES	NO	YES
Res. 1998:2 on total catches (1998)	IWC	YES	NO	YES	YES	YES	NO	NO	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Res. 1998:5 on environmental changes and cetaceans (1998)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
A/RES/54/32. Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1999)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Res. 2000:6 on persistent organic pollutants and heavy metals (2000)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 2000:7 on environmental change and cetaceans (2000)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. Conf. 11.15 (Rev. CoP12) Non-commercial loan, donation or exchange of museum and herbarium specimens (2000)	CITES	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/55/7. Oceans and the law of the sea (2000)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/55/8. Large-scale pelagic drift-net fishing, unauthorized fishing in zones of national jurisdiction and on the high seas, fisheries by-catch and discards, and other developments (2000)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Res. 2001-4 on the incidental capture of cetaceans (2001)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 2001-11 on the importance of habitat protection and integrated coastal zone management (2001)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Res. 2001-13 on small cetaceans (2001)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
A/RES/56/12. Oceans and the law of the sea (2001)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/56/13. Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (2001)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2001)	FAO	YES	YES	YES	YES	YES	YES	YES	YES

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Recommendation of the Standing Committee No. 86 on the conservation of the Black Sea bottle-nosed dolphin (2001)	Bern Convention	YES	YES	YES	YES	NO	YES	YES	YES
Res. 1.9. International implementation priorities for 2002-2006 (2002)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 1.10. Cooperation between national networks of cetacean strandings and the creation of a data base (2002)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 1.11. Guidelines for commercial cetacean-watching activities in the ACCOBAMS area (2002)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 1.12. Conservation of the Black Sea Tursiops truncatus: bottlenose dolphin (2002)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
A/RES/57/141. Oceans and the Law of the Sea (2002)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/57/142. Large-scale pelagic drift-net fishing, unauthorized fishing in zones of national jurisdiction and on the high seas/illegal, unreported and unregulated fishing, fisheries by-catch and discards, and other developments (2002)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Amendments to Appendices I and II of the Convention (CoP12, 2002), Art. 3g	CITES	YES	YES	YES	YES	YES	YES	YES	NO
The Black Sea Biodiversity and Landscape Conservation Protocol (2002)	Bucharest Convention	YES	YES	NO	NO**	NO**	YES	YES	NO
Annex 2 to the Biodiversity Protocol: Provisional List of Species of the Black Sea Importance (2002)	Bucharest Convention	YES	YES	NO	NO**	NO**	YES	YES	NO
A/RES/58/14. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2003)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
A/RES/58/240. Oceans and the Law of the Sea (2003)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Council Regulation (EC) No. 812/2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No. 88/89 (2004)	Habitats Directive and Common Fisheries Policy	YES	NO	YES	YES	NO	NO	NO	YES
Res. 2.7. Working Program 2005–2007 (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.8. Framework guidelines on the granting of exceptions for the purpose of non-lethal in situ research aimed at maintaining a favourable conservation status for cetaceans (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.10. Facilitation of exchange of tissue samples (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.11. Facilitation of scientific research campaigns and programs (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Guidelines for technical measures to minimize cetacean-fishery conflicts in the Mediterranean and Black Seas (Res. 2.12, 2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.13. Pelagic gillnets (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.14. Protected Areas and Cetacean Conservation (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.15. Guidelines on Tissue Banks (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.16. Assessment and impact assessment of Man-Made Noise (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.17. On the release of cetaceans into the wild (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.19. Abundance and distribution of cetaceans within the ACCOBAMS area (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Res. 2.21. Assessment and mitigation of the adverse impacts of interactions between cetaceans and fishing activities in the ACCOBAMS area (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 2.25. Prey Depletion (2004)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
A/RES/59/24. Oceans and the Law of the Sea (2004)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/59/25. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2004)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/60/30. Oceans and the Law of the Sea (2005)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/60/31. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2005)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
RES-GFCM/30/2005/2 General guidelines for a GFCM control and enforcement scheme: needs and principles (2005)	GFCM	YES	NO	YES	YES	NO	YES	NO	YES
A/RES/61/105. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2006)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
A/RES/61/222. Oceans and the law of the sea (2006)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Res. 3.4. Work programme 2008-2010 (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.9. Guidelines for the establishment of a system of Tissue Banks within the ACCOBAMS Area and Ethical Code (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.10. Guidelines to address the impact of anthropogenic noise on marine mammals in the ACCOBAMS Area (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.11. Conservation plan for Black Sea cetaceans (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.12. By-catch, competitive interactions and acoustic devices (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.13. Dolphin interaction programmes (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.15. Comprehensive cetacean population estimates and distribution in the ACCOBAMS Area (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.19. IUCN Red List of cetaceans in the Mediterranean and Black Seas (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.20. Guidelines on the release of cetaceans in the wild (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.22. Marine protected areas for cetaceans (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.25. Cetacean live stranding (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 3.29. Guidelines for a coordinated cetacean stranding response (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
A/Res. 3.1. Amendment of the Annex 2 to the Agreement on the conservation of cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area related to the use of driftnets (2007)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
A/RES/62/177. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982	UNGA	YES	YES	YES	YES	YES	YES	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2007)									
A/RES/62/215. Oceans and the law of the sea (2007)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Work Programme on the Minimizing the introduction of incidental noise from commercial shipping operations into the marine environment to reduce potential adverse impacts on marine life (2008)	IMO	YES	YES	YES	YES	YES	YES	YES	NO
Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing (2008)	Common Fisheries Policy	YES	NO	YES	YES	NO	NO	NO	YES
A/RES/63/111. Oceans and the law of the sea (2008)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/63/112. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2008)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Res. 2009-1: Consensus Resolution on Climate and Other Environmental Changes and Cetaceans (2009)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
Guidance Document for Minimizing the Risk of Ship Strikes with Cetaceans (2009)	IMO	YES	YES	YES	YES	YES	YES	YES	NO
Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy (2009)	Common Fisheries Policy	YES	NO	YES	YES	NO	NO	NO	YES

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
A/RES/64/71. Oceans and the law of the sea (2009)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/64/72. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2009)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
Strategic Plan for Biodiversity 2011-2020 (CoP10, 2010, Decision X/2)	CBD	YES	YES	YES	YES	YES	YES	YES	YES
Res. 4.5. Work programme 2011-2013 (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.7. Guidelines for commercial cetacean-watching in the ACCOBAMS area (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.8. Contribution from ACCOBAMS to the implementation of the Marine Strategy Framework Directive (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.9. Fisheries interactions with cetaceans (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.11. Population structure studies (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.12. Comprehensive cetacean population estimates and distribution in the ACCOBAMS area (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.15. Marine Protected Areas of importance for cetacean conservation (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.16. Guidelines for a coordinated cetacean stranding response (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
Res. 4.17. Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Res. 4.18. Guidelines on the granting of exceptions to Article II, paragraph 1, for the purpose of non-lethal *in situ* research in the Agreement area (2010)	ACCOBAMS	YES	YES	YES	YES	NO	NO	YES	NO
A/RES/65/37A. Oceans and the law of the sea (2010)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/65/38. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2010)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
International Guidelines on By-catch Management and Reduction of Discards (2011)	FAO	YES	YES	YES	YES	YES	YES	YES	YES
Revised *MARPOL Annex V* Regulations for the prevention of pollution by garbage from ships (2011, Res. MEPC.201 (62)	MARPOL	YES	YES	YES	YES	YES	YES	YES	NO
Comission Implementing Regulation (EU) No 404/2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy (2011)	Common Fisheries Policy	YES	NO	YES	YES	NO	NO	NO	YES
A/RES/66/68. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2011)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/66/231. Oceans and the law of the sea (2011)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO

Subsidiary instruments (chronologically, in order of the adoption)	Basic treaty/organ	Parties liable or advised to protect Black Sea cetaceans and their habitats according to the adopted instruments							
		Bulgaria	Georgia	Greece	Romania	Russia	Turkey	Ukraine	EU
Res. 2012-1 on the importance of continued scientific research with regard to the impact of the degradation of the marine environment on the health of cetaceans and related human health effects (2012)	IWC	YES	NO	YES	YES	YES	NO	NO	NO
2012 Guidelines for the implementation of MARPOL Annex V (2012, Res. MEPC.219 (63)	IMO	YES	YES	YES	YES	YES	YES	YES	NO
Recommendation GFCM/36/2012/2 on mitigation of incidental catches of cetaceans in the GFCM area (2012)	GFCM	YES	NO	YES	YES	NO	YES	NO	YES
A/RES/67/78. Oceans and the law of the sea (2012)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO
A/RES/67/79. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (2012)	UNGA	YES	YES	YES	YES	YES	YES	YES	NO

* – To date, Greece not yet ratified this Protocol

** – To date, Romania and Russia have not yet ratified this Protocol

1.1.3. International and regional provisions for inclusion in national legislation

The implementation and enforcement of obligations, recommendations and subsidiary instruments contained within multilateral agreements, treaties and directives generally fall within the competence of national governments. It is the responsibility of national governments to adhere to and demonstrate adherence to obligations or conditions of agreements that their governments have agreed to. National legislation of the coastal states should include coherent and coordinated measures to fulfil the requirements and recommendations. Effective implementation of obligations and recommendations should, in theory, be transposed by governments into national law and be binding and clear.

Based on the recommendations or requirements of the international vehicles set out in the preceding section, and including recommendations based on the experience of the technical management unit for the project, the relevant components that would preferably be included in a comprehensive national legislative framework include: (A) prohibitions and/or limitations; (B) exceptions from bans and limitations; (C) measures to combat IUU fishing; (D) measures against drift nets; (E) measures against ghost fishing; (F) measures to regulate the use of bottom-set gillnets; (G) measures against the use of bottom trawls; and (H) research and conservation measures.

Where relevant, the specific instruments and provisions stemming from multilateral agreements are listed in the following tables.

A. Prohibitions and/or limitations

A1. Provisions to prohibit the deliberate killing or injuring a cetacean.

A2. Provisions to prohibit the taking a cetacean in the wild or attempting to engage in such activity.

A3. Provisions to prohibit the possessing a cetacean, a part of a cetacean or a product derived from a killed or taken cetacean.

A4. Provisions to prohibit the importing any cetacean or part of any cetacean or any product derived from a cetacean which was intentionally killed or taken in the wild.

A5. Provisions to prohibit the use of any port or other place to take, import or possess a cetacean, any part of a cetacean or any product derived from a cetacean.

A6. Provisions to prohibit the transportation, purchase, sell, barter, export or offer to purchase, sell, barter or export any cetacean, any part of a cetacean or any product derived from a cetacean.

B. Exceptions from bans and/or limitations

B1. Provisions to make exceptions from bans/limitations A1–A6 for the purpose of non-lethal *in situ* research aimed at maintaining a favourable conservation status of cetaceans

B2. Provisions to make exceptions from bans/limitations A1–A6 in emergency situations for cetaceans, when exceptionally unfavourable or endangering conditions occur

B3. Provisions to make exceptions from bans/limitations A1–A6 to an action that is taken in a humane manner and is reasonably necessary to relieve or prevent suffering of a cetacean

B4. Provisions to make exceptions from bans/limitations A1–A6 to an action that is reasonably necessary to prevent a risk to human life or health

B5. Provisions to make exceptions from bans/limitations A1–A6 to an action that occurs as a result of an unavoidable accident

C. Measures to combat IUU fishing

Table 1.3 Measures to combat IUU fishing

Instruments	Provisions
UNGA Resolutions: A/RES/49/116 (1994), para 1; A/RES/50/25 (1995), para 3; A/RES/51/36 (1996), para 4; A/RES/52/29 (1997), para 4; A/RES/55/8 (2000), para 11; A/RES/57/142 (2002), para 10; A/RES/58/14 (2003), para 19; A/RES/59/25 (2004), para 27	• to take the responsibility ... to take measures to ensure that no fishing vessels entitled to fly the national flags fish in areas under the national jurisdiction of other States unless duly authorized by the competent authorities of the coastal State or States concerned; such authorized fishing operations should be carried out in accordance with the conditions set out in the authorization; • not to permit vessels to engage in fishing on the high seas or in areas under the national jurisdiction of other States, unless duly authorized by the authorities of the States concerned and in accordance with the conditions set out in the authorization, without having effective control over their activities
FAO Code of Conduct for Responsible Fisheries (1995)	7.6.2: to adopt measures to ensure that no vessel be allowed to fish unless so authorized, in a manner consistent with international law for the high seas or in conformity with national legislation within areas of national jurisdiction; 8.1.1: States should ensure that only fishing operations allowed by them are conducted within waters under their jurisdiction and that these operations are carried out in a responsible manner; 8.2.2: Flag States should ensure that no fishing vessels entitled to fly their flag fish on the high seas or in waters under the jurisdiction of other States unless such vessels have been issued with a Certificate of Registry and have been authorized to fish by the competent authorities. Such vessels should carry on board the Certificate of Registry and their authorization to fish; 8.2.7: Flag States should take enforcement measures in respect of fishing vessels entitled to fly their flag which have been found by them to have contravened applicable conservation and management measures, including, where appropriate, making the contravention of such measures an offence under national legislation. Sanctions applicable in respect of violations should be adequate in severity to be effective in securing compliance and to discourage violations wherever they occur and should deprive offenders of the benefits accruing from their illegal activities. Such sanctions may, for serious violations, include provisions for the refusal, withdrawal or suspension of the authorization to fish
UNGA Resolutions: A/RES/54/32 (1999), para 9; A/RES/55/7 (2000), para 24; A/RES/55/8 (2000) para 12; A/RES/56/12 (2001), para 34; A/RES/56/13 (2001), para 15; A/RES/57/141 (2002), para 55; A/RES/57/142 (2002), para 14; A/RES/58/14 (2003), para 18, 25; A/RES/59/25 (2004), para 26, 33	• to participate in the efforts of the FAO to develop an international plan of action to address IUU fishing; • to continue the development of an international plan of action on IUU fishing for the FAO, as a matter of priority;

Instruments	Provisions
	• to take, as a matter of priority, all necessary steps to implement effectively the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing; • to coordinate activities and cooperate in the implementation of the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing, to develop national plans of action on IUU fishing and management of fishing capacity, to promote information-sharing, to encourage the full participation of all stakeholders; • to develop and implement national and regional plans of action, to put into effect the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing and to establish effective monitoring, reporting, enforcement and control of fishing vessels; • to comply fully with all existing obligations and to combat IUU fishing and urgently to take all necessary steps to implement the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing
UNGA Resolutions: A/RES/54/32 (1999), para 10; A/RES/55/8 (2000), para 16	• to work with flag States and the FAO in developing and implementing measures to combat or curb IUU fishing; • to continue working constructively with the FAO to combat unauthorized fishing in zones of national jurisdiction and on the high seas
UNGA Resolutions: A/RES/55/8 (2000), para 11; A/RES/58/14 (2003), para 19	• to take measures to deter reflagging of fishing vessels to avoid compliance with applicable obligations
FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2001)	16: national legislation should address in an effective manner all aspects of IUU fishing; 18: each State should take measures or cooperate to ensure that nationals subject to their jurisdiction do not support or engage in IUU fishing. All States should cooperate to identify those nationals who are the operators or beneficial owners of vessels involved in IUU fishing; 19: States should discourage their nationals from flagging fishing vessels under the jurisdiction of a State that does not meet its flag State responsibilities; 21: to ensure that sanctions for IUU fishing are of sufficient severity to effectively prevent, deter and eliminate IUU fishing and to deprive offenders of the benefits accruing from such fishing. This may include the adoption of a civil sanction regime based on an administrative penalty scheme. States should ensure the consistent and transparent application of sanctions; 22: all possible steps should be taken to prevent, deter and eliminate IUU fishing activities of States non-cooperating to a relevant regional fisheries management organization;

Instruments	Provisions
	23: to avoid conferring economic support, including subsidies, to companies, vessels or persons that are involved in IUU fishing; 24: to undertake comprehensive and effective monitoring, control and surveillance of fishing from its commencement, through the point of landing, to final destination (including authorization schemes for vessels, vessel monitoring system, onboard observer programmes, *etc.*); 32: to publicize widely full details of IUU fishing and actions taken to eliminate it; 34: States should ensure that fishing vessels entitled to fly their flag do not engage in or support IUU fishing; 37: to take measures to ensure that chartered vessels do not engage in IUU fishing; 38: to avoid creating incentives for vessel owners to reflag their vessels to other States; 39: States should take all practicable steps, including denial to a vessel of an authorization to fish and the entitlement to fly that State's flag, to prevent "flag hopping"; that is to say, the practice of repeated and rapid changes of a vessel's flag; 44: States should adopt measures to ensure that no vessel be allowed to fish unless so authorized; 45: a flag State should ensure that each of the vessels entitled to fly its flag fishing in waters outside its sovereignty or jurisdiction holds a valid authorization to fish issued by that flag State; 46: vessels should have an authorization to fish and where required carry it on board; 47.8: vessels' fishing gear should be marked in accordance with internationally recognized standard; 48: flag States should ensure that their fishing, transport and support vessels do not support or engage in IUU fishing. Flag States should ensure that none of their vessels re-supply fishing vessels engaged in such activities or transship fish to or from these vessels; 49: flag States should ensure that all of their fishing, transport and support vessels involved in transshipment at sea have a prior authorization to transship issued by the flag State; 51: each coastal State should implement measures to prevent, deter and eliminate IUU fishing in the exclusive economic zone (EEZ); 51.1: to provide with effective monitoring, control and surveillance of fishing activities in the EEZ; 51.3: to ensure that no vessel undertakes fishing activities within the waters without a valid authorization to fish issued by that coastal State; 51.4: to ensure that an authorization to fish is issued only if the vessel concerned is entered on a record of vessels;

Instruments	Provisions
	51.6: to ensure that at-sea transshipment and processing of fish and fish products in coastal State waters are authorized by that coastal State; 51.8: to avoid licensing a vessel to fish if that particular vessel has a history of IUU fishing; 52: to use measures for port State control of fishing vessels in order to prevent, deter and eliminate IUU fishing; 56: where a port State has clear evidence that a vessel having been granted access to its ports has engaged in IUU fishing activity, the port State should not allow the vessel to land or transship fish in its ports, and should report the matter to the flag State of the vessel; 66: States should take all steps necessary to prevent fish caught by vessels identified to have been engaged in IUU fishing being traded or imported into their territories; 73: States should take measures to ensure that their importers, transshippers, buyers, consumers, equipment suppliers, bankers, insurers, other services suppliers and the public are aware of the detrimental effects of doing business with vessels identified as engaged in IUU fishing
UNGA Resolutions: A/RES/57/142 (2002), para 20; A/RES/58/14 (2003), para 27; A/RES/59/25 (2004), para 37; A/RES/60/31 (2005), para 49; A/RES/61/105 (2006), para 58; A/RES/62/177 (2007), para 71	• to eliminate subsidies that contribute to IUU fishing
UNGA Resolutions: A/RES/58/14 (2003), para 23; A/RES/58/240 (2003), para 35; A/RES/59/24 (2004), para 46; A/RES/59/25 (2004), para 31	• to take all measures consistent with international law necessary to prevent IUU fishing activities
UNGA Resolutions: A/RES/58/14 (2003), para 29; A/RES/59/25 (2004), para 38; A/RES/60/31 (2005), para 42; A/RES/61/105 (2006), para 42; A/RES/62/177 (2007), para 45, 49	• to address substantive issues relating to the role of the port State, noting that such efforts include the elaboration of principles and guidelines for the establishment of regional memorandums of understanding on port State measures to prevent, deter and eliminate IUU fishing; • to address substantive issues relating to the role of the port State, noting that such efforts include the elaboration of a draft model scheme on port State measures to prevent, deter and eliminate IUU fishing; • to enhance port state control to combat IUU fishing
UNGA Resolutions: A/RES/58/14 (2003), para 20; A/RES/59/25 (2004), para 28; A/RES/60/31 (2005), para 33–37, 44, 61; A/RES/61/105 (2006), para 34–39, 41, 50, 52; A/RES/62/177 (2007), para 37, 39, 40, 43, 44, 58, 59, 61	• to collaborate in efforts to address IUU fishing activities, including, inter alia, the development and implementation of vessel monitoring systems and the listing of vessels in order to prevent IUU fishing activities

Instruments	Provisions
	• to prevent, deter and eliminate IUU fishing and to establish effective control of fishing vessels including the development and implementation of vessel monitoring systems and the listing of vessels in order to prevent IUU fishing activities; • to combat IUU fishing (to establish mandatory vessel monitoring, control and surveillance systems for fishing vessels); • to prevent IUU fishing (to strengthen or establish negative lists of fishing vessels); • to prevent IUU fishing (to exercise effective control over the vessels)
UNGA Resolutions: A/RES/61/105 (2006), para 45; A/RES/62/177 (2007), para 54, 62	• to ensure that vessels do not engage in trans-shipment of fish caught by fishing vessels engaged in IUU fishing
UNGA Resolution: A/RES/62/177 (2007), para 38	• to exercise effective control over nationals and vessels in order to prevent and deter them from engaging in IUU fishing activities or supporting vessels engaging in IUU fishing activities
UNGA Resolutions: A/RES/66/68 (2011), para 115; A/RES/67/79 (2012), para 128	• to develop regional guidelines for establishing sanctions for non-compliance by fishing vessels, and for evaluating national systems of sanctions to ensure that they are effective in securing compliance and deterring violations

D. Measures against drift nets

Table 1.4 Measures against drift nets

Instruments	Provisions
IWC Res. 1990:6 (1990)	• to support UNGA initiative to tackle the problem of large-scale pelagic driftnet fishing and its Impact on the living marine resources of the oceans and seas
UNGA Resolutions: A/RES/46/215 (1991), para 3c, 4; A/RES/50/25 (1995), para 1; A/RES/51/36 (1996), para 1; A/RES/52/29 (1997), para 1	• to ensure that a global moratorium on all large scale pelagic drift-net fishing is fully implemented on the high seas of the world's oceans and seas, including enclosed seas and semi-enclosed seas; • to take measures to prevent large-scale pelagic drift-net fishing operations on the high seas of the world's oceans and seas, including enclosed seas and semi-enclosed seas
UNGA Resolutions: A/RES/50/25 (1995), para 2; A/RES/51/36 (1996), para 3; A/RES/52/29 (1997), para 3	• to take greater enforcement responsibility to ensure full compliance with resolution 46/215 and to impose appropriate sanctions, consistent with obligations under international law, against acts contrary to the terms of that resolution

Instruments	Provisions
UNGA Resolutions: A/RES/55/8 (2000), para 2; A/RES/57/142 (2002), para 5; A/RES/58/14 (2003), para 33; A/RES/59/25 (2004), para 44	• to comply with resolution 46/215 and other subsequent resolutions on large-scale pelagic drift-net fishing, to enforce fully the measures recommended in those resolutions
UNGA Resolutions: A/RES/60/31 (2005), para 50; A/RES/61/105 (2006), para 59; A/RES/62/177 (2007), para 72	• to prevent large-scale pelagic drift-net fishing, to impose appropriate sanctions
UNGA Resolution: A/RES/63/112 (2008), para 74	• to enforce fully the measures recommended for the elimination of large-scale pelagic drift-net fishing
UNGA Resolutions: A/RES/64/72 (2009), para 79; A/RES/65/38 (2010), para 76; A/RES/66/68 (2011), para 79; A/RES/67/79 (2012), para 89	• to eliminate the use of large-scale pelagic drift nets in all seas and oceans

E. Measures against ghost fishing

Table 1.5 Measures against ghost fishing

Instruments	Provisions
FAO Code of Conduct for Responsible Fisheries (1995)	7.2.2g: catch by lost or abandoned gear should be minimized through measures including the development and use of environmentally safe and cost-effective fishing gear and techniques; 7.6.9: to take appropriate measures to minimize catch by lost or abandoned gear; 8.4.1: to ensure that fishing is conducted with due regard to the protection of the marine environment and the prevention of loss of fishing gear; 8.4.6: to develop and apply technologies, materials and operational methods that minimize the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear; 8.9.1c: waste disposal systems should be introduced in fishing harbours and landing places, including for the disposal of fishing gear
UNGA Resolutions: A/RES/58/14 (2003), para 34; A/RES/59/25 (2004), para 45; A/RES/60/31 (2005), para 51; A/RES/61/105 (2006), para 60; A/RES/62/177 (2007), para 73; A/RES/63/112 (2008), para 75; A/RES/64/72 (2009), para 80; A/RES/65/38 (2010), para 79, 125; A/RES/66/68 (2011), para 82, 141; A/RES/67/79 (2012), para 91, 145	• to take action to reduce or eliminate catch by lost or abandoned gear; • to take action to reduce abandoned, lost or otherwise discarded fishing gear
UNGA Resolutions: A/RES/59/25 (2004), para 60; A/RES/60/31 (2005), para 77, 79; A/RES/61/105 (2006), para 94; A/RES/62/177 (2007), para 104; A/RES/63/112 (2008), para 111; A/RES/64/72 (2009), para 133; A/RES/65/38 (2010), para 126; A/RES/66/68 (2011), para 142; A/RES/67/79 (2012), para 146	• to take action to address the issue of lost or abandoned fishing gear and related marine debris, including through the collection of data on gear loss, economic costs to fisheries and other sectors, and the impact on marine ecosystems; • to address the issue of lost and discarded fishing gear and related marine debris; • to address the issue of lost, abandoned and discarded fishing gear and related marine debris and the adverse impacts such debris and derelict fishing gear have on, inter alia, fish stocks, habitats and other marine species; • reaffirms the importance concerning the issue of lost, abandoned, or discarded fishing gear and related marine debris and the adverse impacts such debris and derelict fishing gear have on, inter alia, fish stocks, habitats and other marine species, and urges accelerated progress by States
UNGA Resolution: A/RES/59/25 (2004), para 63	• to establish systems for retrieving lost gear and nets

Instruments	Provisions
UNGA Resolution: A/RES/60/31 (2005), para 81	• to raise awareness within fishing sector and fisheries managers of the issue of derelict fishing gear and related marine debris and to identify options for action
FAO International Guidelines on By-catch Management and Reduction of Discards (2011)	8.1: to consider measures to address the impact of ghost fishing on living aquatic resources. Possible actions to assess and mitigate such impacts include, *inter alia*: (i) adopting objectives in fisheries management policies and plans to minimize mortalities as a result of ghost fishing; (ii) improving the scientific information on the effects of ghost fishing, so that they can be included in stock, fishery and ecosystem assessments; and (iii) developing technologies and measures that quantify, and reduce, the mortalities and impacts associated with ghost fishing. This may include methods for identification of gear ownership, reduction of gear losses, evelopment of gear retrieval procedures and programs, and reducing, and where possible eliminating, fishing power of lost gear, e.g. through the use of degradable materials

F. Measures to regulate the use of bottom-set gillnets for turbot, dogfish and sturgeon

Table 1.6 Measures to regulate the use of bottom-set gillnets for turbot, dogfish and sturgeon

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 9	• to control human activity which could prove harmful to mammals and their habitats
UNGA Resolution: A/RES/59/25 (2004), para 68	• to expand the competence to regulate bottom fisheries and the impacts of fishing on vulnerable marine ecosystems
UNGA Resolutions: A/RES/62/177 (2007), para 11; A/RES/63/112 (2008), para 13; A/RES/64/72 (2009), para 13; A/RES/65/38 (2010), para 13; A/RES/66/68 (2011), para 14; A/RES/67/79 (2012), para 15	• to urgently adopt measures to fully implement the International Plan of Action for the Conservation and Management of Sharks for directed and non-directed shark fisheries, based on the best available scientific information, through, inter alia, limits on catch or fishing effort, by requiring that vessels collect and regularly report data on shark catches, discards and landings, undertaking, comprehensive stock assessments of sharks, reducing shark by-catch and by-catch mortality, and, where scientific information is uncertain or inadequate, not increasing fishing effort in directed shark fisheries until measures have been established to ensure the long-term conservation, management and sustainable use of shark stocks and to prevent further declines of vulnerable or threatened shark stocks

Instruments	Provisions
UNGA Resolutions: A/RES/63/112 (2008), para 14; A/RES/64/72 (2009), para 14; A/RES/65/38 (2010), para 14; A/RES/66/68 (2011), para 15; A/RES/67/79 (2012), para 17	• to take immediate and concerted action to improve the implementation of and compliance with existing regional fisheries management organization or arrangement and national measures that regulate shark fisheries

G. Measures against the use of bottom trawls and also pelagic trawls near sea bottom

Table 1.7 Measures against the use of bottom trawls and also pelagic trawls near sea bottom

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 9	• to control human activity which could prove harmful to mammals and their habitats
UNGA Resolution: A/RES/57/141 (2002), para 53	• to promote the conservation and management of the oceans, to develop and facilitate the use of diverse approaches and tools, including the elimination of destructive fishing practices
UNGA Resolution: A/RES/59/25 (2004), para 66	• to take action urgently, and consider on a case-by-case basis and on a scientific basis, including the application of the precautionary approach, the interim prohibition of destructive fishing practices, including bottom trawling that has adverse impacts on vulnerable marine ecosystems
UNGA Resolution: A/RES/59/25 (2004), para 68	• to expand the competence to regulate bottom fisheries and the impacts of fishing on vulnerable marine ecosystems

H. Research and conservation measures

H1. Provisions to develop a comprehensive programme of scientific research, managerial and practical actions to improve knowledge about cetaceans and their conservation status.

Table 1.8 Research and conservation measures 1

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 10, 11	• to intensify the co-ordination of research and conservation programmes between states with regard to mammals whose area of distribution is situated in frontier regions; • to develop ecological research on wildlife by competent bodies and distribute the results of this research to all concerned, including the general public
UNGA Resolutions: A/RES/55/7 (2000), para 32; A/RES/56/12 (2001), para 21; A/RES/57/141 (2002), para 23	• to consider as a matter of priority the issues of marine science and technology, to adopt the necessary national laws, regulations, policies and procedures to promote and facilitate marine scientific research and cooperation
UNGA Resolution: A/RES/57/141 (2002), para 51	• to develop national, regional and international programmes for halting the loss of marine biodiversity, in particular fragile ecosystems
UNGA Resolutions: A/RES/59/25 (2004), para 59; A/RES/60/31 (2005), para 67; A/RES/61/105 (2006), para 78; A/RES/62/177 (2007), para 95; *etc*.	• to increase scientific research on the marine ecosystem

H2. Provisions to grant permits for research, including non-lethal in situ research and collecting tissue samples from stranded and by-caught cetacean carcasses AND

H3. Provisions of inadmissibility of permits to kill a cetacean or to take a cetacean for maintenance in captivity AND

H4. Provisions of impact assessment for activities that may affect cetaceans or their habitat, including fisheries, offshore exploration and exploitation, marine traffic, military exercises, **etc.**

Table 1.9 Research and conservation measures 2

Instruments	Provisions
FAO Code of Conduct for Responsible Fisheries (1995)	7.2.2f: adverse environmental impacts on marine biological resources from human activities should be assessed and, where appropriate, corrected
UNGA Resolutions: A/RES/55/7 (2000), para 30; A/RES/56/12 (2001), para 39	• to ensure that adverse impacts on the marine environment are taken into account when assessing and evaluating development programmes and projects
UNGA Resolutions: A/RES/63/111 (2008), para 102; A/RES/64/71 (2009), para 116; A/RES/65/37A (2010), para 132; A/RES/66/231 (2011), para 137; A/RES/67/78 (2012), para 149	• to consider the further development and application of environmental impact assessment processes covering planned activities that may cause substantial pollution of or significant and harmful changes to the marine environment

H5. Provisions of permits for activities that may affect cetaceans or their habitat and of periodical scientific review of the impact of permits issued.

Table 1.10 Research and conservation measures 3

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 9	• to control human activity which could prove harmful to mammals and their habitats
UNGA Resolution: A/RES/55/7 (2000), para 30	• to ensure that adverse impacts on the marine environment are taken into account when assessing and evaluating development programmes and projects

H6. Provisions of the demand addressed to fishermen to release cetaceans caught alive incidentally in any fishing gear AND

H7. Provisions of the demand addressed to fishermen to record and report all incidents of cetacean by-catch (including cases resulted in death of cetaceans).

Table 1.11 Research and conservation measures 4

Instruments	Provisions
IWC Resolutions: Res. 1977:6 (1977); Res. 1997:4 (1997)	• to report statistics on all direct and incidental catches of small cetaceans to IWC; • to report statistics on incidental catches of cetaceans to IWC
FAO Code of Conduct for Responsible Fisheries (1995)	8.4.3: States should make every effort to ensure that documentation with regard to fishing operations, retained catch of fish and non-fish species is collected and forwarded systematically to competent bodies. States should, as far as possible, establish programmes, such as observer and inspection schemes, in order to promote compliance with applicable measures

H8. Provisions to elaborate and/or implement regulations and programme to reduce and monitor cetacean by-catch in fishing activities.

Table 1.12 Research and conservation measures 5

Instruments	Provisions
IWC Resolution: Res. 1993:11 (1993)	• to assess incidental catches of harbour porpoises, the effects on the populations, and means of the mitigation
FAO Code of Conduct for Responsible Fisheries (1995)	6.6: to minimize waste catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species; 7.2.2d: to ensure that the biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected; 7.2.2g: catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species should be minimized through measures including the development and use of selective, environmentally safe and cost-effective fishing gear and techniques; 7.6.9: to take appropriate measures to minimize catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species; 8.5.1: to require that fishing gear, methods and practices, to the extent practicable, are sufficiently selective so as to minimize catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species and that the intent of related regulations is not circumvented by technical devices;

Instruments	Provisions
	12.4: to collect reliable and accurate data which are required to assess the status of fisheries and ecosystems, including data on by-catch
UNGA Resolutions: A/RES/50/25 (1995), para 4; A/RES/51/36 (1996), para 5; A/RES/52/29 (1997), para 9; A/RES/55/8 (2000), para 7; A/RES/57/142 (2002), para 21; A/RES/58/14 (2003), para 34; A/RES/59/25 (2004), para 45; A/RES/60/31 (2005), para 51; A/RES/61/105 (2006), para 60; A/RES/62/177 (2007), para 73; A/RES/63/112 (2008), para 75; A/RES/64/72 (2009), para 80; A/RES/65/38 (2010), para 79; A/RES/66/68 (2011), para 82	• to take action to adopt policies, apply measures, collect and exchange data and develop techniques to reduce by-catches; • to take action to reduce by-catch; • to take action to reduce or eliminate by-catch
IWC Resolution: Res. 1997:4 (1997)	• to take action to reduce by-catch
UNGA Resolutions: A/RES/59/25 (2004), para 46; A/RES/60/31 (2005), para 52; A/RES/65/38 (2010), para 82; A/RES/66/68 (2011), para 87; A/RES/67/79 (2012), para 98	• to give due consideration to participation in regional and subregional organizations with mandates to conserve non-target species taken incidentally in fishing operations, in particular, in the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
UNGA Resolutions: A/RES/60/31 (2005), para 65; A/RES/61/105 (2006), para 8; A/RES/62/177 (2007), para 9; A/RES/63/112 (2008), para 11; A/RES/64/72 (2009), para 11; A/RES/65/38 (2010), para 11; A/RES/66/68 (2011), para 12; A/RES/67/79 (2012), para 13	• to collect and report to FAO the by-catch data; • to collect and report fishery related information including by-catch data; • to collect and report to FAO the required catch and effort data, and fishery related information, in a complete, accurate and timely way, including by-catch
UNGA Resolutions: A/RES/61/105 (2006), para 7; A/RES/62/177 (2007), para 7; A/RES/63/112 (2008), para 9; A/RES/64/72 (2009), para 9; A/RES/65/38 (2010), para 9; A/RES/66/68 (2011), para 10; A/RES/67/79 (2012), para 11	• to apply the precautionary approach and an ecosystem approach in adopting and implementing conservation and management measures addressing by-catch
UNGA Resolutions: A/RES/62/177 (2007), para 8; A/RES/63/112 (2008), para 10; A/RES/64/72 (2009), para 10; A/RES/65/38 (2010), para 10; A/RES/66/68 (2011), para 11; A/RES/67/79 (2012), para 12	• to develop, fully implement, and, where necessary, continue to improve robust observer programmes on by-catch species; • to improve data collection on, inter alia, by-catch species, to develop, fully implement, and, where necessary, continue to improve robust observer programmes; • to enhance or develop observer programmes in order to improve data collection on, inter alia, by-catch species
UNGA Resolutions: A/RES/63/112 (2008), para 78; A/RES/64/72 (2009), para 83; A/RES/65/38 (2010), para 80, 83; A/RES/66/68 (2011), para 83, 84, 88; A/RES/67/79 (2012), para 93, 95, 99	• to ensure the adequate conservation of non-target species taken incidentally in fishing operations, taking into consideration best practices for non-target species management;

Instruments	Provisions
	• to develop and implement effective management measures to reduce the incidence of catch of non-target species; • to further study, develop and adopt effective management measures, taking into account the best available scientific information on fishing methods to minimize by-catch
UNGA Resolutions: A/RES/65/38 (2010), para 81; A/RES/66/68 (2011), para 85; A/RES/67/79 (2012), para 96	• to adopt or improve measures to assess the impact of fisheries on species caught as by-catch and to improve the comprehensiveness and accuracy of information and reporting on incidental catch of species caught as by-catch, including through adequate observer coverage and the use of modern technologies;
UNGA Resolutions: A/RES/66/68 (2011), para 86; A/RES/67/79 (2012), para 97	• to strengthen or establish data-collection programmes to obtain reliable estimates of marine mammal by-catch, and to promote further research on selective fishing gear and practices and on the use of appropriate by-catch mitigation measures
FAO International Guidelines on By-catch Management and Reduction of Discards (2011)	3.2.2: to adopt and implement measures necessary to ensure the management of by-catch as part of fisheries management; 3.2.3: to promote capacity building for better management of by-catch including, as appropriate, participation in the co-management and community-based management of fisheries; 3.2.4 (i): to develop or amend management plans for fisheries so that the plans include objectives for the use and management of that portion of the full catch of which by-catch is subset; 3.2.4 (ii): to encourage the involvement of fishers in the development of measures to manage by-catch, recognizing the value of their knowledge and experience; 3.2.4 (iii): to promote the use of appropriate incentives to manage by-catch and ensure they are sufficient to encourage the adoption of and compliance with management measures; 4.1.2: to identify and assess fisheries where by-catch occur and specify the requirements for management actions; 4.1.3: to undertake by-catch management planning for all fisheries that require by-catch management action; 4.1.4: to ensure that by-catch management planning includes best practices for by-catch management developed in cooperation with relevant stakeholders; 5.1.1 (i): to establish appropriate and reliable monitoring and assessment techniques to: (a) determine how by-catch affect living aquatic resources and (b) evaluate and refine the performance of measures for by-catch management;

Instruments	Provisions
	5.1.1 (ii): to implement data collection procedures and protocols appropriate to the scale and type of fishery and taking into account the results of the risk assessment referred to in paragraph 4.1.2, including the use of observers, standardized logbooks and vessel position monitoring systems; 5.1.1 (iii): to consider the use of national and regional training programmes for fishers, resource managers and scientific observers to improve by-catch identification, data collection and reporting; 5.1.2: to develop strategies for the longterm collection of accurate data taking into account the importance to management of spatial and temporal variability in by-catch; 5.1.3: to strive to achieve a level and scope of observer programs sufficient to provide quantitative estimates of total catch and incidental takes of living aquatic resources; 5.1.4: to standardize the collection of by-catch data; 5.1.6: to assess the impacts of by-catch as well as the biological and economic impacts of by-catch management measures; 5.1.7: to give due consideration to the fact that since by-catch management often requires different types of data from many sources, improved integrated systems may be required to aggregate, manage and analyze these data. Consideration should be given to making by-catch data publicly available to promote transparency in by-catch management; 6.1: to conduct and promote research that is essential for planning on by-catch management. Additional research should be conducted on the biology of species taken as by-catch, the performance of fishing gears and mitigation measures and the social and economic consequences of measures and techniques to manage by-catch; 6.3: to collaborate in assessing by-catch issue throughout the entire distribution range of the species of concern; 6.4: to establish research and development programmes for more selective fishing gears or alternative fishing methods that are practical, safe, effective, socio-economically viable and contribute to the sustainable management of the affected species; 6.5: to map seabed habitats, distributions and ranges of species taken as by-catch, in particular rare, endangered, threatened or protected species, to ascertain where species taken as by-catch might overlap with fishing effort; 7.1: to ensure that by-catch management measures are: binding; clear and direct; measurable; science-based; ecosystem-based; ecologically efficient; practical and safe; socio-economically efficient; enforceable; collaboratively developed with industry and stakeholders; and fully implemented;

Instruments	Provisions
	7.3: to ensure that a range of tools to manage by-catch and reduce discards are available. Such tools include, *inter alia*: input and/or output controls; the improvement of the design and use of fishing gear and by-catch mitigation devices; spatial and temporal measures; limits and/or quotas on by-catches; and incentives for fishers to comply with measures to manage by-catch; 7.4.1: to give careful consideration to the implementation of controls on fishing capacity and effort in a fishery where by-catch and discards occur and cause significant problems; 7.4.6: quotas for target species, or allocations of a quota among fleets or fisheries, may be adjusted, based on estimated by-catches associated with catches of the target species; 7.5.1: to consider utilizing technological measures to improve selectivity and reduce by-catch; 7.6.1: to consider measures to reduce interactions with particularly vulnerable by-catch (e.g. juveniles and rare, endangered, threatened or protected species) through identifying and establishing areas where the use of all or certain gears is limited or prohibited; 7.6.2: to consider the use of adaptive spatial closures to reduce by-catch problems; 7.6.3: to encourage information-sharing among fishers and managers to identify areas/times of by-catch problems so that fishers effectively avoid them; 7.6.4: to base closure decisions on the best available scientific advice and give careful consideration to the potential indirect and unintended consequences of such measures; 7.6.5: to consider the feasibility of introducing a requirement to move away from areas where significant by-catch problems occur; 7.7.1: to consider the establishment of individual and fleet-wide limits on by-catch in those fisheries where by-catch is unavoidable; 7.7.5: where information on the by-catch populations is limited, by-catch limits and quotas should be set in accordance with the precautionary approach; 7.8 (i): the access to or restriction from fishing opportunities can be a strong economic incentive for compliance with by-catch mitigation measures; 7.8 (ii): the costs to fishers for installation of by-catch mitigation technologies could be lessened, where appropriate, through the application of grants/loans and preferential treatment on duties and taxes for investment in such technologies; 7.9.1: to seek to eliminate or adjust regulatory measures that provide incentives which may undermine by-catch management measures;

Instruments	Provisions
	7.9.2: in situations where by-catch must be released, techniques may have to undergo further development to maximize the survival of the released living aquatic species; 9.1 (i): to require reporting of all relevant information related to by-catch; 9.2: to establish and implement the appropriate national policies, as well as the legal and institutional frameworks, for effective monitoring, control and surveillance of fisheries for management of by-catch; 9.3: this may include inspection of fishing vessels and gear prior to the commencement of fishing operations; 9.4: to encourage the participation of fishers in policy development, implementation and self-policing (e.g. through co-management and community-based management); 10.1: to provide reliable information and raise the level of awareness of by-catch problems, and measures needed to address them, among fishers, governments, policy-makers, other relevant stakeholders and the general public; 10.2: to develop a framework for long-term cooperative working relationships on by-catch management with stakeholders, management authorities at all levels and other agencies and organizations, including providing accurate and timely information on by-catch-related issues, regulations and activities; 10.4: to collate and share best practice methods for monitoring, estimating and managing by-catch, preparing appropriate legislation and/or regulations and for effective communication and training; 10.5: to provide opportunities for fisheries managers to increase their knowledge of by-catch issue and their potential solutions. Policymakers should be provided with information, advice and options regarding by-catch problems, their socio-economic impact and their potential solutions; 10.6: to ensure that fishing gear technologists receive specialised training in technical measures which may be adopted to mitigate by-catch and should provide adequate training to fishers in the use and maintenance of the technology and practices so developed; 10.7 (i): to take into account fishers' opinions and suggestions on effective by-catch management measures; 10.7 (ii): to provide clear explanations to fishers on why it is necessary to manage by-catch in their fisheries, the consequences of failing to do so and the benefits of adopting by-catch management measures;

Instruments	Provisions
	10.7 (iii): to communicate regularly with fishers on the causes and conditions that lead to by-catch, the evolution of by-catch management programmes, the results of research and the status of species of interest; 10.7 (iv): to coordinate and strengthen the activities and programmes of fishers' cooperatives, companies and similar organizations to manage by-catch; 10.7 (v): to provide adequate training to fishers in the use and maintenance of technology and practices that are used in the management of by-catch, techniques that allow fishers to develop their own solutions, the handling, recovery and release of by-catch species captured alive, basic legislation and policies and communication techniques to allow their by-catch management work to be elucidated to appropriate target audiences; 11.2: to collaborate with FAO and other relevant organizations to standardize monitoring and reporting procedures on by-catch; 11.3: to inform stakeholders and the general public of actions taken to improve by-catch management

H9. Provisions to ensure the maintenance of the diversity and availability of fish stocks and to prevent overfishing.

Table 1.13 Research and conservation measures 6

Instruments	Provisions
FAO Code of Conduct for Responsible Fisheries (1995)	6.1: to ensure effective conservation and management of the living aquatic resources; 6.2: fisheries management should promote the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations. Management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species; 6.3: to prevent overfishing and excess fishing capacity and to implement management measures to ensure that fishing effort is commensurate with the productive capacity of the fishery resources and their sustainable utilization. States should take measures to rehabilitate populations as far as possible and when appropriate; 6.5: to apply a precautionary approach widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment, taking account of the best scientific evidence available. The absence of adequate scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species and non-target species and their environment; 7.1.1: to adopt measures for the long-term conservation and sustainable use of fisheries resources. Conservation and management measures, whether at local, national, subregional or regional levels, should be based on the best scientific evidence available and be designed to ensure the long-term sustainability of fishery resources at levels which promote the objective of their optimum utilization and maintain their availability for present and future generations; short term considerations should not compromise these objectives; 7.1.8: to take measures to prevent or eliminate excess fishing capacity and to ensure that levels of fishing effort are commensurate with the sustainable use of fishery resources as a means of ensuring the effectiveness of conservation and management measures; 7.6.3: where excess fishing capacity exists, mechanisms should be established to reduce capacity to levels commensurate with the sustainable use of fisheries resources so as to ensure that fishers operate under economic conditions that promote responsible fisheries. Such mechanisms should include monitoring the capacity of fishing fleets

H10. Provisions to elaborate and/or implement regulations for minimizing the introduction of anthropogenic noise into the marine environment.

Table 1.14 Research and conservation measures 7

Instruments	Provisions
UNGA Resolutions: A/RES/55/7 (2000), para 25; A/RES/56/12 (2001), para 35; A/RES/57/141 (2002), para 41; A/RES/59/24 (2004), para 54; A/RES/60/30 (2005), para 61; A/RES/61/222 (2006), para 74; A/RES/62/215 (2007), para 80; A/RES/63/111 (2008), para 98; A/RES/65/37A (2010), para 128	• to protect and preserve the marine environment and its living marine resources against physical degradation, to cooperate and take measures for the protection and preservation of the marine environment
UNGA Resolutions: A/RES/58/14 (2003), para 45	• to accelerate activity to safeguard the marine environment against physical degradation
UNGA Resolutions: A/RES/61/222 (2006), para 107; A/RES/63/111 (2008), para 141; A/RES/64/71 (2009), para 162; A/RES/65/37A (2010), para 186; A/RES/66/231 (2011), para 185; A/RES/67/78 (2012), para 205	• to encourage studies and consideration of the impacts of ocean noise on marine living resources; • to encourage further research, studies and consideration of the impacts of ocean noise on marine living resources

H11. Provisions to elaborate and/or implement regulations on the discharge at sea of pollutants known to have adverse effects on cetaceans.

Table 1.15 Research and conservation measures 8

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 9	• to control human activity and in particular the use of toxic substances which could prove harmful to mammals and their habitats
UNGA Resolutions: A/RES/61/105 (2006), para 7; A/RES/62/177 (2007), para 7; A/RES/63/112 (2008), para 9; A/RES/64/72 (2009), para 9; A/RES/65/38 (2010), para 9; A/RES/66/68 (2011), para 10; A/RES/67/79 (2012), para 11	• to apply the precautionary approach and ecosystem approach in adopting and implementing conservation and management measures addressing marine pollution
UNGA Resolutions: A/RES/55/7 (2000), para 25; A/RES/56/12 (2001), para 35; A/RES/57/141 (2002), para 41, 43; A/RES/58/14 (2003), para 45; A/RES/58/240 (2003), para 49; A/RES/59/24 (2004), para 54; A/RES/60/30 (2005), para 61; A/RES/61/222	• to protect and preserve the marine environment and its living marine resources against pollution, to cooperate and take measures for the protection and preservation of the marine environment; • to enhance the protection of the marine environment from pollution

Instruments	Provisions
(2006), para 74; A/RES/62/215 (2007), para 80; A/RES/63/111 (2008), para 98; A/RES/65/37A (2010), para 128; A/RES/65/38 (2010), para 124; A/RES/66/68 (2011), para 140; A/RES/67/79 (2012), para 144	• to accelerate activity to safeguard the marine environment against pollution; • to enhance the protection of the marine environment from pollution
UNGA Resolutions: A/RES/55/7 (2000), para 27; A/RES/56/12 (2001), para 36; A/RES/57/141 (2002), para 42; A/RES/58/240 (2003), para 47; A/RES/59/24 (2004), para 63; A/RES/60/30 (2005), para 69	• to prioritize action on marine pollution from landbased sources as a part of national sustainable development strategies and local Agenda 21 programmes; • to continue to prioritize action on marine pollution from land-based sources as part of national sustainable development strategies and programmes; • to take all appropriate measures to control, reduce and minimize, to the fullest extent possible, marine pollution from land-based sources
UNGA Resolutions: A/RES/55/7 (2000), para 31; A/RES/56/12 (2001), para 40; A/RES/59/24 (2004), para 55	• to take all practicable steps to prevent pollution of the marine environment from ships and by dumping; • to protect and preserve the marine environment from all sources of pollution and take effective measures, according to the scientific, technical and economic capabilities, to prevent, reduce and, where practicable, eliminate pollution caused by dumping or incineration at sea of wastes or other matter
UNGA Resolutions: A/RES/56/12 (2001), para 41; A/RES/57/141 (2002), para 52	• to continue to work on issues relating to the protection of the marine environment from degradation resulting from ship-based activities, including the transfer of harmful aquatic organisms and pathogens through ships' ballast water; • to accelerate the development of measures to address the problem of invasive alien species in ballast water
UNGA Resolutions: A/RES/63/111 (2008), para 112; A/RES/64/71 (2009), para 128; A/RES/65/37A (2010), para 145; A/RES/66/231 (2011), para 150; A/RES/67/78 (2012), para 163.	• to enhance efforts to reduce eutrophication fuelled by riverine run-off of fertilizers, sewage outfall and reactive nitrogen resulting from the burning of fossil fuels and resulting in serious consequences for ecosystem functioning
UNGA Resolutions: A/RES/66/231 (2011), para 133, 164; A/RES/67/78 (2012), para 141, 179.	• to protect and preserve the marine environment and its living marine resources against pollution, to cooperate and take measures for the protection and preservation of the marine environment; • to cooperate and share best practices in the fields of protection of the marine environment, prevention, emergency response and mitigation, and encourages the undertaking of scientific research, including marine scientific research, to better understand the consequences of marine oil spills

H12. Provisions to develop a network of existing protected areas eligible for monitoring and conservation of cetacean populations.

Table 1.16 Research and conservation measures 9

Instruments	Provisions
UNGA Resolutions: A/RES/58/240 (2003), para 54; A/RES/59/24 (2004), para 72; A/RES/60/30 (2005), para 74; A/RES/61/222 (2006), para 97; A/RES/62/215 (2007), para 111; A/RES/63/111 (2008), para 134; A/RES/64/71 (2009), para 153; A/RES/65/37A (2010), para 177; A/RES/66/231 (2011), para 176; A/RES/67/78 (2012), para 194, 195	• to develop representative networks of marine protected areas

H13. Provisions to establish specially protected areas for cetacean conservation.

Table 1.17 Research and conservation measures 10

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 6, 7 and 8	• to safeguard, protect and if need be re-establish habitats essential to the survival of mammal species already threatened or liable to become so, taking into consideration the ecological needs of the species concerned when the size of such areas is being determined; • to place these protected areas under the control of competent persons to enable ecological management to be put into practice and provide the necessary funds; • to designate protected areas where it is necessary to safeguard typical, unique, rare or endangered mammal populations
UNGA Resolutions: A/RES/57/141 (2002), para 53; A/RES/58/240 (2003), para 54; A/RES/59/24 (2004), para 72; A/RES/60/30 (2005), para 74; A/RES/61/222 (2006), para 97; A/RES/62/215 (2007), para 111; A/RES/63/111 (2008), para 134; A/RES/64/71 (2009), para 153; A/RES/65/37A (2010), para 177; A/RES/66/231 (2011), para 176; A/RES/67/78 (2012), para 195	• to establish marine protected areas consistent with international law and based on the best scientific information available
UNGA Resolutions: A/RES/61/105 (2006), para 7; A/RES/62/177 (2007), para 7; A/RES/63/112 (2008), para 9; A/RES/64/72 (2009),	• to apply the precautionary approach and an ecosystem approach in protecting habitats of specific concern

Instruments	Provisions
para 9; A/RES/65/38 (2010), para 9; A/RES/66/68 (2011), para 10; A/RES/67/79 (2012), para 11	
UNGA Resolutions: A/RES/64/71 (2009), para 156; A/RES/65/37A (2010), para 179; A/RES/66/231 (2011), para 178; A/RES/67/78 (2012), para 194	• to further progress towards the establishment of marine protected areas and to further consider options to identify and protect ecologically or biologically significant areas on the basis of the best available scientific information
UNGA Resolutions: A/RES/66/231 (2011), para 175; A/RES/67/78 (2012), para 192	• to strengthen the conservation and management of marine biodiversity and ecosystems and national policies in relation to marine protected areas

H14. Provisions of the capacity building, training and education including:

a) development of networks and databases for collecting information on cetacean sightings, strandings and incidental catches;

b) establishing tissue banks for samples collected;

c) preparation of awareness guides for distribution to users of the sea;

d) development and implementation of training programmes on conservation techniques, in particular, on monitoring and first aid techniques, and responses to emergency situations;

e) development of education programmes and tools for dissemination of information about cetaceans among different target groups.

Table 1.18 Research and conservation measures 11

Instruments	Provisions
Res. (77) 7 of the Committee of Ministers of the Council of Europe (1977), para 11 and 13	• to develop ecological research on wildlife by competent bodies and distribute the results of this research to all concerned, including the general public; • to disseminate general information on the need to protect mammals and on the general principles of the protective measures
UNGA Resolutions: A/RES/56/12 (2001), para 28; A/RES/57/141 (2002), para 37; A/RES/59/24 (2004), para 10; A/RES/60/30 (2005), para 11; A/RES/61/222 (2006), para 11; A/RES/62/215 (2007), para 12; A/RES/63/111 (2008), para 11; A/RES/64/71 (2009), para 11;	• to continue to strengthen capacity-building activities in the field of marine scientific research by, inter alia, training the necessary skilled personnel, providing the necessary equipment, facilities and vessels, and transferring environmentally sound technologies;

Instruments	Provisions
A/RES/65/37A (2010), para 14; A/RES/66/231 (2011), para 14; A/RES/67/78 (2012), para 15	• to continue to strengthen capacity-building activities in the field of marine scientific research by, inter alia, training personnel to develop and enhance relevant expertise, providing the necessary equipment, facilities and vessels and transferring environmentally sound technologies
UNGA Resolutions: A/RES/63/111 (2008), para 125; A/RES/64/71 (2009), para 145; A/RES/65/37A (2010), para 170; A/RES/66/231 (2011), para 171; A/RES/67/78 (2012), para 188	• to continue in a sustainable and comprehensive way to support, promote and strengthen capacity-building activities in the field of marine scientific research, taking into account, in particular, the need to create greater taxonomic capabilities

H15. Provisions to prepare and implement emergency plans for such events as mass strandings, live strandings, major pollution events, epizootics or ice entrapment of cetaceans.

Table 1.19 Research and conservation measures 12

Instruments	Provisions
UNGA Resolutions: A/RES/58/240 (2003), para 55; A/RES/59/24 (2004), para 60; A/RES/60/30 (2005), para 64; A/RES/61/222 (2006), para 77; A/RES/62/215 (2007), para 88; A/RES/63/111 (2008), para 104; A/RES/64/71 (2009), para 118; A/RES/65/37A (2010), para 134; A/RES/66/231 (2011), para 139; A/RES/67/78 (2012), para 151	• to develop and promote contingency plans for responding to pollution incidents, as well as other incidents that are likely to have significant adverse effects on the marine environment and biodiversity

H16. Provisions to prepare and implement guidelines, including a code of conduct, for rescue operations.

H17. Provisions to prepare and implement guidelines and to grant permits on the release of captive cetaceans into the wild.

H18. Provisions to prepare and implement regulations and to grant permits for cetacean-watching activities carried out for commercial purposes.

1.2. National laws relevant to the conservation of cetaceans in the Black Sea

The national laws of all six Black Sea coastal countries; Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine, were examined with a view to:

- Identify for each country the laws providing protection for cetaceans.
- Draw attention to obvious the obvious loopholes.
- Outline procedures for dealing with accidental by-catch.
- Note circumstances in which exceptions from prohibitions can be made.
- Identify laws on the discard of fishing gear (with a view to preventing ghost fishing, a particular hazard for cetaceans).
- Note limitations on the use of bottom set gillnets and other fishing gear involved in cetacean by-catch.
- List penalties such as fines, imprisonment and confiscation of boat or gear.

1.2.1. Bulgaria

The Bulgarian legislation prohibits the catching, transferring, transporting and trade of marine mammals. In the case of by-catch of marine mammals the animals should be returned immediately to the sea regardless of their condition.

All three species of Black Sea cetaceans are protected by the Biological Diversity Act[20] which prohibits:

- All forms of deliberate capture or killing of the animals by whatever devices, means or methods.
- Hunting and disturbance, particularly during the period of breeding, wintering and migration.
- The taking of dead animals.
- Possession, keeping, movement, transport, export, trade and offering for sale or exchange of specimens taken in the wild.

According to the Biological Diversity Act, any person who has found a helpless or dead specimen, or who has unintentionally injured or killed a specimen is obliged to notify the nearest regional authority of the Ministry of Environment and Water within three days. At the discretion of the regional authority such specimen should be provided to a scientific organisation or a school or to a natural history museum for study or augmentation of teaching collections. Therefore, any incident of cetacean by-catch should be reported without delay to the regional authority of the Ministry of Environment and Water and cetacean carcasses extracted from fishing nets should be delivered ashore for scientific and educational purposes. This provision is at variance with the Fishery and Aquaculture Act, which prohibits without exception the transferring and transporting of marine mammals and demands that they are returned instantly to the sea regardless of their condition, even if they are dead.

At the same time the Biological Diversity Act makes provision for certain exceptions from prohibitions listed above. Any exemption could be granted in the following cases:

- In the interests of protection of species of wild flora and fauna and for conservation of natural habitats.
- In the interests of public health and safety.
- For other reasons of overriding public interest, including reasons of social or economic nature or resulting in extremely favourable consequences for the environment.

[20] *Biological Diversity Act. State Gazette, No. 77 dated 09.08.2002 (promulgated); State Gazette, No. 77 dated 09.10.2012 (amended).*

- For the purposes of research and education, for the introduction or reintroduction of species.

No special exception is stipulated in the case of emergency situations for cetaceans, when exceptionally unfavourable or endangering conditions occur for example live strandings, although the Veterinary Practices Act[21] permits the use of euthanasia for terminally ill animals.

There is no formal ban on discarding any fishing gear to prevent the so-called ghost fishing of marine animals. However, the Law on the Maritime Spaces, Inland Waterways and Ports[22] prohibits any discharge, disposal and dumping of solid wastes and if the discarded and abandoned fishing nets are recognized as a kind of solid waste, this instrument can be used for the protection of cetaceans against ghost fishing.

There are some limitations to the use bottom-set gillnets with big mesh size designed for targeting Black Sea turbot, spiny dogfish and sturgeon. Out of the various kinds of fishing gears in use, this type causes the greatest levels of cetacean by-catch in the Black Sea region. Within the turbot fishery, all kinds of gear is prohibited from April 15 for 60 days as this is the period of this species' reproduction. The fishing, carrying, transportation and marketing of sturgeon species are banned in Bulgaria all year round[23].

Bottom trawling and dredging equipment that cause harm to cetacean habitat are prohibited. An exception to this ban is beam trawling despite this method also being detrimental to cetacean habitats.

Fines are stipulated by Bulgarian legislation in cases of:

- Catching, carrying, transporting and selling marine mammals.
- Deliberate capture or killing, hunting, disturbing, possession, keeping, movement, transport, export, trade and offering for sale or exchange of the protected animals (including cetaceans) taken in the wild; taking of found dead animals; not informing the regional authorities within three days about a found specimen in helpless condition or a dead specimen or about an incident of unintentional injuring or killing a specimen.
- Shooting wild animals or animals held in captivity "except in cases of extreme necessity or in accordance with the Biological Diversity Act".
- Acting in cruelty and, therefore, illegally causing the death or severe or lasting harm to an animal. This article of the Criminal Code provides for a fine along with imprisonment of up to three years.

Fines in the case of the illegal use of bottom-set gillnets and bottom trawls are stipulated by Articles of the Fishery and Aquaculture Act.

1.2.2. Georgia

Two Georgian laws; the *Law on Fauna*[24] and the *Law on the Red List and Red Book*[25], are the principal legal tools protecting Black Sea cetaceans in this country.

The *Law on Fauna* prohibits the practice of taking of small cetaceans from the wild and the underwater hunting of cetaceans. Use of the animals for scientific, educational, recreational, esthetic and veterinarian

[21] Veterinary Practices Act. State Gazette, No. 87 dated 01.11.2005 (promulgated); State Gazette, No. 97 dated 07.12.2012 (amended).

[22] Law on the Maritime Spaces, Inland Waterways and Ports. State Gazette, No. 12 dated 11.02.2000 (promulgated); State Gazette, No. 53 dated 13.07.2012 (amended).

[23] Order of the Minister of Agriculture and Food No. RD 09-43 dated 20.01.2012.

[24] Law on Fauna, No. 540 dated 25.12.1996.

[25] Law on the Red List and Red Book, No. 2356 dated 06.06.2003.

purposes (observation, marking, photo-identification, *etc*.) is allowed without taking animals from the wild, as long as it is not detrimental for the population and its habitat.

The only exception for the temporary taking of animals from the wild is for veterinarian purposes but this is not clarified in the document. In case of necessity (which is also not defined), the Ministry of Environment can restrict or prohibit using fauna species including cetaceans for scientific, cultural-educational, recreational, aesthetic, and veterinarian purposes.

Two species of Black Sea cetaceans; the harbour porpoise and the bottlenose dolphin, are included on the 'Red List' for Georgia and therefore are protected by the *Law on the Red List and Red Book* as the threatened (endangered) species. The common dolphin is not included on the national Red List and is not protected by this law.

According to Article 11.1 of the *Law on the Red List and Red Book*, any action which can potentially cause a decrease in the population of endangered wild animals or damage of their habitats, breeding areas, migration routes, access to water is prohibited, "except cases described in other articles of this Law and other regulations". It is not clear which "other regulations" are meant here.

Article 22.2 allows the taking of specimens of endangered species "for the purposes of their survival, cure and population recovery, as well as for scientific purposes".

In addition, Article 22.1 leaves a loophole for deliberate taking of some individuals of the endangered species of wild animals for some purposes, which are not specified in the law. In such circumstances "number of specimens of the endangered species of wild animals allowed for taking shall be defined by the Minister of Environment by a Special Legal Administrative Act". In other words, the Minister has a power to permit direct taking of cetaceans belonging to the two endangered species for purposes different from the purposes mentioned in Article 22.2. For instance, wild animals can be taken from the wild if they cause potential danger to health or life of humans or to their property and the threat is unavoidable. Bottlenose dolphins are particularly exposed to the threat of this regulation as they are known to be involved in depredation (damaging fishing nets or stealing fish from the nets).

Black Sea cetaceans are protected from fishing by the *Order of the Minister of Energy and Natural Resources*[26]. This tool prohibits 'to catch, sell and store' marine mammals. The taking of incidentally caught individuals is forbidden as well. The by-caught cetaceans "are subject to immediate release in the case of accidental capture in fishing gears".

As regards the prevention of ghost fishing, this document prohibits "to abandon in water bodies amateur fishing gears in working regime", however, there is no prohibition of the discard at sea any professional fishing gear.

The order does not require fishermen to report cetacean incidental catches in fishing gear after each case of by-catch. Coastal (mainly amateur) fishers are not obliged to report on by-catch at all. Professional fishermen i.e. possessing a license for their activities, are obliged to keep a fishing log where they should record their by-catch data.

Cross-border trade in cetaceans and products derived from cetaceans is not banned in Georgia. This activity is regulated by the *Decree of the Government*[27] in compliance with CITES provisions, with permits issued for import, export or re-export of species listed in CITES Appendix II.

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[26] *Order of the Minister of Energy and Natural Resources No. 7 dated 06.04.2011.*

[27] *Decree of the Government No. 18 dated 06.02.2007.*

The *Law on Environmental Impact Permit*[28] envisages the assessment of some activities which may affect marine organisms (including cetaceans) and their habitats.

Legal use of bottom-set gillnets jeopardizing cetaceans is confined to turbot fishery. This fishery is rather limited in Georgia in comparison with other Black Sea countries

Fines are stipulated by the *Code of Administrative Violations*[29] in cases of:

- Killing or damaging of endangered species listed in the Red List of Georgia, damaging of their natural habitats.
- Trade in illegally taken specimen of wild species, their parts, or derivative.
- Taking marine organisms by violating rules defined in the Georgian Legislation.
- Violation of license conditions regarding fishing by license owners.

In addition to fines, most of the above articles of the Code of Administrative Violations provide for punishment with confiscation of fishing gear, vessel and taken animals.

1.2.3. Romania

Deliberate killing and taking of cetaceans in the wild is prohibited in this country by Article 5 of the *Annual Prohibition Order*[30] which also requires fishermen to release live cetaceans caught incidentally.

The *Animal Welfare Law*[31] prohibits the exposing of animals to cruelty including

a) Killing animals with intention;

b) Shooting of wild animals;

f) Abandoning an animal whose existence depends on man's care;

l) Catching of animals by methods other than the legal ones.

Above actions, as well as the keeping and trading of wild animals by unauthorized persons, constitute penal offences subjected to a punishment with fines or imprisonment up to three years with or without confiscation of the animals.

The *Animal Welfare Law* makes an exception for the euthanasia of animals with incurable maladies ascertained by a veterinarian.

In April 2006, the Romanian government issued a ban on the commercial fishing of wild sturgeon species for a ten-year period[32]. This in effect prohibited the use of gillnets for sturgeon, known to be detrimental to harbour porpoises and bottlenose dolphins. The Law on Living Aquatic Resources, Fishing and

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[28] *Law on Environmental Impact Permit, No. 1775 dated 01.01.2008.*

[29] *Code of Administrative Violations dated 15.12.1984.*

[30] *For instance, for 2013 these rules are set down by the Annual Joint Order of the Ministry of Agriculture and Rural Development and the Ministry of Environment, Water and Forests No. 40 (2012).*

[31] *Law No. 205 (2004) modified and completed through Law No. 9 (2008) concerning animals protection (became effective since January 15, 2008).*

[32] *Joint Order of the Ministry of Agriculture and Rural Development and the Ministry of Environment and Forests No. 262/330/2006 regarding the preserving of sturgeons population in natural waters and sturgeon aquaculture development in Romania. Official Publication of the Romanian Government, No. 385 dated 4 May 2006.*

Aquaculture[33] and subordinate acts make provision for limitations to the use of turbot and spiny dogfish[34] bottom-set gillnets that are hazardous to cetaceans and prohibits the use of bottom trawls[35] and drift nets[36].

Sanctions for the illegal use of bottom-set gillnet and bottom trawls are stipulated by the Order on Fishing Gear Permitted in the Black Sea[37].

Certain provisions adopted in Romania bare a relationship to some basic aspects of the conservation of cetaceans, including:

- development of a programme to improve knowledge about cetaceans and their conservation status[38];
- impact assessment of activities that may affect cetaceans or their habitat[39],[40];
- granting permits for research, including non-lethal in situ research and collecting tissue samples from stranded and by-caught cetacean carcasses[41];
- regulations on the discharge at sea of pollutants known to have adverse effects on cetaceans;
- network of existing protected areas eligible for monitoring and conservation of cetaceans;
- creation of specially protected areas for cetacean conservation;
- development of networks and databases for collecting information on cetacean sightings, strandings and incidental catches;
- regulations and permits for cetacean-watching activities.

1.2.4. Russia

The legal instruments of the Russian Federation in respect of Black Sea cetaceans make provisions for prohibition of:

- deliberate killing or injuring a cetacean;
- taking a cetacean in the wild or attempting to engage in such activity;
- possessing a cetacean, a part of a cetacean or a product derived from a killed or taken cetacean;
- importing any cetacean or part of any cetacean or any product derived from a cetacean which was intentionally killed or taken in the wild;

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[33] *Law No. 192/2001 regarding living aquatic resources, fishing and aquaculture, modified by Law No. 298/2004. Official Publication of the Romanian Government, No. 593 dated 1 July 2004.*

[34] *Order of the Ministry of Agriculture and Rural Development No. 36/2010 (Articles 4 and 6).*

[35] *Emergency Decree No. 127/2010 (Article 64, a).*

[36] *No reference on relevant document was provided by the national expert.*

[37] *Order of the Ministry of Agriculture and Rural Development No. 449/2008 on Fishing Gear permitted in the Black Sea.*

[38] *Order of the Ministry of Environment, Water and Forests No. 374/2004 (Article 2).*

[39] *Law on Environment Impact Assessement No. 195/2005 and No. 265/2006.*

[40] *Order of the Ministry of Environment, Water and Forests No. 135/2010.*

[41] *No reference on relevant document was provided by the national expert.*

- using any port or other place to take, import or possess a cetacean, any part of a cetacean or any product derived from a cetacean;
- transporting, purchasing, selling, bartering, exporting or offering to purchase, sell, barter or export any cetacean, any part of a cetacean or any product derived from a cetacean.

Exceptions from above prohibitions are stipulated in some particular situations, such as:

- non-lethal in situ research aimed at maintaining a favourable conservation status for cetaceans;
- emergency situations for cetaceans, when exceptionally unfavourable or endangering conditions occur;
- when an action is reasonably necessary to relieve or prevent suffering of a cetacean;
- when an action is necessary to prevent a risk to human life or health;
- when an action occurs as a result of an unavoidable accident.

Additional analysis of some Russian regulatory enactments makes more understandable the present state of protection of Black Sea cetaceans in this country.

There are several laws and other legal tools of the Russian Federation having relevance to the preservation of marine wildlife. The Law on Fisheries and Conservation of Aquatic Biological Resources[42] applies in particular to all wild aquatic mammals, including dolphins and porpoises, although it does not prohibit their taking or killing. Nevertheless, one of the subsidiary instruments, the Rules of Fishing in the Azov and Black Sea Fishery Basin[43], prohibits intentional capture of small cetaceans in the Azov Sea, Kerch Strait and Russian Black Sea, "with the exception of the capture for educational, cultural and awareness purposes". In case of incidental catch of the prohibited species a by-caught animal, irrespective of its state, should be released into the natural environment. In addition, fishermen involved in the by-catch are obliged to stop fishing in this particular area, change location of fishing, record the incident in vessel's log-book and fishing log, and send the information to federal or territorial fish protection authority.

The Law on Animals World[44] applies to all species of marine mammals in the Russian Seas and allows the issuing of special permits for maintaining and breeding in captivity of those species of animals which are listed in the Red Data Book of the Russian Federation.

The Red Data Book of the Russian Federation[45] contains scientific evaluation of the conservation status of rare and endangered species of wild animals residing in the country's territory, on the continental shelf and in the exclusive economic zone[46]. The Black Sea harbour porpoise and the Black Sea bottlenose dolphin are included. The Black Sea common dolphin is not included in the national Red List

According to the Decree of the Russian Government[47], the removal from the wild of animals listed in the national Red Data Book is admitted in exceptional cases such as:

- conservation of these animals,

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[42] *Federal Law on Fisheries and Conservation of Aquatic Biological Resources No. 166-Ф3 dated 20.12.2004 (amended 02.07.2013).*

[43] *Order of the Ministry of Agriculture No. 328 (dated 20.06.2007) on adopting the Rules of Fishing in the Azov and Black Sea Fishery Basin.*

[44] *Federal Law on Animals World No. 52-Ф3 dated 24.04.1995 (amended 07.05.2013).*

[45] *Red Data Book of the Russian Federation: Animals. 2001. Moscow, AST, Astrel, 864 p.*

[46] *Order of the State Committee of Ecology No. 419a (dated 03.10.1997) on the Regulations for Keeping the Red Data Book of the Russian Federation, Article 1.1.*

[47] *Decree of the Government of the Russian Federation No. 158 (dated 19.02.1996) on the Red Data Book of the Russian Federation.*

- control of their population,
- health protection in human community,
- removal of a threat to human's life,
- prevention of mass diseases among domestic animals,
- support to traditional needs of small indigenous ethnoses, and
- with other (unspecified) purposes.

The capture should not cause harm to natural populations and habitats of the taken animals and Russian legislation provides for punishment for violators of these rules.

The *Procedure of Issuing Permits to Turn Over Wild Animals*[48] makes it possible to grant paid licenses to maintain the Red Book animals (including Black Sea bottlenose dolphins and porpoises) in captivity.

There are limitations on the use of fishing gears which are hazardous for Black Sea cetaceans in respect of their by-catch. The *Rules of Fishing in the Azov and Black Sea Fishery Basin*[49] entirely prohibit sturgeon fishery in the Black Sea, Azov Sea and Kerch Strait. All kinds of fishing for turbot, spiny dogfish and rays are prohibited during three months from 1 November to 31 January inclusive. Any fishing of Black Sea turbot is prohibited during the spawning period between 1 April and 15 June. During other periods the deployment of fixed gill nets is limited to 48 hours in summer and 72 hours in autumn and winter.

There is no prohibition on drift nets which are traditionally are used in the Russian Black/Azov Sea and they are not even mentioned in the document regulating fisheries in this basin[41].

We are advised that there are prohibitions in Russia on discarding at sea of fishing gears and the use of bottom trawls as well as pelagic trawls near sea bottom. In addition, we are advised that the Russian authorities promote the conservation of cetaceans in the following ways although the particular domestic tools were not specified:

- development of a comprehensive programme of scientific research, managerial and practical actions to improve knowledge about cetaceans and their conservation status;
- granting permits for research, including non-lethal in situ research and collecting tissue samples from stranded and by-caught cetacean carcasses;
- impact assessment for activities that may affect cetaceans or their habitat;
- demand addressed to fishermen to record and report all incidents of cetacean by-catch;
- regulations and a programme to reduce and monitor cetacean by-catch in fishing activities;
- regulations for minimizing the introduction of anthropogenic noise into the marine environment;
- regulations on the discharge at sea of pollutants known to have adverse effects on cetaceans;
- network of existing protected areas eligible for monitoring and conservation of cetacean populations;
- creation of specially protected areas for cetacean conservation;
- development of networks and databases for collecting information on cetacean sightings, strandings and incidental catches;
- preparation of awareness guides for distribution to users of the sea;

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[48] *Decree of the Government of the Russian Federation No. 156 (dated 19.02.1996) on the Procedure of Issuing Permits (executive licences) to Turn Over Wild Animals belonging to Species Included in the Red Data Book of the Russian Federation.*

[49] *Order of the Ministry of Agriculture No. 328 (dated 20.06.2007) on adopting the Rules of Fishing in the Azov and Black Sea Fishery Basin.*

- development and implementation of training programmes on conservation techniques, in particular, on monitoring and first aid techniques, and responses to emergency situations;
- development of education programmes and tools for dissemination of information about cetaceans among different target groups;
- emergency plans for such events as mass strandings, live strandings, major pollution events, epizootics or ice entrapment of cetaceans.

It should be acknowledged that the *Regulations for Keeping the Red Data Book*[50] make provisions for some activities mentioned above.

1.2.5. Turkey

The interactions between humans and cetaceans in Turkey are regulated by means of two domestic instruments: the *Fisheries Law*[51] and the *Notification regulating commercial fisheries*[52]. The summarized information about relevant articles of these documents is presented in Table 1.

Table 1. Articles of the Turkish *Fisheries Law* and *Notification regulating commercial fisheries* that have relevance to the protection and conservation of cetaceans

	Provisions stipulated in the documents*	Fisheries Law	Notification regulating commercial fisheries
1	Prohibition of deliberate killing or injuring a cetacean, taking a cetacean in the wild or attempting to engage in such activity	Art. 36 h	Art. 16
2	Prohibition to transport, purchase, sell, barter, export or offer to purchase, sell, barter or export any cetacean, any part of a cetacean or any product derived from a cetacean	Art. 25	–
3	Exceptions from above prohibitions (1) and (2) for the purpose of non-lethal *in situ* research aimed at maintaining a favourable conservation status for cetaceans; and in emergency situations for cetaceans, when exceptionally unfavourable or endangering conditions occur	Art. 29	–
4	Prohibition to keep on board of a fishing boat or to use any drift nets	–	Art. 16 and 45 (22)
5	Prohibition to discard or leave adrift at sea any fishing gear	+**	Art. 45 (22)
6	Prohibition or limitations to use bottom-set gillnets for turbot, dogfish and sturgeon	Art. 23 a	–
7	Prohibition to use bottom trawls and also pelagic trawls near sea bottom	Art. 24	Art. 9, 10 and 11
8	Granting permits for research, including non-lethal *in situ* research and collecting tissue samples from stranded and by-caught cetacean carcasses	Art. 29	–
9	Demand addressed to fishermen to release cetaceans caught alive incidentally in any fishing gear	–	Art. 16
10	Regulations on the discharge at sea of pollutants known to have adverse effects on cetaceans	Art. 20	–
11	Creation of specially protected areas for cetacean conservation	–	Art. 8 (1 c)

[50] *Order of the State Committee of Ecology No. 419a (dated 03.10.1997) on the Regulations for Keeping the Red Data Book of the Russian Federation.*

[51] *Fisheries Law No. 1380 (Official Gazette No. 13799 dated 22.03.1971; amended by Law No. 4950 dated 22.07.2003).*

[52] *Notification No. 2012/65 (dated 18.08.2012) regulating commercial fisheries (also known as Notification 3/1).*

	Provisions stipulated in the documents*	Fisheries Law	Notification regulating commercial fisheries
12	Sanctions (including fines) in case of deliberate killing or injuring a cetacean, in case of taking of a cetacean or attempting to engage in such activity	Art. 36 h	–
13	Sanctions (including fines) in case of possession of a cetacean, a part of a cetacean or a product derived from a killed or taken cetacean***	Art. 36 h	–
14	Sanctions (including fines) in case of transport, purchase, sale, barter, export or the offer to purchase, sell, barter or export any cetacean, any part of a cetacean or any product derived from a cetacean***	Art. 25	–
15	Sanctions (including fines) in case of possession on board and use of drift nets at sea	–	Art. 45 (22)
16	Sanctions (including fines) in case of discarding or leaving adrift at sea fishing gears	+**	–
17	Sanctions (fines) in case of illegal use of bottom-set gillnets for turbot, dogfish and sturgeon	Art. 23 a	–
18	Sanctions (fines) in case of illegal use of bottom trawls or pelagic trawls near sea bottom	Art. 24	–
19	Sanctions in case of omission to release a cetacean that was caught incidentally in fishing gear	Art. 23 b	Art. 16

*** The provisions formulated here below are in line with the questionnaire filled in by the experts. Original wording of the provisions in the referred documents most likely is different.**

**** An article was not specified by the experts.**

***** These sanctions do not apply to imported products.**

The *Fishery Regulations*[53], considering marine mammals as aquatic products, are in force as well. This document in particular, prohibits the discharge of substances harmful for aquatic organisms into the sea within the fisheries' production areas. It is prohibited also to use a mid-water trawl as a bottom trawl, although a bottom trawl itself can be used in the territorial waters where fishing is allowed. Aquatic products (*e.g*. cetaceans) accidentally caught alive should be returned to the water, whereas dead by-caught animals should be examined by the authorized organization.

[53] *Fishery Regulations (Official Gazette No. 22223 dated 10.03.1995, amended by Official Gazettes No. 25052 dated 18.03.2003, No. 25374 dated 15.02.2004, No. 27455 dated 07.01.2010, and No. 27517 dated 10.03.2010).*

There are some other laws[54, 55] and regulations[56, 57, 58, 59] in Turkey which have relevance to the protection and conservation of cetaceans and their habitats.

1.2.6. Ukraine

The *Law on Protection of the Environment*[60] considers all wild animals of Ukraine, especially species listed in the Red Data Book, as resources of national significance. All three Black Sea cetacean species are included in the *Red Data Book of Ukraine*[61] although with different conservation categories[62]. The bottlenose dolphin is listed as 'a rare species', the harbour porpoise as 'a vulnerable species' and the common dolphin, *D. delphis* as 'a species with unvalued status'. According the above law[54], an entry in the Red Data Book requires a particular conservation approach including the improvement of their habitats and the creation of conditions for their reproduction, breeding and spread.

The *Law on Animals' World*[63] confirms that wild animals in Ukraine as well as animals' habitats are protected by the state as natural resources of the national significance. The taking of animals from the wild is possible if special permits are issued. A series of conservation measures are stipulated:

- creation of special routine for the protection of species inserted in the Red Data Book of Ukraine;
- preparation and implementation of action plans aimed to conserve and restore the threatened species;
- breeding of rare and endangered species in captivity, establishing of appropriate centres and genetic banks;
- rendering aid to animals in cases of their diseases and menace to their life due to natural disaster or other emergency situation in the environment;
- organising of scientific studies destined to elaborate measures for the protection of animals;
- education of citizens in the vein of humane treatment of animals;
- setting up a state system of inventory and monitoring of wild animals.

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[54] *Environmental Law No. 2872 (Official Gazette No. 18132 dated 11.08.1983, amended by Law No. 5491 dated 26.04.2006).*

[55] *Law on Veterinary Services, Plant Health, Food and Feed No. 5996 (Official Gazette No. 27610 dated 13.06.2010).*

[56] *Regulation on Aquatic Animal Health and Protection and Fight Against Aquatic Animal Diseases (Official Gazette No. 28190 dated 31.01.2012).*

[57] *Regulation of Environmental Impact Assessment (Official Gazette No. 26939 dated 17.07.2008, amended by Official Gazette No. 27437 dated 19.12.2009).*

[58] *Regulation on Control of Water Pollution (Official Gazette No. 25687 dated 31.12.2004, amended by Official Gazette No. 27537 dated 30.03.2010).*

[59] *Notification No. 2012/66 regulating noncommercial fisheries (dated 18.08.2012).*

[60] *Law on Protection of the Environment No. 1268-XII dated 26.06.1991 (Gazette of the Supreme Rada of Ukraine, 1991, No. 41, P. 546).*

[61] *Red Data Book of Ukraine: Animals' World. 2009. Edited by I.A.Akimov. Kiev, Globalconsalting, 600 p.*

[62] *Categories of the Ukrainian Red Data Book differ from the IUCN categories and have no precise formalized criteria for their establishing.*

[63] *Law on Animals' World No. 2894-III dated 13.12.2001 (Gazette of the Supreme Rada of Ukraine, 2002, No. 14, P. 97).*

According to the *Law on Animals' World*, rare and threatened species of the Ukrainian fauna should be included in the Red Data Book of Ukraine. With proper permission, such species can be bred in captivity or in semi-free conditions with the view of their conservation, protection and restoration.

The *Law on Red Data Book of Ukraine*[64] reiterates above provisions concerning species listed in the national Red Data Book. This law presents a list of general measures destined to improve conservation status of rare and threatened species:

- introduction of peculiar legal status for the Red Book species (RBS), with a ban or restriction of their usage;
- preparation of legal instruments regulating protection of RBS;
- monitoring of RBS populations and their habitats;
- creation of protected areas and ecological networking as a matter of first priority in localities where RBS reside and migrate. The residence of Red Book animals somewhere in Ukraine provides the government with grounds to declare this territory as a protected area of the national significance;
- establishment of centres and banks for the conservation of RBS gene pool;
- maintenance and breeding of RBS in simulated conditions;
- environmental impact assessment of activities which may affect RBS;
- facilitating natural recovery of RBS populations;
- scientific research and elaboration of basic elements of RBS protection and reproduction;
- increased administrative, civil and criminal liability for killing or injuring RBS and for infliction of harm to their habitats.

Penalties for violation of the law are stipulated in such cases as:

- killing and/or illegal use of RBS individual;
- deterioration RBS habitats;
- breach of artificial living conditions (e.g., in captivity) resulted in the death, mutilation or injury of RBS individual;
- other (unspecified) actions causing damage to RBS.

For a period of three years from 20 September 2011 to 20 September 2014, any taking of Black Sea cetaceans from the wild is prohibited by the Order of the Ministry of Ecology and Natural Resources[65].

The *Law on Natural Reserved Fund of Ukraine*[66] determines a legal framework for the management and use of protected areas (nature reserves, biosphere reserves, national nature parks, *etc*.). These may include within their boundaries areas of the sea suitable for the monitoring and conservation of Black Sea cetaceans.

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[64] *Law on Red Data Book of Ukraine No. 3055-III dated 07.02.2002 (Gazette of the Supreme Rada of Ukraine, 2002, No. 30, P. 201).*

[65] *Order of the Ministry of Ecology and Natural Resources No. 328 (dated 20.09.2011) on temporary prohibition of special use of cetaceans of the Black Sea and the Sea of Azov.*

[66] *Law on Natural Reserved Fund of Ukraine No. 2456-XII dated 16.06.1992 (Gazette of the Supreme Rada of Ukraine, 1992, No. 34, P. 502).*

The *Law on Protection of Animals against Cruelty*[67], as well as the *Law on Animals' World* and the *Law on Red Data Book of Ukraine*, provides for the keeping of wild animals (*e.g.*, cetaceans) in captivity if relevant permit is issued.

According to the *Regulations of Commercial Fishery in the Black Sea Basin*[68], the intentional catching of RBS (including dolphins and porpoises) is prohibited in the Ukrainian Black Sea.

Any RBS individuals incidentally caught alive should be released into the wild, while the dead by-caught individuals should be recorded. The fisheries protection and environment protection authorities should be informed by fishermen about each incident of RBS by-catch. Bottom-set gillnets for turbot should not be set during the calving period, from 1 to 30 May inclusive. Pelagic trawls should not be used at the sea bottom.

Several articles of the Regulations prohibit to discharge at sea of toxic wastes and pollutants (DDT, hexachloran, *etc*.) known to have adverse effects on marine organisms including cetaceans.

The *Temporary Regulations of Commercial Fishery in the Azov Sea Basin*[69] prohibit the intentional catch of cetaceans. Any incidentally caught live cetaceans should be released; all incidents of cetacean by-catch should be recorded in the vessel's fishing log and reported to local authorities involved in the protection of fish resources and in the protection of environment.

Each year the Ministry of Agrarian Policy and Food issues an order adopting the *Regime of fishery activities in the Black Sea Basin* and the *Regime of fishery activities in the Azov Sea Basin* for the next year.[70] Following the Black Sea Regime 2013, fishermen should promptly discharge any by-caught RBS animals *(e.g*. cetaceans) into the wild irrespective of their condition. At the same time, if a cetacean by-catch has happened, the vessel should change its fishing location for another one.

In contrast, the Azov Sea Regime 2013, whilst demanding from fishermen immediate discharge of by-caught RBS individuals into the wild irrespective of their condition, does not require any other actions prescribed in the Black Sea Regime 2013.

Sturgeon fisheries are prohibited throughout the year. The Black Sea Regime restricts also the use of bottom-set gillnets for turbot, spiny dogfish and rays during the month of May.

The *Rules of Amateur and Sport Fishing*[71] prohibit the catch of marine mammals listed in the Red Data Book of Ukraine.

Cross-border transport of and international trade in Black Sea cetaceans are regulated by CITES provisions in correspondence with the *Law on Accession to CITES*[72].

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[67] *Law on Protection of Animals against Cruelty No. 3447-IV dated 21.02.2006 (Gazette of the Supreme Rada of Ukraine, 2006, No. 27, P. 230).*

[68] *Order of the State Committee for Fisheries No. 164 (dated* ***08.12.1998; amended 15.06.2004****) on the Regulations of commercial fishery in the Black Sea basin.*

[69] *Order of the State Committee for Fisheries No.* ***172*** *(dated* ***31.12.1999; amended 15.06.2004****) on the Temporary regulations of commercial fishery in the Azov Sea basin.*

[70] *Order of the Ministry of Agrarian Policy and Food No. 757 (dated 07.12.2012) on the Regimes of fishery activities in 2013.*

[71] *Order of the State Committee for Fisheries No. 19 (dated 15.02.1999) on the Rules of Amateur and Sport Fishing.*

[72] *Law on Accession to CITES No. 662-XIV dated 14.05.1999 <http://search.ligazakon.ua/l_doc2.nsf/link1/T990662.html>.*

Other regulatory enactments having relevance to the protection and conservation of cetaceans in Ukraine include the *Criminal Code*[73], *Code on Administrative Violations*[74], *Rules for Protection of the Sea against Pollution and Litter*[75], *Programme for Research, Conservation and Restoration of Marine Mammals in the Black and Azov Seas*[76], tools of the veterinary and sanitary legislation.

In the *Criminal Code* the penalty for illegal fishery or other illegal activity associated with taking of aquatic organisms from the wild include fines or imprisonment, with or without confiscation of gears. In addition, according to the *Decree of the Cabinet of Ministers*[77], a compensation amount of UAH100,000 (>€9,000) should be paid by the violator for illegal taking, killing or injuring of a cetacean of any Black Sea species.

The *Code of Administrative Violations* makes provision for fines in cases of illegal import or export of RBS.

1.3. Fishermen's awareness of legal instruments relevant to the conservation of cetaceans in the Black Sea

In order to establish fishermen's awareness of national laws concerning cetaceans, and at the same time to gain indicative information on by-catch rates, and the interaction between fishermen and cetaceans, interviews were carried out with leaders of selected fishing co-operatives in Bulgaria, Romania, Turkey and Ukraine.

MEP together with Dr Alexei Birkun and Dr Simon Northridge designed the questionnaire that formed the basis of the interviews. These were circulated to national team leaders and the interviews were carried out by the most appropriate team member with closest relationships with fishing co-operative leaders in each country.

The number of interviews given by leaders of fishing associations, cooperatives and organizations in each country was as follows: Bulgaria 19, Romania 3, Turkey 14 and Ukraine 3, making a total of 39 interviews. The results of the interviews conducted by Violin Raykov (Bulgaria), Simion Nicolaev (Romania), Arda Tonay (Turkey) and Vladislav Shlyakhov (Ukraine) can be found in Annex 1. The interviewees in Bulgaria, Romania and Ukraine were asked 14 questions and in Turkey 7 questions only (Table 2). The interviewees were requested in addition to provide comments and references to the legal tools currently in force in their countries.

[73] *Criminal Code of Ukraine No. 2341-14 dated 01.09.2001, with amendments of 18.05.2013 (Gazette of the Supreme Rada of Ukraine, 2001, No. 25-26, P. 131).*

[74] *Code of Ukraine on Administrative Violations No. 8073-X dated 07.12.1984, with amendments (Gazette of the Supreme Rada of Ukraine, 1984, No. 51, Appendix, P. 1122).*

[75] *Decree of the Cabinet of Ministers No. 269 (dated 29.02.1996) on adoption of the Rules for Protection of Marine Waters and Territorial Sea against Pollution and Litter.*

[76] *Order of the Ministry of Ecology and Natural Resources No. 188 (dated 05.08.1999) on the Programme for Research, Conservation and Restoration of Marine Mammals in the Black and Azov Seas (Delfin-program).*

[77] *Decree of the Cabinet of Ministers No. 1030 (dated 07.11.2012) on the level of compensation for illegal taking, killing or injuring of species of animal and plant kingdoms listed in the Red Data Book of Ukraine as well as for destroying or deteriorating of their habitats (growing areas).*

1.3.1. The interview questionnaires

Table 1.20: Survey of fishermen's leaders' awareness of national legal protection concerning cetaceans – The questions asked.

Question	Bulgaria	Romania	Turkey	Ukraine
Are you aware of any legislation that:				
• would help control numbers of cetaceans?	+	+	–	+
• would compensate members of your cooperative/association for losses?	+	+	–	+
• makes killing them illegal?	+	+	+	+
• makes accidental catching illegal?	+	+	–	+
• makes harassing or disturbing them illegal?	+	+	+	+
• makes landing by-caught animals illegal?	+	+	–	+
• makes trade in any of them illegal?	+	+	+	+
• makes possession of any part of them illegal?	+	+	–	+
• requires members of your cooperative/association to report any catches or damage?	+	+	–	+
• requires members of your cooperative/association to release any such animal caught alive?	+	+	–	+
Is the legislation sufficient to protect cetaceans in the Black Sea?	+	+	+	+
Are your members aware of the legislation about protection of cetaceans?	+	+	+	+
Does the legislation disadvantage your members when fishing?	+	+	+	+
Could the legislation be improved?	+	+	+	+

1.3.2. Bulgarian interview results

All 19 interviewed leaders of Bulgarian fishing organizations (100%) indicated that they did not know of any legal act purposed to control the numbers of cetaceans nor of any instrument intended to recompense fishermen for losses caused by cetacean depredation. This is a correct assertion as there are no such tools in Bulgaria.

All or most interviewees (94–100%) asserted that they are aware of the legislation that prohibits killing, harassing or disturbing cetaceans, trade in them, makes landing by-caught cetaceans and possession of any part of them illegal, requires to release by-caught cetaceans if they are alive and to report any incident of cetacean by-catch to the authorities. However, most interviewees (94%) referred their knowledge mainly to the Red Data Book of Bulgaria, an information document with no legal validity. As it follows from the Review of the National Law (see 1.2.1 Bulgaria), there are two basic instruments in Bulgaria which regulate (prohibit or require) the above activities: the Fishery and Aquaculture Act (2001)[78] and the Biological Diversity Act (2002)[79]. The latter document was referred to by five respondents only (28%) while

[78] *The Fishery and Aquaculture Act forbids the catching, transferring, carrying, transporting of marine mammals and trade in them (Article 43.1, 77.1 and 77.2) and, in case of by-catch of marine mammals, the Act requires to return the animals into the sea regardless of their condition (Article 43.2).*

[79] *The Biological Diversity Act prohibits all forms of deliberate capture or killing, hunting and disturbance of the protected animals (including all three species of Black Sea cetaceans), taking of found dead animals; prohibits also the possession, keeping, movement, transport, export, trade and offering for sale or exchange of the protected*

the former one, representing fundamental provisions for Bulgarian fishermen, was not mentioned at all (0%).

It should be underlined that 17 respondents (89%) are confident of the presence of some juridical norm that makes illegal the accidental catching (by-catching) of a cetacean in Bulgaria. This is, certainly, a mistake or delusion (fisher's myth) because such or similar provision does not exist in the international and domestic legislation nor in subsidiary regulations. Accordingly, all references provided by the interviewees in this context are incorrect.

All respondents were of the opinion that the legislation is sufficient to protect Black Sea cetaceans (100%) although, at the same time, it could be improved (100%). The legislation disadvantages fishermen when fishing, – they say (100%), – because it puts fishermen in an unfavourable position in relation to cetaceans: there are too many cetaceans in the Bulgarian Black Sea, especially, during recent years (100%); their numbers should be controlled somehow (100%).

All interviewees (100%) declare that fishermen in their organizations are aware of the legislation about the protection of cetaceans. It seems difficult to trust this assurance because, according to the above analysis, the interviewed leaders themselves have considerable gaps in their knowledge of the law.

Table 1.21: Fishermen's Leaders' Awareness of Legislation survey results summary for Bulgaria

No. of interviewees/fishing organizations	
Fishing areas	
Total No. of fishing vessels	
No. of fishermen involved	

Are you aware of any legislation that:	**YES**	**NO**	**Don't know**
Would help control numbers of cetaceans?	0	19 (100%)	0
Would compensate members of your cooperative/association for losses?	0	19 (100%)	0
Makes killing them illegal?	19 (100%)	0	0
Makes accidental catching illegal?	17 (89%)	1 (6%)	1 (6%)
Makes harassing or disturbing them illegal?	19 (100%)	0	0
Makes landing by-caught animals illegal?	18 (95%)	1 (6%)	0
Makes trade in any of them illegal?	19 (100%)	0	0
Makes possession of any part of them illegal?	18 (95%)	0	1 (5%)
Requires members of your cooperative/association to report any catches or damage?	19 (100%)	0	0
Requires members of your cooperative/association to release any such animal caught alive?	19 (100%)	0	0
Is the legislation sufficient to protect cetaceans in the Black Sea?	19 (100%)	0	0
Are your members aware of the legislation about protection of cetaceans?	19 (100%)	0	0
Does the legislation disadvantage your members when fishing?	19 (100%)	0	0
Could the legislation be improved?	19 (100%)	0	0

animals taken in the wild; requires to inform regional authority of the Ministry of Environment and Water about specimens found dead or about an incident of unintentional injuring or killing a specimen (Articles 38.1, 39.1 and 125.1).

1.3.3. Romanian interview results

Two from three respondents pointed out that certain Romanian instruments, the Law on Living Aquatic Resources, Fishing and Aquaculture (2001) and the so called Annual Prohibition Order, help to control numbers of cetaceans. This erroneous assertion is probably a result of misunderstanding of the proposed question as there are in fact no regulations in Romania (including mentioned tools) aimed at controlling the numbers of dolphins and porpoises.

All interviewees justly denied the availability of instruments to compensate Romanian fishermen for losses caused by cetaceans; recognizing cetacean by-catch as illegal action; and making illegal the disturbing or harassment of cetaceans.

All respondents were correct in being aware of legal tools which prohibit intentional killing of cetaceans and the requirement to release incidentally caught cetaceans if they alive. Two respondents correctly indicated the Annual Prohibition Order[80] as a document determining these provisions. However, none of the respondents make reference to the Animal Welfare Law (2004), another document outlawing the killing of wild animals with intention.

All three interviewed leaders of Romanian fishing organizations asserted that the legislation requires fishermen to report any catches of cetaceans or damage to them. At the same time, the interviewees did not provide reference to a relevant legal act but did mention vague sources of information like "NAFA letter to companies"[81] and "Registration Fishing Template". These documents are not mentioned by the Romanian national expert in the Questionnaire on National Legislation[82]. Moreover, the expert denies the presence of any relevant legal tool in Romania.

The expert also denies the existence of domestic legal instruments stipulating prohibitions to possess, transport, purchase, sell, barter, export a cetacean and to use any port or other place to take, import or possess a cetacean. In addition, one of the respondents believed there is an absence of any national regulation prohibiting the landing and possession of cetaceans and trade in them. Another respondent believed that the trade is prohibited but not the landing and possession, whereas the third interviewee was convinced that all these activities are forbidden by the Law on Fisheries and Aquaculture and the Annual Prohibition Order. It seems reasonable to give credence to the expert. Therefore, only one of the respondents answered the questions correctly.

All three interviewed persons stated that the legislation is insufficient to protect Black Sea cetaceans and felt that it could be improved. Two respondents indicated that the legislation disadvantages Romanian fishermen, "because they are obliged to use fishing gear having high by-catch rate", one of the respondents was quoted as saying. The same respondent would like to amend the legislation with a provision to permit the use of fishing gear associated with lower by-catch rates for example, nets made with doubled monofilament.

Two respondents were fully confident in the awareness of their fishermen. The third respondent says his fishermen are aware of the legislation to a limited extent ("partially").

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[80] *This order is issued at the end of each year jointly by the Ministry of Agriculture and the Ministry of Environment.*

[81] *NAFA = National Agency for Fishing and Aquaculture.*

[82] *The Questionnaire on National Legislation Concerning the Protection and Conservation of Cetaceans in the Riparian Countries of the Black Sea: Romania has been filled in by S. Nicolaev (Task A2.2).*

Table 1.22: Fishermen's Leaders' Awareness of Legislation survey results summary for Romania

No. of interviewees/fishing organizations	3
Fishing areas	Entire Romanian coast
Total No. of fishing vessels	95
No. of fishermen involved	>200

Are you aware of any legislation that:	**YES**	**NO**
Would help control numbers of cetaceans?	2	1
Would compensate members of your cooperative/association for losses?	0	3
Makes killing them illegal?	3	0
Makes accidental catching illegal?	0	3
Makes harassing or disturbing them illegal?	0	3
Makes landing by-caught animals illegal?	1	2
Makes trade in any of them illegal?	2	1
Makes possession of any part of them illegal?	1	2
Requires members of your cooperative/association to report any catches or damage?	3	0
Requires members of your cooperative/association to release any such animal caught alive?	3	0
Is the legislation sufficient to protect cetaceans in the Black Sea?	0	3
Are your members aware of the legislation about protection of cetaceans?	3	0
Does the legislation disadvantage your members when fishing?	2	1
Could the legislation be improved?	3	0

1.3.4. Turkish interview results

All 14 interviewed leaders of Turkish fishing cooperatives (100%) were aware of the presence of some legal tools which prohibit the killing, harassing/disturbing cetaceans and trade in them. Most respondents (93%) could not specify these instruments making different, sometimes contradictory comments, such as:

- "I don't know what exactly legislations are"; "I know it is not allowed to kill them"; "I just know it is prohibited but I don't know any further information"; "There are some prohibitions but we don't understand why" (29%);
- "I know there are some agreements with EU, I don't know any local legislation", "It is prohibited under pressure of the European countries" (21%);
- "Our local laws are not allowing"; "It is a very strict law but I don't know which law it is" (14%);
- "There are some local laws/prohibitions and some agreements with EU" (14%);
- "Our local laws still allow to hunt cetaceans but according to European agreements it is prohibited" (7%);
- "It became prohibited in 1972 by an American law" (7%);
- "I don't think there is legislation about this" (7%).

Only one interviewee (7%) suggested a name of a document prohibiting, in his opinion, the killing, harassing/disturbing and trading of cetaceans. He was referring to the FAO[83] Agreement but is mistaken in his opinion. The experts that filled in the Questionnaire on National Legislation[84] indicated that

[83] *FAO = Food and Agriculture Organization of the United Nations.*

[84] *The Questionnaire on National Legislation Concerning the Protection and Conservation of Cetaceans in the Riparian Countries of the Black Sea: Turkey has been filled in by B. Öztürk and H. Kilic (Task A2.2).*

deliberate killing or injuring cetaceans and trade in them are prohibited in Turkey by the amended Fisheries Law (2003); the killing and taking a cetacean in the wild is forbidden also by the Notification regulating commercial fisheries (2012).

All respondents (100%) thought the legislation is sufficient to protect cetaceans in the Black Sea and believe their fishermen are aware of the legislation. The latter assertion seems unconvincing given the quite modest awareness levels shown by themselves and the leaders of fishing cooperatives in general.

A large majority of respondents (93%) believe the legislation is disadvantageous to members of their cooperatives because it does not protect fishermen's interests and property from cetaceans. This conclusion was not formulated by the respondents but based on their comments such as: "dolphins damage our fishing gear" (43%), "they consumed all our fish" (36%) "but we cannot do anything" (7%), "they are taking our source of living" (7%), "we cannot earn money" (7%), "the government prohibits nets we need" (7%).

Ten respondents (71%) thought the legislation could be modified by means of decisions aimed to control cetacean numbers (50%), support for fishermen (14%) and raised awareness (7%). Strong and heartfelt comments suggested strongly held opinions for example, "They have to be hunted in some seasons", "They need to be hunted a bit", "They need to be hunted to a certain level", "We need to have them under control", "We need to reduce them", "Dolphins are our friends but they have to be reduced", "We don't say we should hunt them but we must do something", "Dolphins are increasing horribly, we don't know what to do", "We are sick and tired of them, help us", "Please make some legislations to protect us", "Help us a bit more instead of dolphins", "We need to raise awareness of fishers".

Table 1.23: Fishermen's Leaders' Awareness of Legislation survey results summary for Turkey

No. of interviewees/fishing organizations	14
Fishing areas	Almost entire Turkish Black Sea coast
Total No. of fishing vessels	1055 active of 1165 in total
No. of fishermen involved	1658

Are you aware of any legislation that:	YES	NO
Makes killing them illegal?	14 (100%)	0
Makes harassing or disturbing them illegal?	14 (100%)	0
Makes trade in any of them illegal?	14 (100%)	0
Is the legislation sufficient to protect cetaceans in the Black Sea?	14 (100%)	0
Are your members aware of the legislation about protection of cetaceans?	14 (100%)	0
Does the legislation disadvantage your members when fishing?	13 (93%)	1 (7%)
Could the legislation be improved?	10 (71%)	4 (29%)

1.3.5. Ukrainian interview results

All three interviewed leaders of Ukrainian fishing organizations were not aware of any legal instrument relating to the control neither of either cetacean numbers nor of any tool destined to remunerate fishermen for losses caused by cetaceans. Such regulations do not exist in Ukraine; therefore the negative answer of the respondents is consistent with present state of affairs.

All interviewees when referencing the Regulations of Commercial Fishery, are correctly aware of the availability of domestic tools prohibiting intentional killing of cetaceans and possession of any part of their body as well as requiring them to release incidentally caught cetaceans if they alive. At the same time the respondents do not mention any other legal sources of these provisions for example, the Law on Red Data Book of Ukraine (2002) with relevant by-laws including the Decree of the Cabinet of Ministers No. 1030 (2012)[85] and the Order of the Ministry of Ecology and Natural Resources No. 328 (2011)[86].

All respondents mistakenly believed that the Red Data Book makes the landing of by-caught cetaceans and trade in them illegal. This is incorrect as the Red Data Book of Ukraine and other Ukrainian instruments do not formulate directly these provisions. Nevertheless, both the landing and trade in respect of incidentally caught cetaceans could be recognized as illegal through the use of existing prohibition to keep and store the animals and parts of their body.

Two of the three respondents were mistaken in believing that there are no tools requiring fishermen to report any catches of cetaceans or damage to them. There are in actual fact, three regulation documents requiring them to inform promptly the fish protection and environment protection authorities about each and every incident of cetacean by-catch. They are: the Regulations of Commercial Fishery in the Black Sea Basin[87], the Temporary Regulations of Commercial Fishery in the Azov Sea Basin[88] and the Regime of fishery activities in the Black Sea Basin[89].

One interviewee was also mistaken when they said the accidental catching of cetaceans is illegal according to the Law on Natural Reserved Fund of Ukraine. The by-catches are indeed undesirable but are not outlawed and in fact, this law has no any relation to cetacean by-catch anyway. Another misconception of the same respondent was their assertion that the Red Data Book of Ukraine makes illegal the harassing or disturbing cetaceans.

Only one interviewed person was of opinion that the legislation is sufficient or even excessive ("More than enough", he quoted) to protect cetaceans in the Black Sea. The second interviewee finds difficulty in replying on this question ("I don't know"), whereas the third one considers the legislation as insufficient. Two, the first and third, respondents suppose that the legislation could be improved although they have diametrically opposite views concerning possible amendments. The first respondent suggests the resumption of the restrained dolphin fishery while the third respondent would like to amend the Law on Natural Reserved Fund in respect of expanding provisions applicable for the conservation of cetaceans.

One from three interviewees believes that the legislation disadvantages his fishermen because "it does not allow the control of the numbers of cetaceans".

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[85] *Decree of the Cabinet of Ministers No. 1030 (dated 07.11.2012) on the level of compensation for illegal taking, killing or injuring of species of animal and plant kingdoms listed in the Red Data Book of Ukraine as well as for destroying or deteriorating of their habitats (growing areas).*

[86] *Order of the Ministry of Ecology and Natural Resources No. 328 (dated 20.09.2011) on temporary prohibition of special use of cetaceans of the Black Sea and the Sea of Azov.*

[87] *Order of the State Committee for Fisheries No. 164 (dated **08.12.1998; amended 15.06.2004**) on the Regulations of commercial fishery in the Black Sea basin.*

[88] *Order of the State Committee for Fisheries No. **172** (dated **31.12.1999; amended 15.06.2004**) on the Temporary regulations of commercial fishery in the Azov Sea basin.*

[89] *Order of the Ministry of Agrarian Policy and Food No. 757 (dated 07.12.2012) on the Regimes of fishery activities* in 2013.

Two of the respondents suggest that their fishermen are aware of the legislation but this assurance looks unpersuasive in view of their own imperfect awareness of the legislation. One interviewee says that the awareness of his fishermen is partial (*i.e*. incomplete) and that sounds more realistic.

Table 1.24: Fishermen's Leaders' Awareness of Legislation survey results summary for Ukraine

No. of interviewees/fishing organizations	3
Fishing areas	Black Sea and Azov Sea
Total No. of fishing vessels	183
No. of fishermen involved	>540

Are you aware of any legislation that:	**YES**	**NO**	**Don't know**
Would help control numbers of cetaceans?	0	3	0
Would compensate members of your cooperative/association for losses?	0	3	0
Makes killing them illegal?	3	0	0
Makes accidental catching illegal?	1	2	0
Makes harassing or disturbing them illegal?	1	1	1
Makes landing by-caught animals illegal?	3	0	0
Makes trade in any of them illegal?	3	0	0
Makes possession of any part of them illegal?	3	0	0
Requires members of your cooperative/association to report any catches or damage?	1	2	0
Requires members of your cooperative/association to release any such animal caught alive?	3	0	0
Is the legislation sufficient to protect cetaceans in the Black Sea?	1	1	1
Are your members aware of the legislation about protection of cetaceans?	3	0	0
Does the legislation disadvantage your members when fishing?	1	2	0
Could the legislation be improved?	2	0	1

1.3.6. Discussion and conclusions

The interviewed leaders of 39 fishing associations, cooperatives and organizations represent more than 4,600 fishermen (>2,100 fishing vessels/boats) operating in the Black and Azov Seas across the internal waters, territorial sea and EEZs of Bulgaria, Romania, Turkey and Ukraine. The relatively high occupational status of the interviewed persons would suggest that they should have adequate or reasonable awareness of the legislation concerning the protection of cetaceans. However, only one respondent from 39 (3%), representing the Mena Fish Association (Nessebar, Bulgaria) had answered all questions correctly with regards to the prohibitions/requirements. He was also able to provide the proper references to the appropriate legal tools for each of his answers. The rest of respondents (97%) were mistaken in at least one answer and/or could not refer to appropriate instruments.

With respect to the Turkish respondents, all 14 of them (although they were not asked all of the questions) were able to give proper answers concerning the existing prohibitions but none of them could suggest the correct documentary source of this their knowledge. In general, Turkish leaders of fishing cooperatives seem to be better informed about the requirements than their colleagues in Bulgaria, Romania and Ukraine. However, their awareness of the Turkish legislation cannot be recognized as sufficient, rather it was incomplete and superficial.

As it turned out, most interviewed managers of Bulgarian marine fishery (89%) and one third of Ukrainian respondents were under the mistaken impression that the accidental catching (by-catch) of dolphins and harbour porpoises is deemed an illegal action in their countries. This misconception may already have had

a negative influence on the observance of existing legislation and subsidiary acts. For instance, if fishermen are convinced any cetacean by-catch is illegal, they will hardly ever or never report on such incidents to the authorities despite formal demands to do this[90]. This ignorance or misunderstanding of the regulations by the fishery managers puts them and their fishermen in the false position of potential offenders and makes the development of corrupt practice in the fisheries sector very possible.

Two thirds of Romanian respondents indicated that some domestic instruments are intended to control numbers of cetaceans. It's quite possible these respondents simply misunderstood the question, failing that, their ignorance of the basic nature of conservation in Romanian and EU legislation should be highlighted.

Most involved fishery leaders (95%) considered their fishermen to be aware of the legislation on the protection of cetaceans and only few respondents (5%) say that the awareness of their fishermen is partial or incomplete. Generally, the results of the interviews show quite modest or insufficient levels of legal awareness by the leaders of Black Sea fishing associations, cooperatives and organizations regardless of their nationality. It would therefore be unreasonable to accept them as competent and impartial experts when assessing the awareness of their own people. It's reasonable to assume that the fishermen's awareness in Bulgaria, Romania, Turkey and Ukraine with regards to the various pieces of legislation, is no better than their leaders and is therefore, not as it should be.

From this we can conclude that there is a need to raise awareness of these issues among Black/Azov Sea fishermen and their leaders. It would also seem logical to enhance the awareness of these issues among the officers of the national fish protection services as well possible through extra training.

Full details of the questions, the interviewers and the responses given are in Annex 1.

[90] Demands to report on by-catch In Bulgaria: Article 39.1 of the Biological Diversity Act (2002/2012); in Ukraine: Article 6.1.15 of the Regulations of Commercial Fishery in the Black Sea Basin (1998/2004); Article 4.12 of the *Temporary Regulations of Commercial Fishery in the Azov Sea Basin (1999/2004) and Article 32 of the Regime of fishery activities in the Black Sea Basin for 2013 (2012).*

1.4. Comparison of national laws with international and regional obligations relevant to the conservation of cetaceans

Section 1.1.3 sets out the relevant components that would preferably be included in a comprehensive national legislative framework include: (A) prohibitions and/or limitations; (B) exceptions from bans and limitations; (C) measures to combat IUU fishing; (D) measures against drift nets; (E) measures against ghost fishing; (F) measures to regulate the use of bottom-set gillnets; (G) measures against the use of bottom trawls; and (H) research and conservation measures. The inclusion of these recommended components within the existing national legal frameworks is explored in the following tables.

Table 1.25: recommended prohibitions based on international and regional obligations and presence/absence in existing national legislation

	Prohibitions	BU	GE	RO	RU	TU	UA
1	Prohibition to kill or injure a cetacean intentionally	Y	Y	Y	Y	Y	Y
2	Prohibition to catch/capture/take a cetacean in the wild intentionally (including hunting) or to facilitate such activity	Y	Y	Y	Y	Y	Y
3	Prohibition to possess/keep a cetacean, a part of a cetacean or a product derived from a cetacean	Y	Y	N	Y	N	Y
4	Prohibition to import any cetacean or part of any cetacean or any product derived from a cetacean	Y	Y	N	Y	N	Y
5	Prohibition to use any port or other place to take, import or possess a cetacean, any part of a cetacean or any product derived from a cetacean	N	N	N	Y	N	N
6	Prohibition to transport/transfer/move, purchase, sell, barter, export or offer to purchase, sell, barter or export any cetacean, any part of a cetacean or any product derived from a cetacean	Y	N	N	Y	N	N

Table 1.26: recommended exemptions from prohibitions based on international and regional obligations and presence/absence in existing national legislation

	Exemptions from prohibitions	BU	GE	RO	RU	TU	UA
7	for the purpose of non-lethal *in situ* research aimed at maintaining a favourable conservation status for cetaceans	Y	Y	N	Y	N	Y
8	in emergency situations for cetaceans, when exceptionally unfavourable or endangering conditions occur	N	Y	N	Y	N	Y
9	to an action that is taken in a humane manner and is reasonably necessary to relieve or prevent suffering of a cetacean	Y	N	N	Y	N	Y
10	to an action that is reasonably necessary to prevent a risk to human life or health	Y	Y	N	Y	N	Y
11	to an action that occurs as a result of an unavoidable accident	Y	Y	N	Y	N	N
12	for other purposes	N	N	N	n.a	N	N

Table 1.27: recommended fishing gear limitations based on international and regional obligations and presence/absence in existing national legislation

	Other limitations	BU	GE	RO	RU	TU	UA
13	Prohibition to keep on board of a fishing boat or to use any drift nets	N	N	Y	Y	Y	N
14	Prohibition to discard or leave adrift at sea any fishing gear	Y	Y	N	Y	Y	Y
15	Prohibition or limitations to use bottom-set gillnets for turbot, dogfish and sturgeon	Y	Y	Y	Y	Y	Y
16	Prohibition to use bottom trawls and also pelagic trawls near sea bottom	Y	N	Y	Y	Y	Y*

* prohibition in place for bottom trawls only

Table 1.28: recommended measures for the conservation of cetaceans based on international and regional obligations and presence/absence in existing national legislation

	Measures for the conservation of cetaceans	BU	GE	RO	RU	TU	UA
17	Development of a comprehensive programme of scientific research, managerial and practical actions to improve knowledge about cetaceans and their conservation status	N	N	Y	Y	N	Y
18	Granting permits for research, including non-lethal *in situ* research and collecting tissue samples from stranded and by-caught cetacean carcasses	Y	N	Y	Y	N	Y
19	Inadmissibility of permits to kill a cetacean or to take a cetacean for maintenance in captivity (except extraordinary circumstances listed above as exceptions)	Y	Y	N	Y	N	Y
20	Impact assessment for activities that may affect cetaceans or their habitat, including fisheries, civil works developments, exploration and exploitation of natural resource, marine traffic, military exercises, *etc*.	N	Y	Y	Y	N	Y
21	Permits for activities that may affect cetaceans or their habitat and periodical scientific review of the impact of permits issued	N	N	N	n.a	N	N
22	Require fishermen/fishing vessels to release cetaceans caught alive incidentally in any fishing gear	N	N	N	Y	N	N
23	Require fishermen/fishing vessels to record and report all incidents of cetacean by-catch	N	N	N	Y	N	N
24	Implement and enforce regulations and programme to reduce and monitor cetacean by-catch in fishing activities	N	N	N	Y	N	N
25	Implement and enforce regulations for minimizing the introduction of anthropogenic noise into the marine environment	N	N	N	Y	N	N
26	Implement and enforce regulations on the discharge at sea of pollutants known to have adverse effects on cetaceans	N	N	Y	Y	Y	Y
27	Establish a network of marine protected areas eligible for monitoring and conservation of cetacean populations	N	N	Y	Y	N	Y
28	Identify, create and enforce Special Areas of Conservation for cetacean conservation	N	N	Y	?	N	Y
29	Capacity building, training and education including:						
	a) development of a coherent network and shared databases for collecting information on cetacean sightings, strandings and incidental catches;	N	N	N	Y	N	Y

	Measures for the conservation of cetaceans	BU	GE	RO	RU	TU	UA
	b) establish tissue banks for samples collected;	N	N	N	N	N	N
	c) preparation and dissemination of best practise guides for distribution to users of the sea;	N	N	N	Y	N	N
	d) develop and implement training programmes on conservation techniques, in particular, on monitoring and first aid techniques, and responses to emergency situations	N	N	N	Y	N	Y
	e) develop education programmes and tools for dissemination of information about cetaceans among different target groups	N	N	N	N	N	N
31	Develop and install emergency plans for such events as mass strandings, live strandings, major pollution events, epizootics or ice entrapment of cetaceans	N	N	N	N	N	N
32	Develop and install guidelines, including a code of conduct, for rescue operations	N	N	N	N	N	N
33	Develop and install guidelines and permits on the release of captive cetaceans into the wild	N	N	N	N	N	N
34	Implement regulations and permits for cetacean-watching activities carried out for commercial purposes	N	N	Y	N	N	N

Table 1.29: inclusion of recommended legal sanctions in national legislation with consideration of international and regional obligations with respect to the protection of cetaceans

	Legal sanctions stipulated in event of:	BU	GE	RO	RU	TU	UA
35	deliberate killing or injuring of cetaceans	Y	Y	N	Y	Y	Y
36	taking cetaceans or attempts to engage in taking cetaceans	Y	Y	N	Y	Y	Y
37	possession of a cetacean, a part of a cetacean or a product derived from a killed cetacean or cetacean taken from the wild	Y	Y	N	n.a	N	Y
38	import of any cetacean, part of a cetacean or product derived from a cetacean killed or taken from the wild	Y	Y	N	n.a	N	Y
39	use of any port or other place under the jurisdiction of the country to take, import or possess a cetacean, any part of a cetacean or any product derived from a cetacean	Y	N	N	n.a	N	Y
40	transport, purchase, sale, barter, export or the offer to purchase, sell, barter or export any cetacean, any part of a cetacean or any product derived from a cetacean	Y	Y	N	n.a	N	Y
41	possession on board a fishing vessels of drift nets	N	N	N	Y	Y	N
42	use of drift nets at sea	N	N	N	n.a	Y	N
43	discarding or leaving adrift at sea fishing gears	N	Y	N	N	Y	Y
44	illegal use of bottom-set gillnets for turbot, dogfish and sturgeon	Y	Y	Y	N	Y	N
45	illegal use of bottom trawls or pelagic trawls near sea bottom	Y	Y	Y	n.a	Y	N
46	failure to release incidentally caught cetaceans from fishing gear	Y	Y	N	n.a	N	N

	Legal sanctions stipulated in event of:	BU	GE	RO	RU	TU	UA
47	failure of a fishing vessel master or fishermen to notify designated authority of incidental catches of cetaceans in fishing gear	n.a	Y	Y	n.a	N	N
48	failure to comply with conditions for issued permits	n.a	Y	Y	n.a	N	Y

1.5. Comparison of national laws and best practise laws designed to limit adverse fisheries effects on cetacean populations

The following legislative and subsidiary acts regulating marine fisheries were identified as the national legal tools that have direct relevance to the protection and conservation of Black Sea cetaceans:

Bulgaria: *Fishery and Aquaculture Act* (2001/2012); *Order of the Minister of Agriculture and Food No. RD 09-43* (2012);

Romania: *Law on Living Aquatic Resources, Fishing and Aquaculture* (2001/2004); *Order No. 262/330* (2006); *Order No. 449* (2008); *Order No. 36* (2010); *Annual Prohibition Order* (e.g., *No. 40*, 2012);

Turkey: *Fisheries Law* (1971/2003); *Fishery Regulations* (1995/2010); *Notification regulating commercial fisheries* (2012);

Ukraine: *Regulations of Commercial Fishery in the Black Sea Basin* (**1998/2004)**; *Temporary Regulations of Commercial Fishery in the Azov Sea Basin* (**1999/2004)**; *Rules of Amateur and Sport Fishing* (1999); *Regime of fishery activities in the Black Sea Basin* (2012); and *Regime of fishery activities in the Azov Sea Basin* (2012).

The capacity of domestic fisheries legislation to support the protection and conservation of cetaceans is analysed in Table 1.30. Fisheries legislation of all the four Black Sea countries prohibits intentional catch/capture/take of cetaceans (provision 1); requires the release of any live cetaceans caught incidentally (provision 10); stipulates an annual prohibition of turbot fishery during the period of turbot reproduction (provision 19); and fully or partially prohibits bottom trawling (provision 21). Another 30 provisions listed in Table 1.30 are stipulated in fisheries legislation of not all but some (from one to three) Black Sea countries involved in this analysis.

At the same time, many provisions absent from the mentioned fisheries regulatory tools are present in other national legal instruments having relevance to nature and biodiversity conservation, animal welfare, criminal responsibility, *etc*. For example, in Bulgaria the prohibitions to kill cetaceans intentionally (provision 2 in Table 1.30), to possess/keep or store cetaceans taken in the wild and any parts of their body (provision 3), to export and to offer for sale or exchange cetaceans taken in the wild (provisions 6 and 7) are stipulated by the *Biological Diversity Act* (2002/2012). Another example: sanctions in the case of deliberate killing/shooting/illegally causing the death or severe or lasting harm to a cetacean (provision 23) are specified in the *Biological Diversity Act* (2002/2012), *Animal Protection Act* (2008/2011) and *Criminal Code* (1968/2012) of Bulgaria, in the *Animal Welfare Law* (2004/2008) of Romania, and in the

Criminal Code (2001/2013) and specific *Decree of the Cabinet of Ministers* (2012) of Ukraine. Referenced legal instruments are contained in the footnote below[91].

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[91] *Animal Protection Act. 2008/2011. State Gazette [Bulgaria], No. 13 dated 08.02.2008 (promulgated); State Gazette, No. 80 dated 09.10.2009, No. 8 dated 25.01.2011, and No. 92 dated 22.11.2011 (amended and supplemented).*

Animal Welfare Law. 2004/2008. Law No. 205 (2004) modified and completed through Law No. 9 (2008) concerning animals protection (became effective since January 15, 2008) [Romania].

Annual Prohibition Order. 2012. Joint Order of the Ministry of Agriculture and Rural Development and the Ministry of Environment, Water and Forests No. 40/2012 [Romania].

Biological Diversity Act. 2002/2012. State Gazette [Bulgaria], No. 77 dated 09.08.2002 (promulgated); State Gazette, No. 77 dated 09.10.2012 (amended).

Criminal Code. 1968/2012. State Gazette [Bulgaria], No. 26 dated 02.04.1968 (promulgated); State Gazette, No. 20 dated 09.03.2012, and No. 60 dated 07.08.2012 (amended and supplemented).

Criminal Code. 2001/2013. Criminal Code of Ukraine No. 2341-14 dated 01.09.2001, with amendments of 18.05.2013. Gazette of the Supreme Rada [parliament] of Ukraine, 2001, No. 25-26, P. 131.

Decree of the Cabinet of Ministers. 2012. Decree of the Cabinet of Ministers of Ukraine No. 1030 (dated 07.11.2012) on the level of compensation for illegal taking, killing or injuring of species of animal and plant kingdoms listed in the Red Data Book of Ukraine as well as for destroying or deteriorating of their habitats (growing areas).

Fisheries Law No. 1380. 1971/2003. Official Gazette [Turkey], No. 13799 dated 22.03.1971; amended by Law No. 4950 dated 22.07.2003.

Fishery and Aquaculture Act. 2001/2012. State Gazette [Bulgaria], No. 41 dated 24.04.2001 (promulgated); State Gazette, No. 102 dated 21.12.2012 (amended).

Fishery Regulations. 1995/2010. Official Gazette [Turkey], No. 22223 dated 10.03.1995, amended by Official Gazettes No. 25052 dated 18.03.2003, No. 25374 dated 15.02.2004, No. 27455 dated 07.01.2010, and No. 27517 dated 10.03.2010.

Law on Living Aquatic Resources, Fishing and Aquaculture. 2001/2004. Law No. 192/2001 regarding living aquatic resources, fishing and aquaculture, modified by Law No. 298/2004. Official Publication of the Romanian Government, No. 593 dated 1 July 2004.

Notification regulating commercial fisheries. 2012. Notification No. 65/2012 (dated 18.08.2012) regulating commercial fisheries (also known as Notification 3/1) [Turkey].

Order No. 36. 2010. Order of the Ministry of Agriculture and Rural Development No. 36/2010 [Romania].

Order No. 262/330. 2006. Joint Order of the Ministry of Agriculture and Rural Development and the Ministry of Environment and Forests No. 262/330/2006 regarding the preserving of sturgeons population in natural waters and sturgeon aquaculture development in Romania. Official Publication of the Romanian Government, No. 385 dated 4 May 2006.

Order No. 449. 2008. Order of the Ministry of Agriculture and Rural Development No. 449/2008 on Fishing Gear permitted in the Black Sea [Romania].

Order of the Minister of Agriculture and Food No. RD 09-43 dated 20.01.2012 [Bulgaria].

Regime of fishery activities in the Azov Sea Basin. 2012. Order of the Ministry of Agrarian Policy and Food of Ukraine No. 757 (dated 07.12.2012) on the Regimes of fishery activities in 2013.

Regime of fishery activities in the Black Sea Basin. 2012. Order of the Ministry of Agrarian Policy and Food of Ukraine No. 757 (dated 07.12.2012) on the Regimes of fishery activities in 2013.

Table 1.30: Capacity of the national fisheries legislations concerning the protection and conservation of Black Sea cetaceans

	Provisions stipulated in national instruments	Bulgaria	Romania	Turkey	Ukraine
1	Prohibition to catch/capture/take cetaceans intentionally	Yes[BGa]	Yes[ROa]	Yes[TRa,k]	Yes[UAa,i,r,s]
2	Prohibition to kill intentionally and/or to hunt cetaceans		Yes[ROa]	Yes[TRa,k]	
3	Prohibition to possess/keep or store up cetaceans taken in the wild and any parts of their body			Yes[TRa]	Yes[UAd,k]
4	Prohibition to transfer/move/transport cetaceans	Yes[BGa]		Yes[TRb]	Yes[UAr]
5	Prohibition to trade in cetaceans	Yes[BGa]		Yes[TRb]	
6	Prohibition to export cetaceans taken in the wild			Yes[TRb]	
7	Prohibition to offer for sale or exchange the cetaceans taken in the wild			Yes[TRb]	
8	Exceptions (from prohibitions 1–8 above) which can be granted in following cases:				
	(1) for the protection of species of wild flora and fauna and for the conservation of natural habitats			Yes[TRc]	
	(2) for the purposes of research and education			Yes[TRc]	
9	Demand to return bycaught cetaceans to the sea regardless of their condition (alive or dead)	Yes[BGb]			Yes[UAm,q]
10	Demand to release live cetaceans caught incidentally	Yes[BGb]	Yes[ROa]	Yes[TRk,o]	Yes[UAb,c,j]
11	Demand to record incidents of cetacean by-catch (both dead and live animals)				Yes[UAb,c,j]
12	Demand to inform authorities about each incident of cetacean by-catch				Yes[UAe,j,m]
13	Demand to change fishing location for another one if a cetacean by-catch has happened				Yes[UAn]
14	Provision to provide humane assistance to a cetacean bycaught alive before it is released				Yes[UAn]
15	Provision to examine dead bycaught animals by an authorized organization			Yes[TRo]	
16	Provision to create specially protected areas for cetacean conservation			Yes[TRi]	

Regulations of Commercial Fishery in the Black Sea Basin. ***1998/2004.*** *Order of the State Committee for Fisheries of Ukraine No. 164 (dated* ***08.12.1998; amended 15.06.2004****) on the Regulations of commercial fishery in the Black Sea basin.*

Rules of Amateur and Sport Fishing. 1999. Order of the State Committee for Fisheries of Ukraine No. 19 (dated 15.02.1999) on the Rules of Amateur and Sport Fishing.

Temporary Regulations of Commercial Fishery in the Azov Sea Basin. ***1999/2004.*** *Order of the State Committee for Fisheries of Ukraine No.* ***172*** *(dated* ***31.12.1999; amended 15.06.2004****) on the Temporary regulations of commercial fishery in the Azov Sea basin.*

	Provisions stipulated in national instruments	Bulgaria	Romania	Turkey	Ukraine
17	Prohibition to discharge, dispose and dump wastes and substances harmful to marine living resources (including cetaceans)			Yes[TRg,m]	Yes[UAh,l]
18	Prohibition to discard or leave adrift at sea any fishing gear			Yes[TRh,l]	
19	Annual prohibition of turbot fishery during the period of turbot reproduction	Yes[BGc]	Yes[ROb,c]	Yes[TRd]	Yes[UAf,p]
20	Long-term prohibition of sturgeon fishery	Yes[BGg]	Yes[ROd]		Yes[UAi,o,q]
21	Prohibition of bottom trawling	Yes[BGd]	Yes[ROe]	Yes[TRf,j,n]	Yes[UAg]
22	Prohibition of drift nets		Yes[ROe]	Yes[TRk,l]	
23	Sanctions in case of deliberate killing/shooting/illegally causing the death or severe or lasting harm to a cetacean			Yes[TRa]	
24	Sanctions in case of deliberate catching/capture a cetacean	Yes[BGe]		Yes[TRa]	
25	Sanctions in case of hunting cetaceans			Yes[TRa]	
26	Sanctions in case of possessing/keeping cetaceans taken in the wild			Yes[TRa]	
27	Sanctions in case of carrying/moving/transporting cetaceans	Yes[BGe]		Yes[TRb]	
28	Sanctions in case of selling marine mammals/trade in cetaceans taken in the wild	Yes[BGe]		Yes[TRb]	
29	Sanctions in case of exporting cetaceans taken in the wild			Yes[TRb]	
30	Sanctions in case of offering for sale or exchange cetaceans taken in the wild			Yes[TRb]	
31	Sanctions in case of omission to release a cetacean that was caught incidentally in fishing gear			Yes[TRe,k]	
32	Sanctions in case of discarding or leaving adrift at sea fishing gears			Yes[TRh]	
33	Sanctions in case of illegal use of bottom-set gillnets and bottom trawls	Yes[BGf]	Yes[ROe]	Yes[TRd,f]	
34	Sanctions in case of possession on board and use of drift nets			Yes[TRl]	

[BGa] – *Fishery and Aquaculture Act* (2001/2012), Art. 43.1; [BGb] – ibid, Art. 43.2; [BGc] – ibid, Art. 32.1 and Annex 1; [BGd] – ibid, Art. 35.1 (with the exception of beam trawl which is not prohibited); [BGe] – ibid, Art. 77; [BGf] – ibid, Art. 70, 73 and 74; [BGg] – *Order of the Minister of Agriculture and Food No. RD 09-43* (2012);

[ROa] – *Annual Prohibition Order* (2012), Art. 5; [ROb] – *Law on Living Aquatic Resources, Fishing and Aquaculture* (2001/2004); [ROc] – *Order No. 36* (2010), Art. 4 and 6; [ROd] – *Order No. 262/330* (2006); [ROe] – *Order No. 449* (2008);

[TRa] – *Fisheries Law* (1971/2003), Art. 36h; [TRb] – ibid, Art. 25; [TRc] – ibid, Art. 29; [TRd] – ibid, Art. 23a; [TRe] – ibid, Art. 23b; [TRf] – ibid, Art. 24; [TRg] – ibid, Art. 20; [TRh] – ibid, unspecified article; [TRi] – *Notification regulating commercial fisheries* (2012), Art. 8 (1c); [TRj] – ibid, Art. 9, 10 and 11; [TRk] – ibid, Art. 16; [TRl] – ibid, Art. 45 (22); [TRm] – *Fishery Regulations* (1995/2010), Art. 11 and Annex 5; [TRn] – ibid, Art. 14B; [TRo] – ibid, Art. 19;

[UAa] – *Regulations of Commercial Fishery in the Black Sea Basin* (**1998/2004**), Art. 16.2; [UAb] – ibid, Art. 6.1.15; [UAc] – ibid, Art. 16.2; [UAd] – ibid, Art. 9.9.2; [UAe] – ibid, Art. 6.1.15; [UAf] – ibid, Art. 12.2; [UAg] – ibid, Art. 14.6; [UAh] – ibid, Art. 9.1, 9.8.2, 9.8.3; [UAi] – *Temporary Regulations of Commercial Fishery in the Azov Sea Basin* (**1999/2004**), Art. 13.2; [UAj] – ibid, Art. 4.12; [UAk] – ibid, Art. 9.2; [UAl] – ibid, Art. 8.1 and 8.5; [UAm] – *Regime of fishery activities in the Black Sea Basin* (2012), Art. 32; [UAn] – ibid, Art. 33; [UAo] – ibid, Art. 19.2; [UAp] – ibid, Art. 9; [UAq] – *Regime of fishery activities in the Azov Sea Basin* (2012), Art. 9; [UAr] – *Rules of Amateur and Sport Fishing* (1999), Art. 3.14; [UAs] – ibid, Art. 4.10.

1.6. Recommendations for strengthening national and regional legislation

The Black Sea is the largest semi-enclosed sea in the world, bordered by coastal states, all of which have very different social and economic characteristics. Each state has an exclusive economic zone and related arrangements in respect of environmental protection and fisheries management (Duzgunes and Erdogan, 2008[92]). The net result is a complex legislative environment, with a diverse range of laws, treaties, directives and instruments that operate at national and international levels. The analysis of national and international legislation quickly identified that within the legislative environment, there are a substantial number of tools and mechanisms to support the protection of cetaceans and management of fisheries interactions. All coastal states have ratified or acceded to international treaties that stipulate a commitment to protecting biodiversity (e.g., the Convention on Biological Diversity, 1992) and protection of endangered marine species through responsible fishing practises (e.g., the Code of Conduct for Responsible Fisheries, FAO, 1995). All coastal states have national legislation in place that prohibits killing or injuring cetaceans. Legislation or instruments to enact legislation to conserve and protect cetacean populations in the Black Sea therefore exist, but the Multilateral Environmental Agreements (MEAs) and Fisheries Agreements each tend to address aspects of or are related to the conservation of cetaceans, rather than there being one vehicle that addresses the various adverse human induced impacts on cetaceans and which sets out the requirements to monitor cetacean populations.

While improvements to national legislation should be made through integrating the protection of endangered species within national fisheries law, given the migratory nature of cetaceans in the Black Sea and the need for trans boundary action to achieve their protection, a coherent regional approach to protection is crucial. The absence of a single regional organisation that could provide a basis for a legally enforceable framework for the protection of cetaceans and for the management of activities that adversely impact cetaceans in the Black Sea is significant. As incidental catches in fishing gear are generally accepted as the most significant single detrimental impact on cetacean populations in the Black Sea (Birkun, 2002[93]; Notarbartolo di Sciara & Birkun, 2010[94]), regional cooperation on fisheries remains one of the most pressing issues[95].

While the focus of this study is the adverse impacts of fishing on Black Sea cetacean populations, it is important to recognise that Black Sea cetaceans are affected by a range of anthropogenic activities, of which fishing is one, albeit probably the most significant. Depredation, prey depletion, climate change, chemical pollution, ship strikes, anthropogenic noise, habitat degradation and other impediments to migration all have a cumulative effect that requires consideration if populations of cetaceans in the Black Sea are to be safeguarded for the future. A comprehensive plan for protection and conservation of cetacean species in the Black Sea should also take into account other stressors and anthropogenic sources

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[92] *Duzgunes, E., and N. Erdogan. 2008. Fisheries management in the Black Sea countries. Turkish Journal of Fisheries and Aquatic Science 8:181-192*

[93] *Birkun, A., Jr. 2002. Interaction between cetaceans and fisheries: Black Sea. Pp. 98-107. Cetaceans of the Mediterranean and Black Seas: State of knowledge and conservation strategies. (Ed. By G. Notarbartolo di Sciara), ACCOBAMS Secretariat, Monaco. 219pp*

[94] *Notarbartolo di Sciara, G. and A. Jr. Birkun. 2010. Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas. ACCOBAMS, Monaco. 232p.*

[95] *The socio-economic importance of fishing to coastal communities in Black Sea coastal states and the poor perception of cetaceans held by many fishers interviewed suggests that a focus on improving fisheries management including provisions to safeguard endangered species may be more effective than a direct focus on legislation to protect cetaceans.*

of mortality. High priority regional threats in the Black Sea in addition to incidental catch in fishing gear include pollution, habitat and feeding ground degradation (Prideaux, 2011[96]).

Certain MEAs include more direct provisions that specifically address multiple threats from a species conservation and regional perspective. CMS, ACCOBAMS/GFCM, the Black Sea Commission and EU Legislation all include direct provisions (some of which remain in draft, e.g., the Black Sea Commission) and could act as legally enforceable frameworks for the protection of cetaceans in the Black Sea and for addressing adverse fisheries impacts on cetacean populations. However no one vehicle has both the institutional strength to oblige all Black Sea coastal states to enact and enforce national laws, cooperate across borders and implement and demonstrate the efficacy of measures taken to address adverse impacts on cetacean populations.

CMS, through ACCOBAMS, addresses the principle threats to cetaceans in the Mediterranean and Black Sea, including entanglement and by-catch, climate change, ship strikes, pollution, habitat/feeding ground degradation, marine noise and 'other' impediments to migration. However, the Russian Federation and Turkey are not parties to ACCOBAMS and it has very limited capacity to implement changes, particularly with regard to fisheries management and the implementation of technical measures designed to reduce incidental catch.

By contrast, EU Legislation is legally binding and the EC has the capacity to enforce obligations designed to conserve cetaceans (and marine biodiversity in general) and to stipulate changes in fisheries management measures nationally and supranationally. The enlargement of the European Union (EU) in 2007 to include two new Member States – Bulgaria and Romania – led to the Black Sea waters under the sovereignty or jurisdiction of these Members States becoming the responsibility of the EU within the framework of, *inter alia*, the Common Fisheries Policy (CFP), Directive 2008/56/EC on establishing a framework for community action in the field of marine environmental policy – known as the Marine Strategy Framework Directive (MSFD) – and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora – known as the Habitats Directive. Accession to the EU has led to obligations on Bulgaria and Romania to meet and manage requirements of environmental protection, management of fishing fleets and ensuring strict protection of Black Sea cetacean species (as Annex IV species). The potential accession of Turkey to the EU would further expand these obligations to waters within Turkish jurisdiction, increasing the EU's jurisdiction to just over 50% of the Black Sea. As a candidate member, Turkey has taken initial steps to harmonise its fisheries management practises with those of the EU (Goulding *et al*., 2014[97]) and would presumably be obliged to implement the Habitats Directive and MSFD should Turkey become a member of the EU. This raises the possibility that a substantive, legally enforceable framework for fisheries management and marine biodiversity conservation could become active across the areas of Black Sea associated with the majority of fishing effort and, possibly, the majority of habitat occupied by Black Sea cetacean populations. While the EU's reach is limited to waters within the jurisdiction of its Member States, it continues to play a central role in supporting negotiations towards the establishment of a ratified fisheries and marine environmental Convention for the Black Sea. This role is necessary not least because the EU has significant technical and economic capacity to support negotiations, but also because fisheries management within EU waters (but beyond territorial waters) is a matter for the European Commission. The European Commission therefore will play a key role in the

[96] *Prideaux, M. 2011. Towards a CMS Global Programme of Work for Cetaceans: Implementing CMS Resolution 8.22: Adverse Human Induced Impacts on Cetaceans (UNEP/CMS/Inf 10.15), Convention on the Conservation of Migratory Species of Wild Animals, Bonn*

[97] *Goulding, I. C., K. A. Stobberup, and T. O'Higgins. 2014. Potential economic impacts of achieving good environmental status in Black Sea fisheries. Ecology and Society* ***19****(3): 32*

adoption of measures to reduce incidental catches of cetaceans and thus be involved in the establishment of a functional Black Sea fisheries management organisation.

The challenge of establishing a single legally enforceable framework is significant and, despite the longstanding knowledge that human activities have been having a substantial detrimental effect on the biodiversity and the livelihoods of coastal communities, there has clearly been insufficient commonly held political will to drive coastal states to agree a binding convention on fisheries and marine environmental matters. The Black Sea remains a degraded ecosystem, in part due to inadequate fisheries conservation measures at sea-basin level (COM, 2009[98]), and in part due to chemical pollution, invasive species, nuclear contamination, climate change, over-fishing and Illegal, Unreported and Unregulated fishing (Duzgunes and Erdogan, 2008). The ecological regimes in the Black Sea from a pristine environment to a degraded environment are well documented (e.g., GFCM Secretariat, 2011[99]) and the reasons why fish stocks and the ecosystem are degraded are well known (Daskalov, 2011[100]). The clear urgency of the environmental problems of the Black Sea led to coastal states agreeing to the Bucharest Convention against Pollution in the Black Sea (1992), a legal convention whose implementation is promoted by the Black Sea Commission (BSC). The Bucharest Convention was followed by the Odessa Declaration, a Ministerial Declaration on the Protection of the Black Sea (1993), which adopted, *inter alia*, the taking of appropriate measures for the restoration and conservation of biodiversity in the Black Sea in the spirit of the 1992 Biodiversity Convention"[101]. Yet despite these longstanding attempts to improve environmental management, political will has not been sufficiently galvanised to achieve shared environmental goals. Recent geopolitical upheaval in the region is likely to push environmental matters, including the protection of cetaceans, further down the agenda of regional priorities. The Commission on the Protection of the Black Sea Against Pollution – the Black Sea Commission – has, however, made progress towards the adoption of both a Strategic Action Plan for the Black Sea Biodiversity and Landscape Conservation Protocol and, critically, a legally binding Convention for Fisheries and Conservation of Living Resources of the Black Sea. All Black Sea coastal states are party to the Commission. Given the geopolitical complexity of the region and the involvement of all coastal states, that progress has been made towards the creation of a multilateral agreement that specifically addresses both fisheries management and cetacean incidental catches is encouraging, although this is tempered by the length of time progress towards ratification continues to take. This suggests that of all regional vehicles, the Black Sea Commission is probably the best equipped to act as the vehicle for achieving the conservation of Black Sea cetaceans, working in close association with other important multilateral agreements and obligations, including EU Legislation, ACCOBAMS and GFCM. It is not yet clear if the shared framework of the Black Sea Convention would enable EU Member States to meet their obligations under EU Legislation (O'Higgins *et al.*, 2014[102]), suggesting that for EU Member States, additional measures within national legislation may also be required in addition to measures adopted and implemented in response to possible Black Sea regional conventions.

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[98] *COM. 2009. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Developing the international dimension of the Integrated Maritime Policy of the European Union, Brussels, 15.10.2009, pp. 9-10*

[99] *General Fisheries Council of the Mediterranean (GFCM) Secretariat. 2011. Status of the GFCM actions in the Black Sea. 13th Session of the Scientific Advisory Committee, 7-11 February 2011, Marseille, France [online]*

[100] *Daskalov, G. M. 2011. Ecosystem Shifts in the Black Sea. In: Regime Shifts in Marine Ecosystems. European Parliament Policy Department B: Structural and Cohesion Policies: Fisheries [online]*

[101] http://www.blacksea-commission.org/_odessa1993.asp

[102] *O'Higgins, T., A. Farmer, G. Daskalov., S. Knudsen and L. Mee. 2014 Achieving good environmental status in the Black Sea: scale mismatches in environmental management. Ecology and Society* ***19****(3): 54*

The limitations of multilateral environmental agreements that are not legally binding are clear. All coastal states are signatories or parties to various international commitments for the protection of biodiversity, including cetaceans. Some agreements have been in force for several decades, yet cetacean populations – and fish stocks – in the Black Sea are far from being recognised as of favourable conservation status. Ultimately, national legislation is the vehicle under which appropriate measures and surveillance are implemented and enforced. It is also important to recognise the efforts that Black Sea coastal states have made in the past two to three decades to mitigate and reduce threats, without which the situation for cetaceans would probably be far worse. It is also important to recognise and support the tireless efforts that cetacean and fishery scientists in the Black Sea continue to expend in an effort to improve the lot of the biodiversity in the Black Sea. It is testament to their dedication that they continue to expend significant efforts despite the difficult geopolitical background. Nonetheless, it is difficult to ignore the lack of a single body that is recognised by all coastal states as providing scientific advice or that acts as a single voice for environmental matters in the Black Sea. As previously stated, all coastal states have signed, agreed and ratified numerous Conventions, Agreements and Treaties that indicate the consensus that regional cooperation is a necessity if the environmental and societal benefits that the Black Sea ecosystem provides are to be preserved for this and future generations. As noted by Goulding *et al*. (2014): "notwithstanding Turkey's non-ratification of UNCLOS, there is nothing in international law to prevent the parties from applying voluntarily the principles therein, and establishing an RFMO for the Black Sea". Also as previously noted, a regional management organisation, preferably one that incorporates both fisheries and marine environmental matters, which can produce binding resolutions is critical to safeguarding *inter alia* cetacean populations in the Black Sea.

Regardless of these limitations, the review of legislation indicates that there is sufficient legislation in place, particularly within Member State jurisdictions, to research, assess and manage pressures and threats to cetacean species, and to designate SACs. Strengthening the capacity of the Member States and the coordination and capacity of regional bodies to implement legislation and to conduct the required research would appear to be more appropriate than the determination and enactment of additional legislative instruments. Implementation will always be hampered if there is insufficient collective political will to shore up implementation and enforcement efforts, and this remains one of the region's greatest challenges. An additional challenge is to overcome the negative perceptions that many fishers have about cetaceans, and education about the ecological importance of cetaceans and about the longer term economic benefits of sustainable fishing practises should be one tool applied nationally and regionally.

In summary:

- The sum of national and regional legislation is adequate to conserve and protect Black Sea cetaceans and to require changes to human activities that result in adverse impacts on the populations of Black Sea cetaceans. However the legislation is fragmented and certain measures, obligations or stipulations only apply in certain states or regions within the Black Sea. At national level, fisheries legislation and environmental legislation are not always coordinated and strategic objectives may conflict.

- There are a number of MEAs that operate in the Black Sea relevant to cetacean conservation with overlapping agendas, differing jurisdictions and in several cases without the capacity to make the fulfilment of obligations or meeting recommendations legally binding. Given the trans boundary nature of cetacean populations and of fishing activities (among other activities) that affect cetacean populations, it remains critical that a single, legally enforceable framework for fisheries management and marine conservation is ratified by all coastal states. The ratified body would take responsibility for monitoring, assessing and determining measures to address incidental catch and co-ordinating cetacean conservation through: improving coordination on scientific research and advice; standardising scientific methods for monitoring and research; and providing

recommendations to be adopted at national level to reduce threats to cetaceans (and other marine biodiversity).

- Ultimately the definition, adoption and implementation of measures to monitoring conservation status and to address adverse impacts falls within the competence of national authorities. National legislation therefore needs to be sufficiently precise, specific and clear and carry sufficient binding force to meet national and regional commitments.

- National legislation should explicitly reference and stipulate responsibility for a system of monitoring incidental capture of cetacean species, the requirement to implement effective measures should adverse populations impacts be likely, and statutory duties of national authorities to undertake surveillance of the conservation status of Black Sea cetacean species and associated habitats, and guarantee that surveillance will be undertaken systematically and permanently. Enforcement measures should transposed in national legislation to provide sufficient binding force.

- Efforts to standardise and coordinate the most appropriate legislation in all Black Sea coastal states would be beneficial. National authorities should confirm that international, regional and national obligations to protect cetaceans (and marine biodiversity) are clearly transposed in national legislation and reflect the broader regional environmental objectives.

- Coordinating fisheries legislation with environmental legislation is important. Strengthening existing fisheries legislation by bringing fisheries legislation within environmental strategic priorities and explicitly recognising the need to monitor and, where demonstrated, apply effective measures to address incidental catches of cetaceans in fisheries.

- Integrating strengthened fisheries legislation with legislation that provides strict protection of endangered species and which aims to achieve favourable conservation status of endangered species through surveillance of conservation status and taking appropriate and effective measures would be beneficial and would support meeting sub-regional obligations. Strict protection of endangered species is a particularly useful concept for cetaceans, which are highly mobile and for which the identification of important parts of their habitat may be difficult and costly to identify or misguided.

- The development of national marine strategies that take into account the specificities of national waters and that reflect the overall perspective of the Black Sea marine environment would be one approach that would coordinate fisheries and marine environmental strategic priorities. Bulgaria and Romania, as EU Member States are obliged to develop such strategies under the Marine Strategy Framework Directive, which provides a comprehensive benchmark for the protection of marine biodiversity taking into account the ecosystem based approach to the management of human activities and to protect marine biodiversity to achieve 'Good Environmental Status'. The initial assessments (fulfilling the reporting obligations for MSFD reporting on Initial Assessments (Art. 8), Good Environmental Status (Art.9), Env. targets & associated indicators (Art.10) and related reporting on geographic areas, regional cooperation and metadata), provide a useful foundation to support a collaborative regional approach to adopting a coherent set of basin wide targets and indicators.

- The adoption of basin wide indicators would support a coordinated approach to the surveillance and monitoring of cetacean populations in the Black Sea, and of incidental catches of cetaceans

in fishing gear. Coastal states could agree to populate a shared database, accessible to all, with data on population monitoring and by-catch monitoring according to an agreed survey methodology. The adoption of a single methodology would greatly enhance the knowledge and understanding of the conservation status of Black Sea cetaceans at national and regional levels.

- The development and implementation of national marine strategies in each coastal state that take into account the protection of marine biodiversity and the management of human activities that affect the marine ecosystem would be a major step forward for the protection of marine biodiversity (including cetaceans) and for coastal livelihoods. For countries to develop feasible strategies would require coordination and collaboration across the six coastal states. Such strategies would lead to coordinated legislation, measures and, hopefully, enforcement at national and regional levels. The European Commission can provide substantial support to encourage collaboration between Member States and the other Black Sea coastal states, particularly regarding fisheries management measures, such as MCS of turbot fisheries in EU waters.

- There are sufficient signs to suggest that improved enforcement of existing legislation would be beneficial, given the longstanding acknowledgement that incidental catches of cetaceans and unmanaged fishing for pressure stocks using gear that has adverse impacts on cetacean populations are widespread. Capacity building, coordination between national authorities and information sharing would be good starting points to improve monitoring, control and surveillance systems in all countries. Political will to support enforcement is essential.

2. Review of existing information on Black Sea cetacean populations

2.1 Review of information on the density, abundance and distribution of cetacean populations in the Black Sea[103]

2.1.1. Introduction

A retrospective analysis was carried out of available information on the density, abundance and distribution of the three cetacean subspecies in the Black, Azov and Marmara seas and straits connecting the seas. National teams in Bulgaria, Romania, Turkey and Ukraine were asked to produce national overviews of published and unpublished population data according to terms of reference and a template prepared by MEP. The results were collated and analysed and a review was produced based upon the information received. (See Annex 3).

The cetacean fauna in the Black Sea includes three species/subspecies – the Black Sea harbour porpoise, the Black Sea common dolphin and the Black Sea bottlenose dolphin. All three species are covered by Annex IV of the European Habitats Directive and therefore require strict protection by EU member states. The present state of Black Sea cetacean populations is not certain in spite of research and conservation measures during last twenty years. The insufficiency of scientific information concerns the population abundance, distribution, migrations, critical habitats, anthropogenic and natural threats as well as some basic aspects of life history and pathology.

The review (Annex 3) presents the updated and critically analyzed information on the distribution, abundance and habitats of each Black Sea cetacean subspecies.

2.1.2 Black Sea harbour porpoise (*Phocoena phocoena relicta*)

The Black Sea harbour porpoise is recognized as endemic subspecies (*P. p. relicta*) with morphological and genetic differences from *P. phocoena* populations elsewhere in the world.

2.1.2.1 Geographic range

The subspecies' range includes the Black Sea proper, Azov Sea, Kerch Strait The Black Sea population is completely isolated from the nearest *P. phocoena* population in the northeastern Atlantic by a broad range discontinuity in the Mediterranean Sea, from the northern Aegean to the Strait of Gibraltar. It is clear that harbour porpoises came to the Black Sea via the Mediterranean which, therefore, must have had its own population in the past.

[103] *Compiled by Alexei Birkun, Jr. with contribution of the national data by Konstantin Mihaylov, Radoslava Bekova (Bulgaria), Simion Nicolaev, Gheorghe Radu (Romania), Ayaka A. Öztürk, Arda M. Tonay, Bayram Öztürk (Turkey), and Sergey Krivokhizhin (Ukraine).*

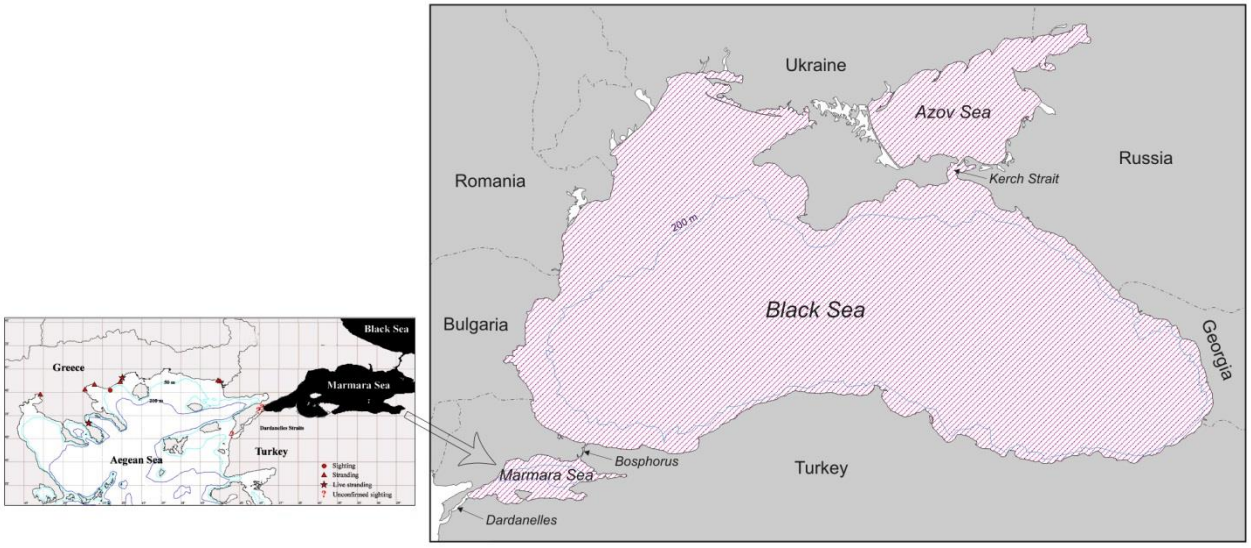

Figure 2.1 Range of the Black Sea harbour porpoise (inset the North Aegean Sea) (Birkun and Frantzis, 2008)

The range of the Black Sea subspecies includes territorial waters and exclusive economic zones of Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine in the Black Sea; internal waters of Ukraine in the Black Sea; internal waters of Russia and Ukraine in the Azov Sea and Kerch Strait; internal waters of Turkey; Greek and Turkish waters in the northern Aegean Sea and, probably in its southern part[104]. Occasionally, harbour porpoises have been sighted in the Danube, Dnieper, South Boug, Don and Kuban rivers, their estuaries, deltas and tributaries, and coastal freshwater, brackish and saline lakes and lagoons Most of these sites (except Varna lake and Ropotamo estuary, Bulgaria) are situated in Ukraine and Russia, on the northern and northwestern coasts of the Black Sea and round the Azov Sea.

The population of *P. p. relicta* may consist of three or more subpopulations including those that spend much of the year in geographically and ecologically different areas. The Bosporus Straits, the Sea of Marmara and the Dardanelles Straits serve as conduits between the Black and Aegean Seas. Water flow at the surface is into the Aegean, from the Black Sea. If porpoises were to leave the Black Sea, the conditions in the northern Aegean Sea would remain similar to those of the Black Sea. The period of greatest similarity would be February and March.

2.1.2.2 Principal, secondary and occasional habitats

Black Sea harbour porpoises live in the marine environment but on rare occasions they may occur in estuarine and fluvial environments. They do not avoid waters with low salinity and high turbidity and they may occur in brackish bays and lagoons visiting rivers and estuaries at warm times of the year.

<u>Principal habitat:</u> Circumlittoral area over the continental shelf (usually more than 6 m but less than 200 m deep).

<u>Secondary habitats:</u> Open sea (more than 200 m deep) and shallow sea (less than 6 m deep; includes sea bays and straits).

[104] *On 10 January 2013, one adult female harbour porpoise was found dead on the coast of Torba village near Bodrum (Tonay and Dede, 2013).*

Occasional habitats: Isolated instances are known of Black Sea harbour porpoises visiting estuaries of big rivers including their deltas, big rivers proper and their confluents, coastal brackish and saline lagoons, and freshwater lakes connected with the sea by rivers.

2.1.2.3. Critical habitats

Harbour porpoises undertake annual migrations, leaving the Azov Sea and northwestern Black Sea before winter and returning in spring. Such movements also may occur between the Black Sea and Marmara Sea. In Bulgaria cetaceans, including harbour porpoises, appear regularly first, in February-April, in the southern area and their migration path is to the north; in autumn they take on return migration to the south within the same close to the shore zone.

The primary wintering areas are in the south-eastern Black Sea including southern Georgian territorial waters and possibly eastern Turkish territorial waters. These are also the well-known wintering grounds of Black/Azov Sea populations of the anchovy, a principal prey species for harbour porpoises during the cold season.

During their seasonal migration animals may remain for a few days at different sites forming dense aggregations of some hundreds of individuals. Sometimes, early and rapid ice formation, can prevent animals leaving the Azov Sea and cause mass mortality due to ice entrapment. The last recorded die-off of this kind occurred in November 1993.

The critical habitats of the harbour porpoise overlap with fishing grounds of intense bottom-set gillnet fisheries in all Black Sea countries. Specifically:

Bulgaria: areas between Kavarna and Cape Cherni; near Krapets (by the Romanian border); to the south of Burgas; from Shabla to Balchik; and from Bjala to Cape Emine; EEZ of Bulgaria;

Georgia: area between the mouth of Chorokhi river and the Turkish border;

Romania: EEZ of Romania;

Russia: area from Anapa to Sochi; the Kerch Strait;

Turkey: waters off the western (European) coast; and Prebosphoric area;

Ukraine: area adjoining the Danube Delta; Dniester Bank; waters off the Crimea round Tarkhankut peninsula (including Karkinitsky Bay), between Cape Khersones and Cape Sarych (near Sevastopol), between Cape Kiik-Atlama and Cape Chauda (Gulf of Feodosia), and in the Kerch Strait; EEZ of Ukraine in the northwestern Black Sea.

2.1.2.4. Population

The total population size of the Black Sea harbour porpoise is unknown. Past Black Sea region-wide estimates based on strip transect surveys carried out in the USSR and Turkey have been shown to be fundamentally flawed for a number of methodological and analytical reasons. Nevertheless, it was generally assumed that during most of the 20th century, the abundance of harbour porpoises in the Black Sea was higher than that of bottlenose dolphins, and lower than that of common dolphins. Results of surveys suggest that present total population size is at least several thousands and possibly in the low tens of thousands. A summary of density estimates is provided in Table 2.1 below.

Table 2.1 Harbour porpoise density and abundance estimates in selected Black Sea areas and contiguous water bodies

Surveyed area and observation effort	Observation platform	Research period	Uncorrected density estimates	Uncorrected abundance estimates	References
Azov Sea in total, 40,280 km^2/2,735 km	aircraft	Jul 2001	0.07 (0.03–0.16; 95% CI)	2,922 (1,333–6,403; 95% CI)	Birkun *et al*. (2002)[107]
Southern Azov Sea (within above area), 7,560 km^2/ 413 km	aircraft	Jul 2001	0.12 (0.04–0.36; 95% CI)	871 (277–2,735; 95% CI)	Birkun *et al*. (2003)[108]
Southern Azov Sea (the same area), 7,560 km^2/716 km	aircraft	Aug 2002	0.12 (0.06–0.27; 95% CI)	936 (436–2,009; 95% CI)	Birkun *et al*. (2003)[108]
Kerch Strait in total, 890 km^2/353 km	aircraft	Jul 2001	Not available (too small sample size: 5 sightings, 12 animals)		Birkun *et al*. (2002)[107]
Kerch Strait in total, 890 km^2/353 km	aircraft	Aug 2002	Not available (too small sample size: 4 sightings, 4 animals)		Birkun *et al*. (2003)[108]
Kerch Strait, 862 km^2/310 km	vessel	Aug 2003	0.06 (0.01–0.28; 95% CI)	54 (12–245; 95% CI)	Birkun *et al*. (2004a)[109]
NE shelf area of the Black Sea, 7,960 km^2/791 km	aircraft	Aug 2002	Not available (too small sample size: 8 sightings, 15 animals)		Birkun *et al*. (2003)[108]
NW, N and NE Black Sea within Ukrainian and Russian territorial waters, 31,780 km^2/ 2,230 km	vessel	Sep-Oct 2003	0.04 (0.02–0.09; 95% CI)	1,215 (492–3,002; 95% CI)	Birkun *et al*. (2004a)[109]
Ukrainian EEZ within NW shelf area, 22,630 km^2/388 km	vessel	Sep 2004	Not available (too small sample size: 8 sightings, 25 animals)		Krivokhizhin (2009)[195]
SE Black Sea within Georgian territorial waters, 2,320 km^2/211 km	vessel	Jan 2005	1.54 (0.89–2.65; 95% CI)	3,565 (2,071–6,137; 95% CI)	Birkun *et al*. (2006)[105]
Central Black Sea beyond territorial waters of Ukraine and Turkey, 31,200km^2/660 km	vessel	Sep-Oct 2005	0.26 (0.06–1.27; 95% CI)	8,240 (1,714–39,605; 95% CI)	Krivokhizhin *et al*. (2006)[106]

[105] *BIRKUN JR., A., KRIVOKHIZHIN, S., KOMAKHIDZE, A., MUKHAMETOV, L., SHPAK, O., GORADZE, I., KOMAKHIDZE, G. AND KRYUKOVA, A., 2006 - Wintering concentrations of Black Sea cetaceans off the Crimean and Caucasian coasts. 20th Annual Conference of the European Cetacean Society. (Gdynia, 2-7 April 2006).*

[106] *Krivokhizhin, S., Birkun, A., Jr., Shpak, O., Mukhametov, L. (2006) Offshore harbour porpoises in the central Black Sea. P.210 In: Abstr. 20th Annual Conf. of the European Cetacean Society (Gdynia, 2-7 April 2006). ECS, Gdynia, 244pp.*

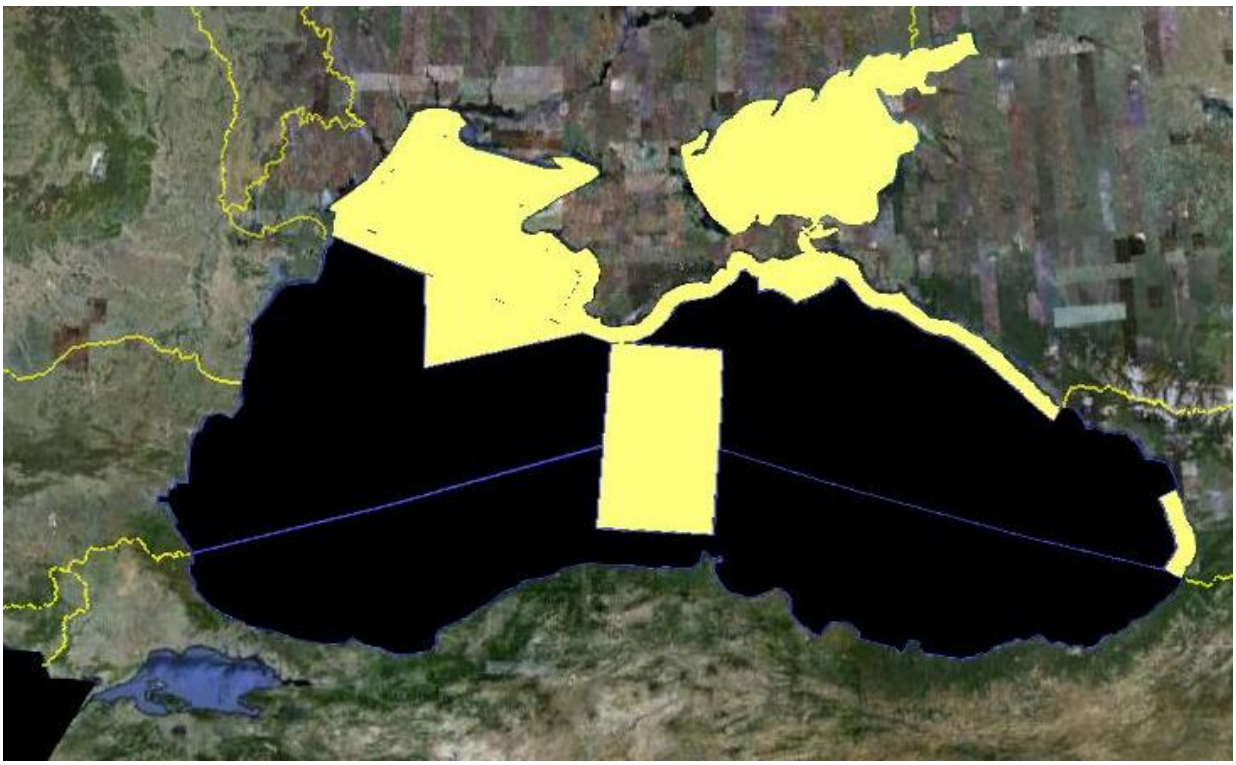

Figure 2.2 Geographical extent of line-transect cetacean surveys where harbour porpoises were recorded (yellow shaded areas) (Notarbartolo di Sciara and Birkun, 2010)

2.1.2.5 Population trend

In the 20th century, the number of Black Sea harbour porpoises was dramatically reduced by significant

↓ – until 1983 (directed killing)

↓? – 1983–2006 and beyond (incidental mortality and habitat degradation)

direct killing for the cetacean-processing industry that continued until 1983. The numbers of animals taken was not recorded accurately. However, it can be inferred that the population size was reduced due to the direct kills (totalling some hundreds of thousands) by the time the total ban on cetacean hunting was enforced in the Black Sea region. It is strongly suspected that during the subsequent period from 1983-2006, the population declined further, due to large-scale mortality in bottom-set gillnets. In addition to this, there are other ongoing threats including habitat degradation and parasitic and bacterial infections.

2.1.3. Black Sea common dolphin (*Delphinus delphis ponticus*)

This subspecies was proposed on the basis of its morphological features, however, comparative analyses using skull morphometrics and microsatellite DNA loci suggested that differences do exist between Black Sea and Mediterranean common dolphins.

2.1.3.1. Geographic range

The range of common dolphins (Figure 2.3) encompasses almost the entire Black Sea, including territorial waters and exclusive economic zones of Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine, and internal waters of Ukraine in Karkinitsky Bay. Common dolphins are well known also in the Bosphorus, Marmara Sea and Dardanelles. Common dolphins do not occur in the Azov Sea and normally avoid the Kerch Strait.

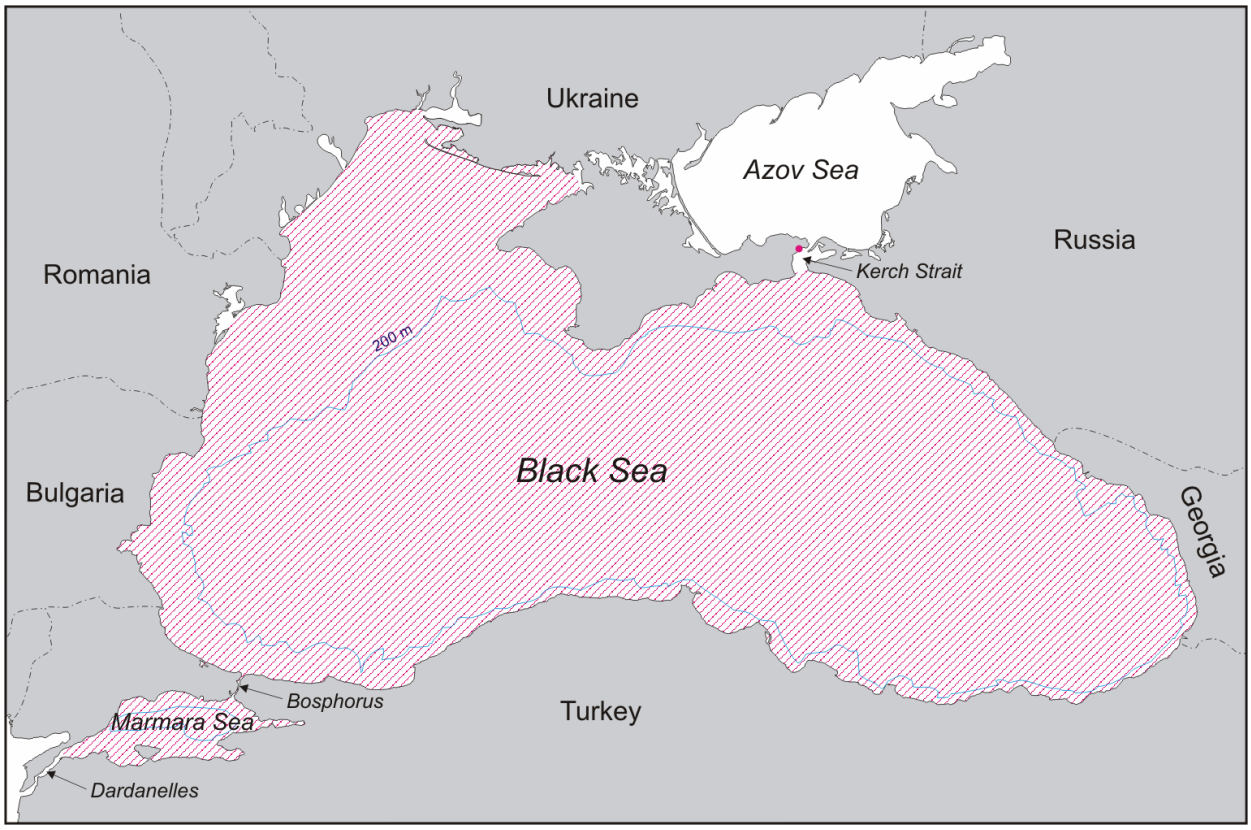

Figure 2.3 Range of the Black Sea common dolphin. Red dot in the Kerch Strait indicates where a live stranding was recorded in August 1994 (Birkun, 2008a)

2.1.3.2. Principal, secondary and occasional habitats

Black Sea common dolphins exclusively inhabit the marine environment.

Principal habitat: open Sea (usually more than 200 m deep).

Secondary habitat: circumlittoral area over the continental shelf (usually more than 6 m but less than 200 m deep).

Occasional habitats: shallow sea (usually less than 6 m deep; includes sea bays and the Kerch strait).

2.1.3.3. Critical habitats

Common dolphins are distributed mainly offshore and visit shallow coastal waters following seasonal aggregations of their preferred prey, the Black Sea anchovy and Black Sea sprat. Annual winter concentrations of anchovies in the southeastern Black Sea and, to a lesser degree, south of Crimea create favourable conditions for wintering concentrations of common dolphins. Summer concentrations of sprats in the northwestern, northeastern and central Black Sea attract common dolphins to quite different feeding grounds. These cetaceans avoid waters with low salinity which may explain why they never occur in the Sea of Azov and, normally, in the Kerch Strait.

Common dolphin critical habitats that overlap with the fishing grounds of intense trawl fishery targeting schooling pelagic fish are identified as follows:

Bulgaria: uncertain;

Georgia: area between Cape Anaklia and Sarp (Turkish border) in winter;

Romania: uncertain;

Russia: area between the Kerch Strait and Anapa in autumn;

Turkey: uncertain;

Ukraine: area between the Kerch Strait and Cape Sarych in autumn and winter.

2.1.3.4. Population

The population size of the Black Sea common dolphin is unknown. Region-wide estimates based on strip transect surveys in the USSR and Turkey have been shown to be fundamentally flawed for a number of methodological and analytical reasons. Nevertheless, it is generally recognized that for almost the first two-thirds of the 20th century, the abundance of common dolphin in the Black Sea was far higher than that of bottlenose dolphins and harbour porpoises. The results of surveys suggest that the current total population size is at least several 10,000s, and possibly 100,000 or more. A summary of density estimates is provided in Table 2.2 below.

Table 2.2 Common dolphin density and abundance estimates in selected Black Sea areas and contiguous water bodies

Surveyed area and observation effort	Observation platform	Research period	Uncorrected density estimates	Uncorrected abundance estimates	References
Turkish Straits System (Bosphorus, Marmara Sea and Dardanelles)	vessel	Oct 1997	Not available	773 (292–2,059; 95% CI)	Dede (1999)[263]
Turkish Straits System (Bosphorus, Marmara Sea and Dardanelles)	vessel	Aug 1998	Not available	994 (390–2,531; 95% CI)	Dede (1999)[263]
Azov Sea in total, 40,280 km^2/2,735 km	aircraft	Jul 2001	No sightings		Birkun *et al*. (2002)[107]
Southern Azov Sea (the same area), 7,560 km^2/716 km	aircraft	Aug 2002	No sightings		Birkun *et al*. (2003)[108]
Kerch Strait in total, 890 km^2/353 km	aircraft	Jul 2001	No sightings		Birkun *et al*. (2002)[107]
Kerch Strait in total, 890 km^2/353 km	aircraft	Aug 2002	No sightings		Birkun *et al*. (2003)[108]
Kerch Strait, 862 km^2/310 km	vessel	Aug 2003	No sightings		Birkun *et al*. (2004a)[109]
NE shelf area of the Black Sea, 7,960 km^2/791 km	aircraft	Aug 2002	Not available: only 1 sighting, 1 animal		Birkun *et al*. (2003)[108]
NW, N and NE Black Sea within Ukrainian and Russian territorial waters, 31,780 km^2/2,230 km	vessel	Sep-Oct 2003	0.17 (0.09–0.31; 95% CI)	5,376 (2,898–9,972; 95% CI)	Birkun *et al*. (2004a)[109]

[107] *Birkun A., Jr., Glazov D., Krivokhizhin S., Mukhametov L. (2002) Distribution and abundance of cetaceans in the Sea of Azov and Kerch Strait: Results of aerial survey (July 2001). P.73 In: Abstr. 16th Annual Conf. of the European Cetacean Society (Liege, 7-11 April 2002),? 86pp.*

[108] *Birkun, A., Jr., Glazov, D., Krivokhizhin, S., Nazarenko, E., Mukhametov, L. (2003) Species composition and abundance estimates of cetaceans in the Kerch Strait and adjacent areas of the Black and Azov Seas: The second series of aerial surveys (August 2002). In: Abstr. 17th Annual Conf. of the European Cetacean Society, pp.271-272, Las Palmas de Gran Canaria, 9-13 March 2003, 285pp.*

[109] *Birkun, A.A., Jr., Krivokhizhin, S.V., Glazov, D.M., Shpak, O.V., Zanin, A.V., Mukhametov, L.M. (2004a) Abundance estimates of cetaceans in coastal waters of the northern Black Sea: Results of boat surveys in August-October 2003. In: Marine Mammals of the Holarctic: Collection of Scientific Papers after the 3rd Internat. Conf., pp.64-68, Koktebel, Ukraine, 11-17 October 2004, Moscow, 609pp.*

Ukrainian EEZ within NW shelf area, 22,630 km^2/388 km	vessel	Sep 2004	0.12 (0.03–0.51; 95% CI)	2,619 (598–11,467; 95% CI)	Krivokhizhin (2009)
SE Black Sea within Georgian territorial waters, 2,320 km^2/211 km	vessel	Jan 2005	4.18 (2.16–8.11; 95% CI)	9,708 (5,009–18,814; 95% CI)	Birkun *et al*. (2006)[105]
Central Black Sea beyond territorial waters of Ukraine and Turkey, 31,200km^2/660 km	vessel	Sep-Oct 2005	0.15 (0.05–0.51; 95% CI)	4,779 (1,433–15,945; 95% CI)	Krivokhizhin *et al*. (2006)[106]

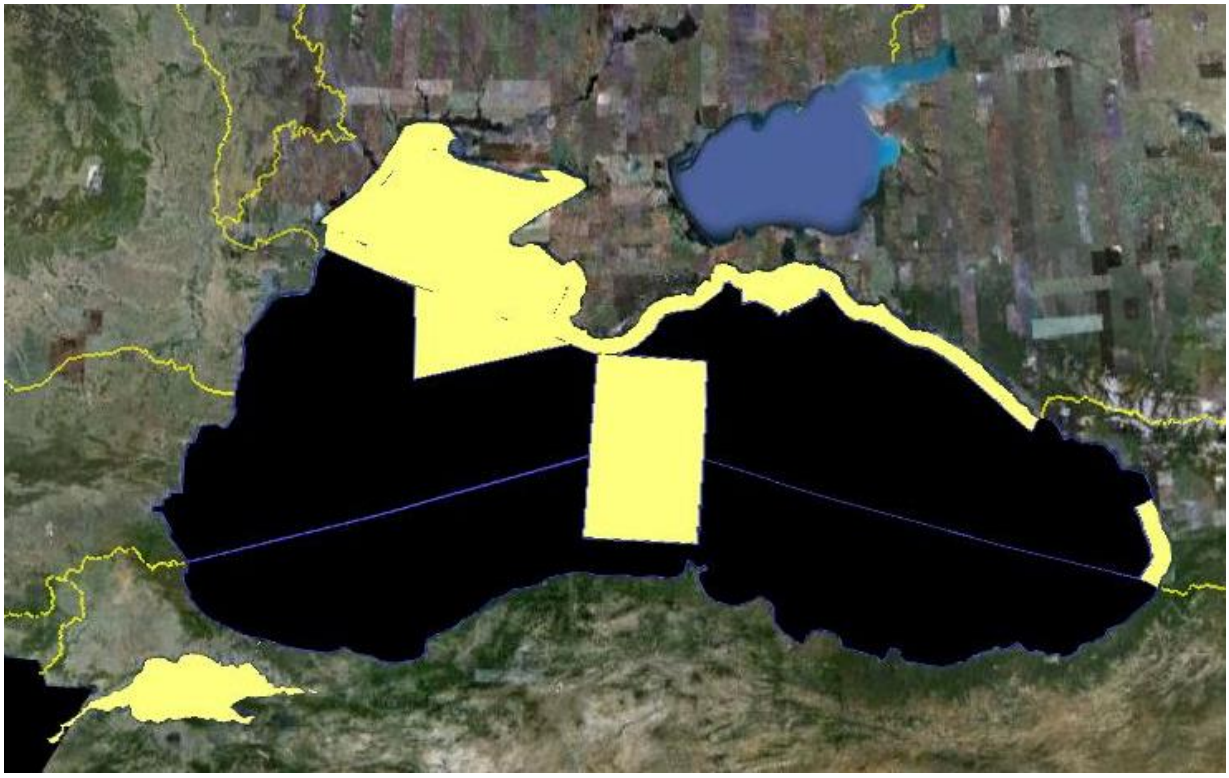

Figure 2.4 Geographical extent of line-transect cetacean surveys where common dolphins were recorded (yellow shaded areas) (Notarbartolo di Sciara and Birkun, 2010)

2.1.3.5. Population trend

↓ – until 1983 (directed killing)

↓? – 1983–2006 and beyond (ongoing threats)

By the mid 1960s, the population was depleted due to the killing of many 100,000s of common dolphins in the mid-20th century. This direct take continued until 1983 when cetacean hunting finally ceased in Turkey. It might be assumed that during the period after 1983 the population was increasing. However, this may not be the case in view of mass mortality events in 1990 and 1994 and the pronounced depletion of these dolphins' primary prey species during the same period.

2.1.4. Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*)

Bottlenose dolphins in the Black Sea are recognized as endemic subspecies possessing morphological differences from Atlantic and Pacific populations. The Black Sea population is also differentiated genetically from other bottlenose dolphin populations in the eastern and western Mediterranean and the northeastern Atlantic.

2.1.4.1. Geographic range

The range of Black Sea bottlenose dolphins (Figure 2.5) includes the Black Sea proper; Kerch Strait along with the adjoining part of the Azov Sea and, probably the Marmara Sea, Bosphorus and Dardanelles straits. The genetic data suggest that the TSS constitutes an ecological barrier between the Black Sea dolphins and those in the Mediterranean, although limited gene flow between the two seas is probable.

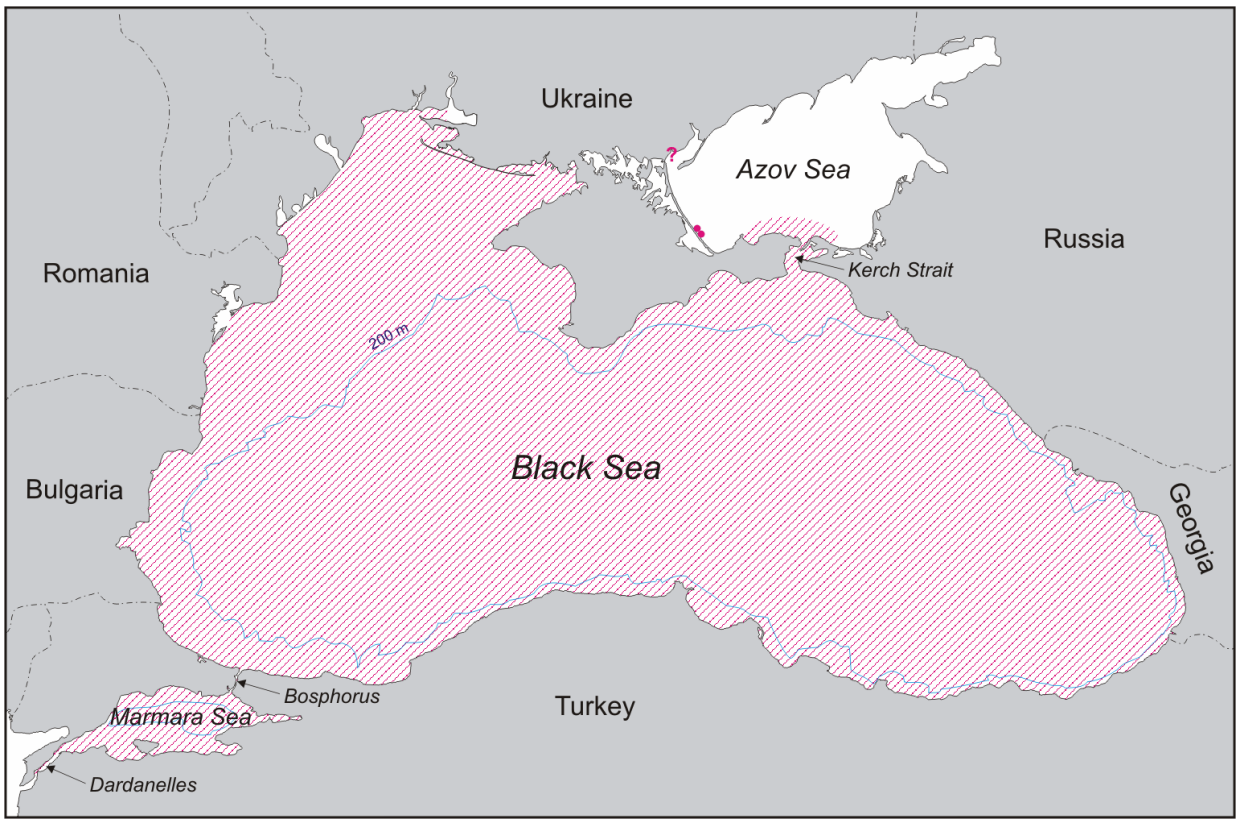

Figure 2.5 Range of the Black Sea bottlenose dolphin. Red dots (direct observations) and query mark (eyewitness's testimony) indicate locations of strandings on the Azov Sea coast (Birkun, 2008b).

The range of the Black Sea subspecies includes the territorial waters and exclusive economic zones of Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine in the Black Sea; internal waters of Ukraine in the Black Sea, internal waters of Russia and Ukraine in the Kerch Strait and Azov Sea; and internal waters of Turkey, including the Bosphorus Strait, Marmara Sea and Dardanelles. In Romania bottlenose dolphins are sighted most frequently in Gura Portitei area and in front of Techirghiol Lake.

There are a few records of bottlenose dolphins entering rivers, *e.g*. the Danube in Romania and the Dnieper in Ukraine.

2.1.4.2. Principal, secondary and occasional habitats

Black Sea bottlenose dolphins live predominantly in the marine environment, although they may occur occasionally in estuarine and fluvial environments.

Principal habitat: circumlittoral area over the continental shelf (usually more than 6 m but less than 200 m deep).

Secondary habitats: open sea (usually more than 200 m deep) and shallow sea (usually less than 6 m deep; includes sea bays and straits).

Occasional habitats: a few instances of Black Sea bottlenose dolphins visiting big rivers are known. Sightings in some estuaries and coastal saline lagoons are not rare. Few stranded individuals were found on the Azov Sea shore.

2.1.4.3. Critical habitats

Bottlenose dolphins are distributed across the Black Sea shelf although they sometimes occur far offshore. In the northern Black Sea they form scattered communities of some tens to approximately 150 animals in different places around Crimea. Accumulations also are known to form off the Russian Caucasus and close to the Turkish coast. Bottlenose dolphins typically aggregate during autumn, winter and spring in a relatively small area off southern Crimea between Cape Sarych and Cape Khersones. Groups of hundreds of animals migrate every autumn to this area from the eastern and, probably, other parts of the Black Sea. In the Turkish Black Sea, Zonguldak and Sinop areas seem to be the most important areas for bottlenose dolphins whereas they are rare off the eastern coast of Turkey. Bottlenose dolphins migrate to Bulgarian waters annually from the southeast and northeast in spring. The migration routes, breeding, calving, feeding areas of bottlenose dolphin coincide with the fishing grounds where turbot is exploited intensely by bottom-set gillnets.

Bottlenose dolphin critical habitats overlapping with fishing grounds of intense bottom-set gillnet fishery are identified as follows:

Bulgaria: between Kavarna and Cape Cherni; near Krapets (by the Romanian border); to the south of Burgas; EEZ of Bulgaria;

Georgia: uncertain;

Romania: EEZ of Romania;

Russia: area from Anapa to Sochi; the Kerch Strait;

Turkey: western (European) coast and Prebosphoric area;

Ukraine: Dniester Bank; waters off the Crimea round Tarkhankut peninsula (including Karkinitsky Bay), between Cape Kiik-Atlama and Cape Chauda (Gulf of Feodosia), and in the Kerch Strait; EEZ of Ukraine in the northwestern Black Sea.

2.1.4.4. Population

The total population size is unknown. During most of the 20th century, the bottlenose dolphin was considered the least abundant of the three cetacean species in the Black Sea. During the 1990s, bottlenose dolphins have become prevalent in coastal waters of the northern Black Sea where the sighting rate increased by a factor of five between 1995 and 1997-1998.

There are some abundance estimates from line transect surveys in different parts of the range. These estimates suggest that present population size is at least several thousand but, presumably, not more than ~15,000.

Table B1-3. Bottlenose dolphin density and abundance estimates in selected Black Sea areas and contiguous water bodies

Surveyed area and observation effort	Observation platform	Research period	Uncorrected density estimates	Uncorrected abundance estimates	References
Turkish Straits System (Bosphorus, Marmara Sea and Dardanelles)	Vessel	Oct 1997	Not available	495 (203–2,197; 95% CI)	Dede (1999)[263]
Turkish Straits System (Bosphorus, Marmara Sea and Dardanelles)	Vessel	Aug 1998	Not available	468 (184–1,186; 95% CI)	Dede (1999)[263]
Azov Sea in total, 40,280 km^2/2,735 km	aircraft	Jul 2001	No sightings		Birkun *et al*. (2002)[107]
Southern Azov Sea (the same area), 7,560 km^2/716 km	aircraft	Aug 2002	No sightings		Birkun *et al*. (2003)[108]
Kerch Strait, 890 km^2/353 km	Aircraft	Jul 2001	0.09 (0.03–0.22; 95% CI)	76 (30–192; 95% CI)	Birkun *et al*. (2002)[107]
Kerch Strait, 890 km^2/353 km	Aircraft	Aug 2002	0.10 (0.04–0.27; 95% CI)	88 (31–243; 95% CI)	Birkun *et al*. (2003)[108]
Kerch Strait, 862 km^2/310 km	Vessel	Aug 2003	0.15 (0.08–0.28; 95% CI)	127 (67–238; 95% CI)	Birkun *et al*. (2004a)[109]
NE shelf area of the Black Sea, 7,960 km^2/791 km	Aircraft	Aug 2002	0.10 (0.04–0.26; 95% CI)	823 (329–2,057; 95% CI)	Birkun *et al*. (2003)[108]
NW, N and NE Black Sea within Ukrainian and Russian territorial waters, 31,780 km^2/2,230 km	Vessel	Sep-Oct 2003	0.13 (0.08–0.22; 95% CI)	4,193 (2,527–6,956; 95% CI)	Birkun *et al*. (2004a)[109]
Ukrainian EEZ within NW shelf area, 22,630 km^2/388 km	vessel	Sep 2004	0.08 (0.03–0.21; 95% CI)	1,776 (660–4776; 95% CI	Krivokhizhin (2009)[195]
SE Black Sea within Georgian waters, 2,320 km^2/211 km	Vessel	Jan 2005	No sightings		Birkun *et al*. (2006)[105]
SE Black Sea within Georgian waters, 2,320 km^2/211 km	Vessel	May 2005	No sightings		Komakhidze and Goradze (2005)[110]

[110] *KOMAKHIDZE G., I. GORADZE, 2005 - Estimate of distribution and number of cetaceans in coastal waters of south - eastern part of the Black Sea. Workshop on cetaceans surveying in the Black Sea, 17-18 October 2005, Istanbul - Turkey*

SE Black Sea within Georgian waters, 2,320 km^2/211 km	Vessel	Aug 2005	No sightings	Komakhidze and Goradze (2005)[110]
SE Black Sea within Georgian waters, 2,320 km^2/211 km	Vessel	Nov 2005	No sightings	Irakli Goradze, 2006, pers. comm.
Central Black Sea beyond territorial waters of Ukraine and Turkey, 31,200km^2/660 km	Vessel	Sep-Oct 2005	No sightings	Krivokhizhin *et al*. (2006)[106]

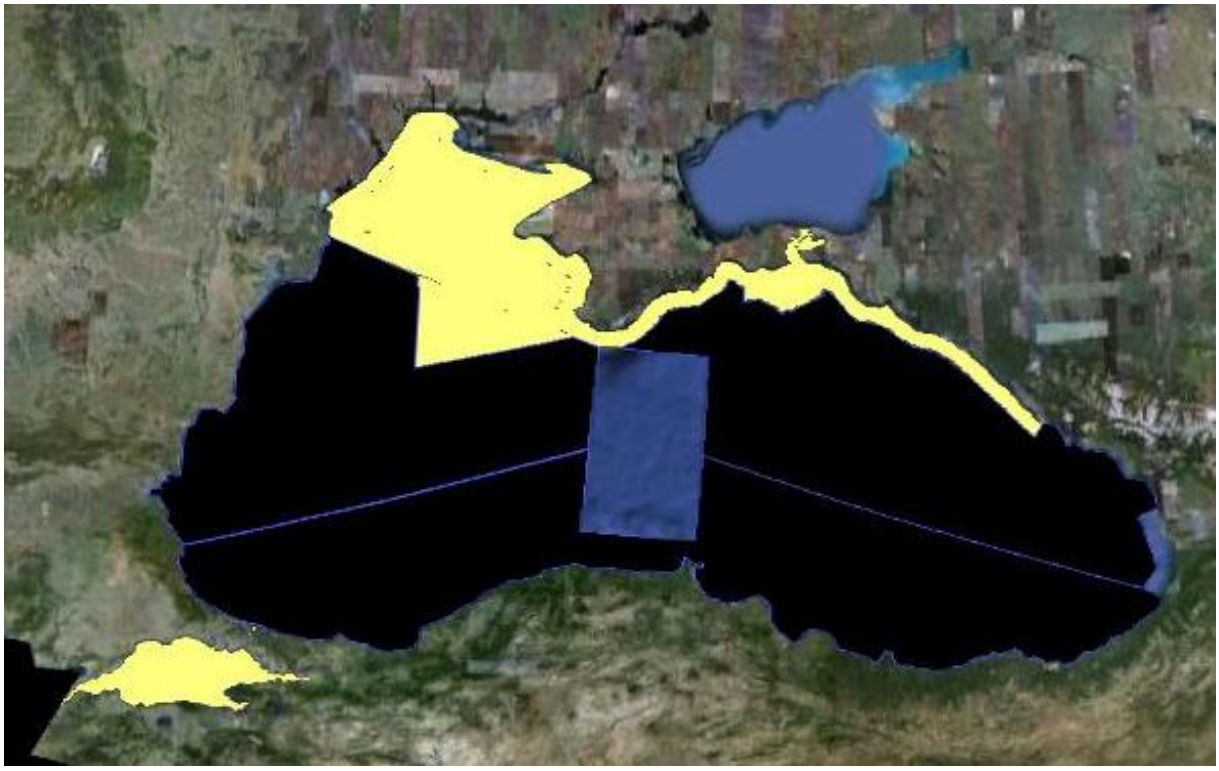

Figure 2.6 Geographical extent of line-transect cetacean surveys where bottlenose dolphins were recorded (yellow shaded areas) (Notarbartolo di Sciara and Birkun, 2010).

2.1.4.5. Population trend

↓ – until 1983 (directed killing)

↑? – 1983–2005 (mortality event in 1990 and persistent anthropogenic threats could have compromised recovery)

? – 2006–2012 and beyond

In the 20th century, the number of Black Sea bottlenose dolphins was reduced by direct killing for the cetacean-processing industry, which continued until 1983. The numbers of animals taken were not recorded accurately. Nevertheless, it can be inferred that the population size had been reduced by many thousands as a result of these direct kills. It is suspected that during the period beyond 1983 the population had a tendency to increase. However, it is also suspected that recovery was compromised by a mortality event in 1990 and is continuing to be compromised by anthropogenic influences.

2.1.5. Conclusion

There are several gaps in the knowledge for the abundance of the Black Sea cetaceans.

The population biology of the three species, their abundance and densities are insufficiently studied in the Black Sea region as a whole and in each Black Sea country. No basin-wide or country-wide cetacean line transect survey aimed at gaining such knowledge has been carried out.

Information relating to the areas important for cetaceans (such as the aforementioned critical habitats) is incomplete. The western Black Sea, including the areas of the European Union (Bulgarian and Romanian basins), as well as the eastern and southern parts of the basin are less studied than the northern Black Sea.

The population structure and actual population trend of the three cetacean subspecies is poorly known and population parameters such as extent of occurrence, area of occupancy, number and size of subpopulations, number of locations and degree of fragmentation have not yet been identified. Similarly, areas of major human impacts on cetacean populations are not well identified. Although there is some basic information, such hot spots are not well ascertained in most Black Sea countries. Finally, seasonal and inter-annual variations in cetacean migrations and distribution are not well studied.

2.2. Black Sea Cetacean Surveys

In order to consolidate existing data and shape a dataset on cetacean line-transect boat and aerial surveys previously conducted in the Black Sea region, terms of reference and a template were produced by MEP and completed by national teams in Turkey and Ukraine . The results were collated and analysed and the following ten surveys were identified as relevant:

- Cetacean aerial Survey in the Azov Sea and Kerch Strait 2001
- Cetacean aerial survey in the south-eastern Azov Sea and Kerch Strait 2002
- Cetacean vessel survey in the Kerch Strait 2003
- Cetacean Vessel survey in the north and eastern Black Sea 2003
- Cetacean vessel survey in the north-western Black Sea 2004
- Cetacean vessel survey in the central Black Sea 2005
- Cetacean vessel survey in the northern Black Sea off south-western Crimea 2005
- Cetacean vessel survey in the south-eastern Black Sea 2005
- Cetacean vessel survey in the Western Black Sea 2007
- Cetacean vessel survey in the northern Black Sea off south-eastern Crimea 2011

In addition to these ten historical surveys, a further three surveys were conducted as part of this project. These are listed below:

- Cetacean aerial survey of the western Black Sea 2013
- Cetacean vessel survey of the western Black Sea 2013
- Cetacean opportunistic ferry survey between Ilyichevsk and Poti 2013

The full dataset for each survey can be found in Annex 2 Analysis of the three project surveys and therefore analysis of newly collected abundance data for these three species is provided in Section 5.

3. Review of existing information on interactions between Black Sea cetacean populations and fisheries[111]

3.1. Historical interactions between cetaceans and fisheries in the Black Sea

For most of the 20th century, mass commercial killing remained the principal human activity affecting Black Sea cetaceans. All riparian countries pursued their commercial interests for many years and contributed to the direct depletion of dolphin and porpoise populations in the region. Eventually, governments and intergovernmental organizations began to notice the effects of over-exploitation and legal killing was stopped in April 1983[112]. However, cetacean populations were still affected by poaching and capture of wild animals for dolphinaria.

Currently, by-catches in fishing gear constitute the major source of human-induced mortality of Black Sea cetaceans. All three species (harbour porpoise, bottlenose dolphin and common dolphin) are known to be taken as by-catch, although incidental takes of harbour porpoises evoke the greatest concern.

3.2. Legal kills in the dolphin-processing industry

Historical origins of the Black Sea cetacean fisheries are unclear, but most likely this activity is a centuries-old tradition of the coastal nations possibly dating back to the Hellenistic culture. Early reports[113] indicated "numerous dolphin catches off the Crimea and, especially, near Bosphorus". Legal cetacean killing ended in the former USSR, Bulgaria and Romania in 1966 and continued until 1983 in Turkey.

3.2.1. Commercial reasons

In the 19th century Black Sea cetaceans were killed almost exceptionally for the oil obtained by the melting of their blubber and sold as lamp-oil for home lighting. The meat had very limited use as bait in spiny dogfish long-line fishery, and sometimes it was consumed as a food by fishermen. In the former USSR, cetacean oil found wide application in the pharmaceutical industry. It was the raw material for vitamin-D-containing medicines, the currier's oil in the tanning industry and was used in the manufacturing of paint, varnish, soap, engine and lubricating oil. The muscle was used for tinned meat and sausages, the skin for leather goods, and the residues of cetacean carcasses were utilized for the production of fish meal, bone fertilizer and glue. The lubricating oil, "Delfinol" remedy, shoe polish, leather and dried meat were produced in Bulgaria. The main products of Turkish dolphin fisheries were the oil and meal for poultry feed. The oil exported to Western Europe was used for cosmetics.

Other reasons for the direct killing of cetaceans was their piscivorous nature – in some areas they were considered as undesirable rivals or even enemies of pelagic and coastal fisheries. Pseudoscientific estimations of enormous fish volumes allegedly consumed by Black Sea cetaceans were used in the USSR as a justification for mass dolphin killing.

3.2.2. Catching techniques

Purse-seining and shooting were the two principal methods used to capture cetaceans in the Black Sea cetacean fisheries. The non-selective purse seine, enabling the catch of 1,000 or more animals, was the technique most developed in the former USSR. The fishery by means of fire-arm had been prohibited in

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[111] *Compiled by Alexei Birkun, Jr. with contribution of the national data by Konstantin Mihaylov, Radoslava Bekova (Bulgaria), Simion Nicolaev, Gheorghe Radu (Romania), Ayaka A. Öztürk, Arda M. Tonay, Bayram Öztürk (Turkey), Sergey Krivokhizhin and Vladyslav Shlyakhov (Ukraine).*

[113] *Rathke M. 1837. Beitrag zur Fauna der Krym. Mém. Pres. à l'Acad. des Sci. de St.-Pétersbourg par Divers Savants. 3 (cited according to Kleinenberg, 1956).*

that country since 1936 because it usually was accompanied by "too large quantity of wounded and sunk dolphins lost for the utilization". However, shooting has been the most widely used technique since the 1940s and became the predominant technique from the 1960s-1980s. Shooting could result in losses of the catch by 40-50% through sinking. This high loss rate in the Turkish cetacean fisheries had been subsequently noted in documents of the IWC (International Whaling Commission) and of the IUCN (International Union for Conservation of Nature) documents. Turkish fishermen also used driftnets to capture cetaceans which were around 150-180 meters in length and 10-12 meters in height. These nets did not have weights on the lower line, instead they were furnished with two buoys on both ends of the net and one anchor for one end. The maximum catch for this type of net was up to 15 individuals.

3.2.3. General statistics and geography

The exact number of Black Sea cetaceans killed and processed in the 19th and 20th centuries is unknown because of poor catch statistics collected by riparian countries. In the 20th century in the former Russian Empire the number undoubtedly exceeded 1.5 million animals of all three species, while other Black Sea states collectively may have killed about four to five million[114,115]. It is commonly acknowledged that the Black Sea cetacean populations were strongly reduced by the fishery[116,117,118] and that perhaps they have not recovered until recently[119], yet a lack of reliable population estimates[120,121] can neither confirm nor deny this assumption.

3.2.3.1. Bulgaria

Until the Balkan War (1912-1914) the seasonal yields obtained by the Turkish from Constantinople in the Bulgarian area was around 300-350 cetaceans. The Bulgarians killed 400-500 individuals per season and the Lipovans (Cossack immigrants) took 1200-1700 individuals per season[122]. The annual catch in Bulgaria (Varna and Burgas regions) for the period 1934-1944 was 2-3 thousand tons. According to other authors (Danilevsky and Tyutyunikov, 1966), the Bulgarian cetacean fishery almost ceased from 1941-1944.

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[114] *Birkun A., Jr. 2002. Cetacean direct killing and live capture in the Black Sea. In: G. Notarbartolo di Sciara (Ed.), Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies. A report to the ACCOBAMS Secretariat, Monaco, February 2002. Section 6, 10 p.*

[115] *Birkun A.A., Jr., Krivokhizhin S.V. 1996. Present state and causes of the Black Sea cetacean populations suppression. Communications 1 and 2. Vestnik Zoologii, N3:36-42 and N4-5:53-59. (in Russian).*

[116] *Zemsky V.A., Yablokov A.V. 1974. Catch statistics, short history of exploitation and present status of Delphinus delphis, Tursiops truncatus and Phocoena phocoena in the Black Sea. FAO/ACMRR Group II Meeting (La Jolla, USA, 16-19 Dec 1974).*

[117] *Smith T.D. 1982. Current understanding of the status of the porpoise populations in the Black Sea. Mammals in the Seas, Vol. 4. FAO Fisheries Series 5(4):121-130.*

[118] *Klinowska M. (Comp.) 1991. Dolphins, Porpoises and Whales of the World. The IUCN Red Data Book. IUCN, Gland and Cambridge, viii + 429 p.*

[119] *Birkun A.A., Jr., Krivokhizhin S.V. 2001. Contemporary state of marine mammal populations in the Black and Azov Seas: National Report. Pp. 27-37 in: A.A. Birkun, Jr., S.I. Gubar, V.I. Karamushka, S.V. Krivokhizhin, and Ya.I. Movchan (Eds.), Marine mammals in the waters of Ukraine (Proc. Workshop on the research and conservation of Black Sea cetaceans and needs assessment for the accession of Ukraine to ACCOBAMS, Kiev, Ukraine, 30 March 2001). Andriivsky Publ. Center, Kiev, 44 p. (in Ukrainian).*

[120] *IWC. 1983. Report of the Sub-Committee on Small Cetaceans. Rep. Int. Whal. Commn. 33:152-170.*

[121] *Buckland S.T., Smith T.D., Cattanach K.L. 1992. Status of small cetacean populations in the Black Sea: Review of current information and suggestions for future research. Rep. Int. Whal. Comm., 42:513-516.*

[122] *Stefanova V., Petrova L., Todorova D. 1986. Pp 31-40: Fishing along the Varna Coast in the First Decades of the 20th Century. In: Bulgarian Ethnology (issue 3/1986). Publ. by Ethnographic Institute with Museum, BAS, 3140 p.*

It was reported[123] that usually one shooting brigade killed around 1000 dolphins. These types of cetacean fisheries were carried out by 15 vessels, mainly from Varna. Purse-seining was conducted by a group of three vessels.

More reliable statistics are available for the period 1947-1961[124,125,126] which represent the catches by month and separately for the northern (Varna) and southern (Burgas) fishing regions in numbers of animals and weight of yielded blubber. The cetacean catches in the Varna region were harvested typically by shooting.

The overall catches for both regions reached a peak in 1959 (55956 animals) followed 37232 animals in 1958 and 30518-33916 between 1954 and 1956[125]. The mean catch for the period 1947-1961 was 22,080 animals. Reportedly[126], cetacean catch in Bulgaria amounted to 1700 tonnes in 1954 and 2798 tonnes in 1959. This is no less than 34000 and 55960 animals, respectively, when assuming 50 kg as the mean weight of an average Black Sea cetacean carcass[127,126,128]. Reportedly[129], the Bulgarian annual dolphin catch in the 1960s was around 60000 individuals. In the same period, yearly numbers of combined Bulgarian and Soviet catch were provided: 1960 – 68,200; 1961 – 60,860; 1962 – 60,860; 1963 – 46,600; 1964 – 8,800; 1965 – 6,200; and 1966 – 6,000 animals[130]. Other published data[131] are very contradictory and not consistent with any cited published data so must be interpreted with caution.

3.2.3.2. Romania

In Romania it has been reported that commercial cetacean killing lasted 33 years, beginning in 1934[132]. That year 667 dolphins and porpoises were taken, allegedly by fishing nets. The peak of the Romanian dolphin fishery (10500 individuals) occurred in 1937 (Table 3.1). In 1954 the total catch was about 10 tonnes, but during 1955-1963 they did not exceed 1-2 tonnes per year[126]. In the 1960s catches showed a steady decline despite an increase in fishing effort and financial subsidies from the government[132].

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[123] *Nikolov D.H. 1963b. Black Sea mammals, Library for the sea. State Publ. - Varna, 67 p. (in Bulgarian).*

[124] *Kabaivanski Y. 1954. The dolphin, the spiny dogfish and the blue mussel as source of raw materials for food industry and other, Sofia, 57 p.*

[125] *Nikolov D.H. 1963a. Catches and distribution of dolphin herds off the Bulgarian coast. Proc. CNIRR, Varna, vol. 3, 183-198 (in Bulgarian).*

[126] *Ivanov L.S., Beverton R.J.H. 1985. The Fisheries Resources of the Mediterranean. Part 2: Black Sea. FAO Studies and Reviews, 60, 135 p.*

[127] *Berkes F. 1977. Turkish dolphin fisheries. Oryx, 14(2):163-167*

[128] *Yel M., Özdamar E., Amaha A., Miyazaki N. 1996. Some aspects of dolphin fishery on the Turkish coast of the Black Sea. Pp. 31-40 in: B. Öztürk (Ed.), Proceedings of the First International Symposium on the Marine Mammals of the Black Sea (Istanbul, Turkey, 27-30 June 1994). ACAR Matbaacilik A.Ş., Istanbul, 120 p.*

[129] *Velikov A. 1998. Marine mammals. Pp. 37-40 in: A. Konsulov (Comp.), Black Sea biological diversity: Bulgaria. UN Publ., New York, 131 p.*

[130] *Zemsky V.A. 1996. History of the Russian fishery of dolphins in the Black Sea. Pp. 46-48 in: B. Öztürk (Ed.), Proceedings of the First International Symposium on the Marine Mammals of the Black Sea (Istanbul, Turkey, 27-30 Jun 1994). ACAR Matbaacilik A.Ş., Istanbul, 120 p.*

[131] *Dobrovolov I., Joneva J. 1994. Condition of the dolphins populations in the Bulgarian sector of the Black Sea. P. 24 in: Abstr. Internat. Symp. on the Marine Mammals of the Black Sea, Istanbul, Turkey, 27-30 June 1994. Istanbul, 67 p.*

[132] *Vasiliu F., Dima L. 1990. Quelques considerations sur la presence et la mortalite des dauphins sur le littoral Roumain de la mer Noire. Pp. 171-176 in: Recherches marines (Proc. Romanian Marine Research Institute). IRCM, Constantza, 23, 200 p*

Table 3.1 Cetacean catches in Romania between 1934 and 1956 (data presented by S. Nicolaev and G. Radu)

Year	1934	1935	1936	1937	1940	1950	1951	1952	1953	1954	1955	1956
No. of individuals	667	3,521	5,316	10,500	743	1,250	250	250	500	250	500	250
Year	1934	1935	1936	1937	1940	1950	1951	1952	1953	1954	1955	1956

3.2.3.3. Tsarist Russia and Soviet Union (territories of present Georgia, Russia and Ukraine)

It was reported[133] that in the mid-1860s the cetacean fishery in Abkhasia (near Cape Pitsunda and Sukhumi district of the Russian Empire) was performed by more than thirty seasonally immigrating Turkish artisan crews which produced about 49 tonnes of oil per fishing season. This may have related to the processing of around 3000-6000 animals, assuming that 8-17 kilogrammes of oil could be extracted from one Black Sea cetacean carcass[133].

From 1887-1913, 19 cetacean fishery sites were situated along the Crimean and Caucasian coasts, and all or almost all Black and Azov Sea ports of Tsarist Russia were involved in dolphin oil trade[133,134]. For example, in a nine year period (1887-1895), a total of 528 tonnes of oil were exported through Sukhumi customs only. It was estimated[133] that the amounts of 147 and 328 tonnes corresponded, respectively, to the minimum and maximum annual levels of dolphin oil production in the late 1880s to early 1900s on the Caucasian coast from the Kerch Strait to the Russian-Turkish border. Such estimates might relate to the annual processing of around 650-41000 cetaceans, or nearly 25,000 specimens on average. Unknown values of dolphin catches off the Crimea and in the Azov Sea restrict analysis for the entire Russian area at the beginning of the 20th century.

In 1914-1920, during the First World War and Civil War in Russia, the mass killing of Black Sea cetaceans was suspended with one exception. The German occupation forces (1918-1919) hunted dolphins in the Crimea with machine-guns and supplied Germany with the preserved products processed in the Sevastopol's dolphin processing factory[134].

The fast development of the Soviet cetacean fisheries began in 1929, under the impetus of the systematic organizing of specialized governmental enterprises and fishing co-operatives, and the establishment of so-called marine mammal processing plants in Sevastopol, Balaklava, Yalta, Novorossiysk, Tuapse and Akhali-Afoni. Such plants were provided with a widely dispersed network of Crimean and Caucasian landing sites to receive and prepare cetacean carcasses. Furthermore, in 1930 the cetacean processing factory ship "Krasny Kubanets" began its operations in Black Sea waters[134].

Until the mid-1930s the Soviet cetacean fishery had operated in coastal waters with a maximum offshore distance of about 20 miles. From 1936, with the introduction of an aerial reconnaissance service (one spotting airplane), the operating area was considerably widened to up to 150 miles offshore, and covered approximately 150000 square kilometres of sea surface from Cape Sarych south Crimea to Cape Pitsunda

[133] *Silantyev A.A. 1903. Black Sea Coast of the Caucasus in Agricultural and Commercial Respects. Issue 1. Dolphins Fishery off the Caucasian Coasts. Department of Agriculture, S.-Peterbourg, 61 p. (in Russian).*

[134] *Kleinenberg S.E. 1956. Mammals of the Black and Azov Seas: Research Experience for Biology and Hunting. USSR Acad. Science Publ. House, Moscow, 288 p. (in Russian).*

in Abkhasia[135]. As a result, the level of cetacean catch immediately rose to unprecedented numbers. For example, in June 1936 over 25000 individuals were caught in one spot located at a distance of 115 miles from Novorossiysk; 3000 individuals were killed during one day in August near Yalta. Two two marine mammal processing plants in Novorossiysk and Yalta processed 44537 animals in 1935, and 55195 in 1936[135]. The absolute annual maximum of the Soviet Black Sea cetacean fisheries was reached in 1938, where 147653 individuals (or 7300 tonnes) were taken[136].

During the Second World War, which affected the USSR from June 1941 to May 1945, there was a severe reduction of cetacean fisheries, then a subsequent growth of catches between 1946 and 1959. In the 1960s the level of catches decreased from year to year in spite of the steady raising of fishing efforts. Finally, during the last three years of legal killing (1964-1966) the annual catch declined to 300-440 tonnes[137,126] corresponding to 5600-7400 animals[138]. The over-exploitation of cetacean populations was considered as the only cause of the notable depression of the dolphin industry before its ban (May 1st, 1966). A total of 1,201803 individuals of all three Black Sea cetacean species were killed and processed in the Soviet Union over 27 years from 1931 to 1957[136] with an extra 465620 animals caught by the USSR and Bulgaria together during the following nine years, from 1958-1966[139].

3.2.3.4. Turkey

Cetacean hunting was considered to be amongst the Turkish traditional types of fisheries[140]. According to a recent review paper[141], the cetacean fishery began in ancient time in Anatolia and continued for over 2300 years. In the 1830s the occurrence of dolphin catches was reported in Prebosphoric area[113] and at the beginning of the 1900s it was reported that hereditary dolphin hunters originated from the Anatolian towns of Rize and Trabzon[133].

Catch statistics were probably not kept in Turkey in the 19th century, and large information gaps existed until the 1950s. According to published data[142,143], in 1933 the pooled catch of cetaceans was around 111 tonnes[144], in 1941 it rose to 3000-4000 tonnes and to 4000 tonnes in 1947[126]. This corresponded roughly to 2220, 60000-80000 and 80000 animals, respectively, each with a mean weight of 50 kg. In contrast to other Black Sea countries, Turkey intensified its cetacean fisheries during the Second World War. Since 1940 and up to the ban in April 1983, dolphin hunters were provided by the government with free rifles and cut-price ammunition. 250-500 rifles and 250000-750000 rounds were distributed each year in the

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[135] *Zalkin V.I. 1937. Scientific and fishing reconnaissance in the Black Sea in 1936. Rybnoye Khozyaystvo, N5:16-17. (in Russian).*

[136] *Bodrov V.A., Grigoryev S.N., Tveryanovich V.A. 1958. Techniques and Technology of the Processing of Marine Mammals: Whales, Dolphins, Pinnipeds. Pishchepromizdat, Moscow.*

137 Danilevsky N.N., Tyutyunnikov V.P. 1968. Some data on current state of dolphins stock in the Black Sea. Rybnoye Khozyaystvo, N11:25-27. (in Russian).

[138] *Smith T.D. 1982. Current understanding of the status of the porpoise populations in the Black Sea. Mammals in the Seas, Vol. 4. FAO Fisheries Series 5(4):121-130.*

[139] *Zemsky V.A. 1996. History of the Russian fishery of dolphins in the Black Sea. Pp. 46-48 in: B. Öztürk (Ed.), Proceedings of the First International Symposium on the Marine Mammals of the Black Sea (Istanbul, Turkey, 27-30 Jun 1994). ACAR Matbaacilik A.Ş., Istanbul, 120 p.*

[140] *Devedjan K. 1926. Pêche et Pêcheries en Turquie. Constantinople (cited according to Kleinenberg, 1956).*

[141] *Tonay A.M., Öztürk A.A. 2012. Historical records of cetacean fishery in the Turkish seas. J. Black Sea/Mediterr. Environ., 18(3): 388-399.*

[142] *Öztürk B. 1997. Balinalar ve Yunuslar: Setolojiye Giriş. Anahtar Kitaplar, Istanbul, 122 p. (in Turkish).*

[143] *Öztürk B. (Comp.) 1999a. Black Sea Biological Diversity: Turkey. UN Publ., New York, 144 p.*

[144] *Sarikaya S. 1975. Yunus baligi-dolfina. Ziraat mühendisligi, 104:30-36 (cited according to Öztürk, 1999; in Turkish).*

south-eastern maritime area from Sinop to Rize, although cetacean fisheries operated along the entire Turkish Black Sea coast from Iğneada to Hopa, in an area exceeding 80 miles offshore[128,143].

In the 1951-1956 period the yearly values of dolphin-processing material ranged from approx. 8,500 to 10,000 tonnes[137]. This corresponds to an annual level of catch/landing comprised of between 157,000 and 185,000 individuals (1951-1957 estimate[143]). In the 1959-1980 period the annual harvest varied between 427 and 8,346 tonnes[144,127,126]. Similarly to other Black Sea countries, there was a marked decrease of cetacean catch in 1960-1965. A FAO fisheries mission estimated that a figure of just under 250,000 small cetaceans were taken in Turkey between 1976 and 1981[145], within a grand total of 2,017,640 animals eliminated between 1953 and 1982[130]. During the last five years before the ban (1979-1983), the annual catch probably did not exceed 6,000-7,000 individuals[143].

The following towns were known as dolphin fishing towns along the Turkish Black Sea coast: Sürmene in Trabzon, Çayeli and Pazar in Rize, Gülburnu in Giresun, Perşembe and Kışlaönü in Ordu, Karadeniz Ereğlisi, Sarıyer, Rumeli and Anadolu Feneri in Istanbul[146]. In 1970, in addition to several thousand tonnes of dolphins and porpoises taken from the Black Sea there was also a relatively small catch in the Marmara (1.5 t) and Aegean (0.5 t) seas[127].

3.2.4. Catch composition

As shown above, the statistics of Black Sea cetacean fisheries were usually expressed as total weight or total numbers in the catch without species differentiation. However, since the 19th century the common dolphin (*D. d. ponticus*) was known as a main target species in the Tsarist Russia and USSR, while the bottlenose dolphin (*T. t. ponticus*) represented the rarest prey, and the harbour porpoise (*P. p. relicta*) had an intermediate commercial importance[133,134,147]. In the 1930s the average proportion of the three species in the Soviet harvest was: one bottlenose dolphin (0.5%) per 10 harbour porpoises (4.7%) per 200 common dolphins (94.8%)[148]. That ratio remained more or less immutable until the mid-1950s[134]. In the late 1950s–early 1960s the common dolphin fraction began to decrease (80-90%), while harbour porpoises became the numerically dominant in 1964-1966, the last three years of mass killing in the former Soviet Union[137]. According to these authors, a similar inversion of species composition, likely caused by the devastation of *D. d. ponticus* population, occurred at the same time in Bulgaria. From 1976 to the early 1980s the Turkish harvest consisted mainly of harbour porpoises (80%) with a relatively small quantity of common dolphins (15-16%) and bottlenose dolphins (2-3%)[120,118]. No information is available on species composition in the Romanian fishery.

The data concerning sex and age composition of cetacean harvests are very limited and relate mostly to the Soviet fishery[134,137]. In the 1930s-1950s the catches of common dolphin involved mostly mature males (40-60%), but in 1963-1964 immature individuals of both sexes and pregnant and nursing females became prevalent (70-75% in total). In the harbour porpoise sample of 1,333 carcasses, investigated in March-April 1966 at the Novorossiysk plant, sex ratio was 1:1 (50.1% males and 49.9% females); pregnant and lactating females constituted 36.2% and 1.4%, respectively, of all females examined. Fifty three

[145] Klinowska M. (Comp.) 1991. *Dolphins, Porpoises and Whales of the World. The IUCN Red Data Book*. IUCN, Gland and Cambridge, viii + 429 p.

[146] Öksüz S., Kol H., Yilmaz E. 2005. Strange and tragic job: Civra's dolphin hunters. Boat Magazine, Sürmene Gymnasium, 1: 9-14 (in Turkish).

[147] The use of Zalkin-Kleinenberg's formula "1:10:200" for the estimation of species composition after 1957 (*e.g.* Zemsky, 1996) is methodologically incorrect.

[148] Zalkin V.I. 1940b. The data on biology of Azov and Black Sea harbour porpoise (Phocaena phocaena relicta Abel). Zoologichesky Zhurnal, 19(1):160-171. (in Russian).

bottlenose dolphins processed in April 1966 at in the same plant included 27 males and 26 females; of these 63% were pregnant and 7.4% were lactating[137].

In Turkey in 1982-1983, pregnant common dolphin females represented 30% of the total in all inspected cetacean hunts[128].

3.3. Illegal direct takes

Illegitimate exploitation of marine biological resources (illegal, unreported or unregulated – IUU – fishing) is one of the major environmental, economic and social problems concerning the entire Black Sea region. The scale of the unauthorized fisheries is not evaluated officially at the national and international level, but at present it possibly exceeds the combined value of all legal coastal fisheries. As a rule, recent poachers are much better equipped than law-abiding fishermen and fish protection officers. The use of modern satellite-navigating, radio-locating and echo-sounding devices, disposable monofilament nets and highly mobile boats with powerful engines enables them to conduct concealed fishing operations in any maritime area, at any time (mainly at night) and under any weather condition. Fortunately, unlawful direct take of cetaceans seems to be limited by the lack of adequate market in the riparian countries. By contrast, cetacean by-catches due to the illegal Black Sea turbot (*Psetta maeotica*) and sturgeon (*Acipenser spp*.) gill-net fishery may have considerable magnitude. Some examples, given below, illustrate these suppositions:

- Dolphin hunting was temporarily prohibited in Turkey for 18 months between September 1980 and March 1982. However, in 1981 the "Et Balik Kurumu" factory in Trabzon processed 326 tonnes or 6,519 cetaceans into 121 tonnes of oil and 60 tonnes of "fish" meal [128]; those values exceeded factory's annual production rates recorded in the preceding five and subsequent two years, when the cetacean fishery was permitted. Furthermore, during a joint USSR-US dolphin sighting survey conducted in June 1981 "a large number of harbour porpoise carcasses were observed floating off the coast of Turkey, with evidence of having been shot"[121];
- In 1990 a dead harbour porpoise with bullet wounds in its integument tissues and spine was found stranded on the Crimean coast[149]. That was a single case amongst 817 cetacean strandings recorded in Ukraine in 1989-1996[150];
- Illegal takes of at least two of the three cetacean species known in the region were reported in Turkey in 1991[121]. In particular, 232 harbour porpoises deliberately or incidentally killed by netting were processed in March 1991 in Yakakent, Turkey, for oil, animal feed and fertilizer[151];
- 194 dead cetaceans together with 18,424 turbots, 143 sturgeons, 401 dogfishes and 1,359 rays were found in 6,416 Turkish poaching nets (about 640 kilometres long in total) confiscated in spring 1991 in Soviet waters[152]. Numerous illegal visits of Turkish fishing boats to Ukrainian Black Sea area were recorded each year during the last decades[153];

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[149] *Birkun A., Jr. 2002a. Cetacean direct killing and live capture in the Black Sea. In: G. Notarbartolo di Sciara (Ed.), Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies. A report to the ACCOBAMS Secretariat, Monaco, February 2002. Section 6, 10 p.*

[150] *Krivokhizhin S.V., Birkun A.A., Jr. 1999. Strandings of cetaceans along the coasts of Crimean peninsula in 1989-1996. Pp. 59-62 in: P.G.H. Evans and E.C.M. Parsons (Eds.), European research on cetaceans – 12 (Proc. 12th Annual Conf. European Cetacean Society, Monaco, 20-24 Jan 1998). ECS, Valencia, 436 p.*

[151] *(Anonimous, 1991);*

[152] *Pasyakin V. 1991. The operation «Kalkan» is completed. Kurortny Krym, 78:4. (in Russian).*

[153] *Sedoy M., Konovalov A., Kiselev D. 2001. The chase in the Black Sea. Komsomol'skaya Pravda, 13 April 2001:11. (in Russian).*

- In April 2002, seven Turkish vessels were apprehended poaching turbot in the Romanian sea and in their nets (approx. 40 km) about 100 cetacean individuals were found[154];
- According to the questionnaire distributed among fishermen in Rumeli Feneri (Turkey), only in 2008 a total of 1,279 turbot nets have been lost at sea (ghost fishing), and 1,200 of these nets were lost in the Romanian and Ukrainian Exclusive Economic Zones[155]). The interviews conducted with fishermen in frames of this project revealed that there were 10,000-15,000 turbot nets lost in the same area of the north-western Black Sea[156].

The isolated cases of deliberate killing and harassment (frightening by pyrotechnic means and fire-arms) occur as a result of adverse interaction between dolphins and coastal fisheries. For instance, at least two bottlenose dolphins were reported shot in Balaklava, Ukraine, in 2004[157]. A case of suspected kill by automatic firearms was reported in summer 2011 in the southern Bulgarian Black Sea[158].

3.4. Live capture

No published statistics exist for Black Sea live capture cetacean fisheries. Since the 1960s several hundreds of bottlenose dolphins and some tens of harbour porpoises and common dolphins were taken alive for military, commercial and scientific needs, mostly in the former USSR but also in Romania. The Russian Federation and Ukraine continued that practice periodically in Taman Bay (Kerch Strait) and off south Crimea till the early 2000s. The captures concentrated mainly on *T. t. ponticus*, the other species being of lesser interest for dolphinaria because of difficulties in their maintenance. In 1987, two harbour porpoises and three common dolphins were captured and during 70 days they were fed in a pool in Turkey[159].

The capture operations, carried out by means of the purse-seining, were sometimes accompanied by the death of cetaceans as a result of strong stress and asphyxia. Most of these cases have not been officially recorded. In spring 1982, 11 of the 38 harbour porpoises caught for the Soviet Navy and academic dolphinaria perished because they were unable to come to the surface to breathe[160]. The dead individuals were not entangled, but were found in wide underwater pockets in the net formed by local sea currents. At least four bottlenose dolphins (September 1986) and 11 common dolphins (July 1988) have died due to the "live" capturing in Romania[161]. According to these authors, in summer 1985 two harbour porpoises were caught by a group of tourists and delivered to the Constantza dolphinarium, where they later died.

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[154] Anton E., Nicolaev S., Radu G., Radu E., Adam A. 2002. Research on the incidental dolphin catches during the illegal commercial fishing. P. 25-32 in: Annales of „Dunarea de Jos" University of Galati. Fascicle VII – Fishing and aquaculture.

155 Taner L. 2010. Determination of amount of lost fishing gear which cause to ghost fishing in Istanbul artisanal fisheries. MSc thesis. Istanbul University, Istanbul, Turkey (in Turkish).

[156] Tonay, unpublished data).

[157] Birkun A., Jr. 2006. Common bottlenose dolphin (Tursiops truncatus ponticus), Black Sea subspecies. Pp. 74-83 in: R. Reeves and G. Notarbartolo di Sciara (compilers and editors), The status and distribution of cetaceans in the Black Sea and Mediterranean Sea. IUCN Centre for Mediterranean Cooperation, Malaga, Spain. 137pp.

[158] (A. Russev, pers. comm. to K. Mihaylov)

[159] Çelikkale S., Ünsal S., Durakanoğlu F.H., Karaçam H., Düzgüneş E. 1988. Project report on the determination of dolphin stocks in the Black Sea and their biological characteristics. Ministry of Agriculture, Forestry and Rulal Affairs, Ankara, 98 pp (in Turkish).

[160] Birkun A., Jr. 1996. Complexities of by-catch diagnosis in Black Sea cetaceans. Pp. 12-15 in: T. Kuiken (Ed.), Diagnosis of by-catch in cetaceans (Proc. 2nd ECS Workshop on cetacean pathology, Montpellier, France, 2 Mar 1994). ECS Newsletter, 26 (special issue), Saskatoon, Canada, 43 p.

[161] Vasiliu F., Dima L. 1990. Quelques considerations sur la presence et la mortalite des dauphins sur le littoral Roumain de la mer Noire. Pp. 171-176 in: Recherches marines (Proc. Romanian Marine Research Institute). IRCM, Constantza, 23, 200 p.

During the 1980-2010s period the exploitation of captive cetaceans intensified, and the number of dolphinaria for public display and for "swimming with dolphins" and so called "dolphin- assisted therapy" programmes has increased in the Russian Federation, Turkey and Ukraine. According to CITES statistics, at least 92 bottlenose dolphins were removed from the Black Sea region during 1990–1999[162].

At least four bottlenose dolphins live-captured in Turkey in 2006-2007 were taken from the Marmara Sea[163] and, thus, could belong to either the Black Sea or Mediterranean populations which are treated in a different ways by CITES (with more strict regulations – 0 quota for export – in the case of Black Sea bottlenose dolphins). However, the population status of those animals was not ascertained by genetic examination and this oversight, in principle, could facilitate shifting them abroad to any country.

In 2007, the Ministry of Environment and Natural Resources of Ukraine granted several permits for the removal of live stranded Black Sea bottlenose dolphins from the wild for rescue and rehabilitation purposes[163]. As a result, at least three but, probably, >20 healthy individuals of this subspecies were captured in Ukraine with no return into the natural environment[164]. According to preliminary estimates, total number of bottlenose dolphins captured in 2007-2008 in Ukraine has amounted to 25-30 individuals (letter No. 30 of 09.09.2009 to the Ministry of Ecology and Natural Resources of Ukraine from the Black Sea Council for Marine Mammals NGO). This illegal practice has not stopped so far.

Furthermore, information was received[165] that a new dolphinarium in Batumi, Georgia, held in captivity 20 bottlenose dolphins, allegedly captured in the Georgian Black Sea in May–June 2009. Based on the above source, six animals have already died during one year. Both the legal and health status of captive Black Sea bottlenose dolphins in Georgia are unclear[164].

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[162] *Reeves R.R., Smith B.D., Crespo E., Notarbartolo di Sciara G. 2003. Dolphins, Whales, and Porpoises: 2000-2010 Conservation Action Plan for the World's Cetaceans. IUCN, Gland, Switzerland, 139pp.*

[163] *Black Sea Commission. 2010. Progress report on the implementation of the Conservation Plan for Black Sea Cetaceans (October 2007 – October 2009). 6th Meeting of the ACCOBAMS Scientific Committee (Casablanca, Morocco, 11-13 January 2010), SC6-Doc08, 17 p. (unpublished).*

[164] *Notarbartolo di Sciara G., Birkun, A., Jr. 2010. Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas. ACCOBAMS, Monaco. 232 p.*

[165] *Diasamidze E. 2010. Secrets of Batumi dolphinarium. Netgazeti.ge, 30 July 2010, http://netgazeti.ge/GE/18/law/2127/ (In Georgian) + video.*

3.5. Other impacts of fisheries on cetaceans

Different types of fishery can provoke a number of effects on Black Sea cetaceans, including in particular[166]:

- Mortality and non-mortal injuries in fishing gear;
- Alteration of feeding resources;
- Deterioration of habitats;
- Modification of behaviour; and
- Distortion of distribution, migration patterns and reproductive ability.

Most above direct and indirect effects are poorly studied and understood.

3.5.1. Accidental mortality and non-mortal injuries in fishing gear

The earliest mention of incidental catch (by-catch) of Black Sea cetaceans in fishing operations dates back to the 19th century. Such cases are reported in connection with seine-net fishery of shad in the Sea of Azov[167]. The entrapment in fixed nets (especially, in bottom-set gillnets for turbot) has also been reported to be a cause of cetacean accidental mortality along the Caucasian coast[133]. However, no statistics on dolphin and porpoise by-catches were recorded in the Black Sea countries up to the late 1960s.

Regular recording of cetacean by-catch began in the former USSR in 1968 and lasted till 1993 (included). During 26 years that was a responsibility of the Fish Protection Service attached to the Ministry of Fisheries of the USSR (until 1991) and to analogous national ministries/committees of Ukraine, Russia and Georgia (since 1991). For a long time the information on cetacean by-catches was available only to narrow ministerial use. The only brief publications from that period[168,169,170] are restricted to the Black Sea waters off the Crimea peninsula and Russian Caucasus, including the Kerch Strait.

During 1984-1990 the incidental capture of cetaceans was also monitored in Romania by the Museum of Natural Sciences in Constanţa[132]. The Grigore Antipa National Institute for Marine Research and Development (Constanţa) reported on cetacean by-catches in the Romanian Black Sea within the period from 2002-2006[171].

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[166] *Birkun A., Jr. 2002b. Interactions between cetaceans and fisheries in the Black Sea. In: G. Notarbartolo di Sciara (Ed.), Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies. A report to the ACCOBAMS Secretariat, Monaco, February 2002. Section 10, 11 p*

[167] *Danilevsky N.Y. 1871. Investigations on the State of Fisheries in Russia. Vol. 8. St. Petersburg (cited according to: Silantyev, 1903; in Russian).*

[168] *Zhuravleva T.M., Shalamov A.I., Prutko Y.G. 1982. Supervision over the observance of dolphin fisheries ban in the Black Sea. Pp. 123-124 in: Abstr. 8th All-Union Conf. on the Research, Conservation and Rational Use of Marine Mammals (Astrakhan, USSR, 5-8 October 1982). Astrakhan, 435 p. (in Russian).*

[169] *Artov A., Pavlov V., Zhuravleva T. 1994. Incidental killing of Black Sea dolphins off the Crimea and Krasnodar territory coasts: analysis of official data and outlook. Pp. 58-59 in: P.G.H. Evans (Ed.), European research on cetaceans – 8 (Proc. 8th Annual Conf. European Cetacean Society, Montpellier, France, 2-5 March 1994). ECS, Lugano, 288 p.*

[170] *Pavlov V., Artov A., Zhuravleva T. 1996. Impact of fishing on Black Sea dolphins off the Crimea coasts. Pp. 41-43 in: B. Öztürk (Ed.), Proceedings of the First International Symposium on the Marine Mammals of the Black Sea (Istanbul, Turkey, 27-30 June 1994). ACAR Matbaacilik A.Ş., Istanbul, 120 p.*

[171] *Radu G., Anton E., Radu E. 2006. Conservation status of cetaceans in the Black Sea area. 4th Meeting of the ACCOBAMS Scienific Committee (Monaco, 5-8 November 2006), Doc. SC4/Inf14, 11 pp. (unpublished).*

In 1993-1997, 1999, 2002 and 2003, by-catches were recorded periodically along the western coast of the Turkish Black Sea by researchers from the Istanbul University[172,173,174].

The comparative study of cetacean by-catches and strandings was carried out for two years (February 1997 – January 1999) simultaneously in Bulgaria (Institute of Fisheries, Varna), Georgia (Institute of Marine Ecology and Fisheries, Batumi) and Ukraine (BREMA Laboratory, Simferopol)[175,176,177].

It is difficult to analyse the results of all these studies (Table 3.2) because of different, sometimes unknown research methodology and efforts; however, some conclusions seem to be possible.

[172] *Öztürk B. 1999b. Cetaceans and the impact of fisheries in the Black Sea. Bull. ACCOBAMS, N2:11-12.*

[173] *Tonay A.M., Öz M.I. 1999. Stomach contents of harbour porpoises entangled in the fishing nets in the western Black Sea. Pp. 92-98 in: Proc. Annual Conf. on Underwater Science and Technology (SBT'99, Turkey, 1999) (in Turkish).*

[174] *Tonay A.M., Öztürk B. 2003. Cetacean by-catches in turbot fishery on the western coast of the Turkish Black Sea. Pp. 131-138 in: I.K. Oray, M.S. Çelikkale and G. Özdemir (Eds.), Internat. Symp. of Fisheries and Zoology in memory of Ord. Prof. Dr. Curt Kosswig in his 100th birth anniversary (Istanbul, Turkey, 23-26 October 2003).*

[175] *BLASDOL. 1999. Estimation of human impact on small cetaceans of the Black Sea and elaboration of appropriate conservation measures: Final report for EC Inco-Copernicus (contract No. ERBIC15CT960104). C.R. Joiris (Coord.), Free University of Brussels, Belgium; BREMA Laboratory, Ukraine; Justus Liebig University of Giessen, Germany; Institute of Fisheries, Bulgaria; and Institute of Marine Ecology and Fisheries, Georgia. Brussels, 113 p.*

[176] *Birkun A., Krivokhizhin S., Goldin E., Pavlov V., Artov A., Suremkina A., Shibanova O., Goldin P., Stanev T., Mikhailov K., Petkov M., Komakhidze A., Mazmanidi N., Burchuladze M., Goradze I., Komakhidze G., Baumgaertner W., Siebert U., Wuenschmann A., Holsbeek L., Ali B., Joiris C. 1999a. Cetacean by-catches and strandings along the north, west, and east coasts of the Black Sea in 1997-1998. P.81 in: P.G.H. Evans, J. Cruz and J.A. Raga (Eds.), European research on cetaceans – 13 (Proc. 13th Annual Conf. European Cetacean Society, Valencia, Spain, 5-8 April 1999). ECS, Valencia, 484 p.*

[177] *Birkun A.A., Jr., Krivokhizhin S.V. 2000. Distribution of cetaceans and trends in their abundance off the coasts of the Crimea. Pp. 23-27 in: Proc. Internat. Conf. Marine Mammals of Holarctic (Arkhangelsk, Russia, 21-23 September 2000). Pravda Severa, Arkhangelsk, 464 p. (in Russian).*

Table 3.2 Number of cetacean by-catches recorded in fishing nets in the Black Sea region (1968-2006). Stranded cetaceans (suspected by-catches) are not included in this table. Data sources:[151,160,161,162,163,164,165]

	Russia and Ukraine		**Romania**				**Turkey**				**Bulgaria**		**Georgia**		**Ukraine**	
Study period	1968-1993 (26 years)		1984-1990 (7 years)		2002-2006 (5 years)		1993-1997 (5 years)		1999, 2002, 2003 (3 years)		February 1977 – January 1999 (2 years)					
Study area (waters off)	Crimea and North Caucasus including the Kerch Strait		south part of the Romanian coast		Exclusive Economic Zone (mainly)		west coast, from Igneada to Bosphorus		west coast, from Karaburun to Agva		entire coastline		coasts of Georgia and Adjara		Black Sea coast of Crimea	
Number of by-catches:																
harbour porpoises, *n* (%)	1,685	(80.8)	541	(95.6)	46	(90.2)	62	(98.4)	68	(98.6)	13	(92.9)	7	(63.6)	123	(94.6)
common dolphins, *n* (%)	297	(14.2)	22	(3.9)	3	(5.9)	0	(0.0)	0	(0.0)	0	(0.0)	3	(27.3)	0	(0.0)
bottlenose dolphins, *n* (%)	104	(5.0)	3	(0.5)	2	(3.9)	1	(1.6)	1	(1.4)	1	(7.1)	1	(9.1)	7	(5.4)
in total	2,086	(100.0)	566	(100.0)	51	(100.0)	63	(100.0)	69	(100.0)	14	(100.0)	11	(100.0)	130	(100.0)
References	Pavlov *et al*. (1996) and reports of the Crimean Black Sea Fish Protection Service[170]		Vasiliu and Dima (1990)[161]		Radu *et al*. (2006)[171]		Öztürk *et al*. (1999b)[172]		Tonay and Öz (1999); Tonay and Öztürk (2003)[173,174]		BLASDOL (1999)[175]					

3.5.1.1. Geographical distribution

Cetacean by-catches occur in the Black Sea waters of all six riparian countries. In Russia and Ukraine by-catches take place also in the Azov Sea and Kerch Strait. Several by-catches of harbour porpoises have been recorded in the Marmara Sea as well[178].

Most cases of incidental entanglement in fishing nets occur not far from the shore in shallow waters over the continental shelf. For instance, by-caught individuals examined in Ukraine, were found at a depth from few metres to 94 metres[166]; by-catches in the Turkish Black Sea were reported within the 100-metre-depth coastal zone[174].

Traditional areas of bottom-set gillnet fishery could be considered as the hot spots of cetacean mortality in fishing gear. Some (but obviously not all) fishing sites in which by-catch occurrences are frequent were revealed in Russia (coastal area from Anapa to Sochi) and Ukraine (waters off the Crimea between Chernomorskoye and Evpatoria, near Sevastopol, and in the Gulf of Feodosia)[170,175]. According to the latter report, in Bulgaria the majority of definite and suspected by-catches were recorded in two areas: from Shabla to Balchik and from Bjala to Cape Emine; in Georgia most cases were concentrated between the mouth of Chorokhi river and the Turkish border. In Romania during 2002-2006 almost all by-catches have been registered beyond the territorial waters, in the exclusive economic zone[171]. In Turkey a well-defined hot spot of cetacean by-catch is lying in the southwestern corner of the Black Sea, just to the west from the northern entrance of the Bosphorus[172,173,174].

3.5.1.2. Species composition

Harbour porpoises almost always represented the major part of cetacean by-catches recorded in different places around the Black Sea. On the contrary, bottlenose dolphins never predominated in by-catch statistics; as far as common dolphins are concerned, only two exceptions are known in 1968 and 1976 when yearly number of common dolphins, by-caught in the Crimean and Caucasian area, was higher than the number of by-caught porpoises[170]. Quite often the share of incidentally captured *P. p. relicta* mounted over 90% (Table 3.2).

It was estimated[166] that, according to the results of previous studies[161,170,175,172] during the past decade (1990-1999) a total of 448 accidentally caught cetaceans were recorded in the Black Sea, including 425 harbour porpoises (95%), 10 common dolphins (2%) and 13 bottlenose dolphins (3%). Adjusted for more recent studies[173,174,179] these figures could be re-estimated for the 19-year period (1990-2008) as follows: a total of 1,126 by-caught cetaceans on record, including 1,089 porpoises (96.7%), 17 common dolphins (1.5%) and 20 bottlenose dolphins (1.8%)[164].

The updated list of cetacean by-catches recorded in the Turkish Black Sea during last two decades is shown in Table 3.3.

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[178] *Tonay A.M., Dede A., Öztürk A.A. 2007b. Stomach contents of bycaught harbour porpoises (Phocoena phocoena) from the Marmara Sea. Rapp. Comm. int. Mer Médit., 38: 617.*

[179] *Radu G., Anton E., Dumitrache C. 2008. National overview on the current status of cetacean-fisheries conflicts including by-catch and depredation: Romania. International Workshop on Cetacean By-catch within the ACCOBAMS Area (Rome, Italy, 17-18 September 2008). Working paper, 14 p. (unpublished).*

Table 3.3 Records of by-caught cetaceans in the Turkish Black Sea

Year	Region	Harbour porpoise	Bottlenose dolphin	Common dolphin	Total	References
1993-1997	Western	62	-	1	63	Öztürk et al. (1999b)[172]
1999	Western	28	-	-	28	Tonay and Öz (1999)[173]
2002-2003	Western	40	1	1	42	Tonay and Öztürk (2003)[174]
2006	Central	94	-	-	94	Gönener and Bilgin (2009)[185]
2007-2008	Western	24	1	-	25	Tonay (2011)[181]
2010-2012	Eastern	79	-	4	83	Bilgin et al. (2013)[186]
Total		327	2	6	335	

The above data strongly suggest that the direct impact of Black Sea fisheries is focused mainly on *P. p. reicta*, and the intensity of this impact is much higher compared to the adverse influence of fisheries on the other two species.

3.5.1.3. Hazardous gear and seasons

Between the late 1960s and the early 1990s bottom-set gillnets for turbot (*Psetta maxima maeotica*) and spiny dogfish (*S. acanthias*) caused 98% of known cetacean by-catches in the waters off Crimea and Russian Caucasus; the remaining 2% belonged to bottom-set gillnets for sturgeons (*Acipenser spp., Huso huso*) and labyrinth trap nets[169]. It should be noted that official statistics in those areas were always quite incomplete because some legal and numerous illegal nets were not accounted for; moreover, the trawling fleet was almost entirely uncontrolled as far as cetacean by-catches are concerned.

It is reported that[161] in Romania most incidental catches of harbour porpoises occurred in passive fishing gear (not specified in detail) predominantly in spring, from March to May, when small schooling fishes, mostly sprats (*Sprattus sprattus phalaericus*) and anchovies (*Engraulis encrasicolus ponticus*), aggregate in the northwestern Black Sea; the by-catch of common dolphins coincided with a scad (*Trachurus spp.*) fishery by means of pound nets in July–September. Mass by-catch of harbour porpoises in bottom-set gillnets for turbot was registered in the Romanian waters in April 2002[171].

In Turkey most published cases of cetacean by-catch have occurred in turbot bottom-set gillnets from March to June, with a prominent peak of the records in May and June[180,173,174]. It should be underlined that 75% of by-catches occur during May and June when turbot fishery is banned in Turkey[181]. The trammel nets (and also longlines) for turbot fishery, the usage of which is forbidden in order to protect the juvenile turbots, are illegally used widely in the western Turkish Black Sea.

In addition, there are cursory mentions that harbour porpoises and bottlenose dolphins die in Turkish waters also due to the sole (*Solea spp.*) and sturgeon (completely prohibited) bottom fisheries, and

[180] *Öztürk B., Öztürk A.A., Dede A. 1999b. Cetacean by-catch in the western coast of the Turkish Black Sea in 1993-1997. P. 134 in: P.G.H. Evans, J. Cruz and J.A. Raga (Eds.), European research on cetaceans – 13 (Proc. 13th Annual Conf. European Cetacean Society, Valencia, Spain, 5-8 April 1999). ECS, Valencia, 484 p.*

[181] *Tonay A.M. 2011. Estimates of cetacean by-catch in the turbot fishery on the Turkish Western Black Sea coast in 2007 and 2008. GFCM, Scientific Advisory Committee, 2nd Transversal Working Group on By-Catch (in collaboration with ACCOBAMS), 7-9 December 2011, Antalya, Turkey (unpublished).*

"frequent instances of accidental capture by gill or trammel nets" are known for common dolphins[143]. No dogfish nets are used in the Turkish Black Sea.

By-catches are most frequent during the year's second quarter (108 cases, or 68% of the reported total) off the Black Sea western, eastern and northern coasts, with peaks of the accidents in April (Bulgaria), May (Georgia) and June (Ukraine)[175]. By-catches, recorded within these risky months, occurred in bottom-set gillnets for turbot (99 harbour porpoises and five bottlenose dolphins) and trap nets (two bottlenose dolphins). During the other months one bottlenose dolphin and about 40 harbour porpoises were found in turbot nets, and few porpoises (no less than four individuals) in the bottom-set gillnets for spiny dogfish. All three cases of common dolphin by-catch were caused by pelagic trawling for anchovy in December in the Georgian territorial waters[175] representing a well-known wintering area of this fish species.

Two more common dolphin by-catch incidents were recorded in November 1995 in the northwestern Black Sea near Evpatoria, Ukraine, during pelagic trawling operations for sprat[166]. A single case of cetacean (harbour porpoise) entrapment in trammel (triple-wall) net was registered in January 1994 in Laspi Bay, south Crimea. In addition, Ukrainian fishermen allege that bottlenose dolphins and, perhaps, other Black Sea cetaceans are sometimes incidentally caught in purse seines used to catch far-east mullet (*Liza haematocheila*) in the Kerch Strait and for the winter fishery for anchovy off the southern coast of Crimea.

Thus, bottom-set gill nets and turbot fishing period between April and June appear the principal fishing gear and season which are hazardous for Black Sea bottlenose dolphins and, especially, for harbour porpoises. Common dolphins are threatened mainly by trawl nets catching pelagic schooling fishes in late autumn and winter. Other fishing techniques, including purse seines, trammel and trap nets, seem to be of secondary importance.

Bottom-set gillnets are dangerous for Black Sea cetaceans, in particular, because of their large mesh size: from 8-11 cm (dogfish nets) to 12-15 cm (sturgeon nets) and 18-22 cm (turbot nets). The height of these nets varies between 1.5 and three metres, and their length may reach 50-100 metres. Fishermen usually tie together some tens to 200 nets making a single line. The IUU fishing is widespread in the Black and Azov Seas suggesting that significant share of by-catches takes place due to this human activity[182].

3.5.1.4. Non-mortal injuries and mortality rate

No direct data are available concerning Black Sea cetaceans which, after the entrapment, manage to break loose from fishing nets without human assistance. Certainly, this kind of unrecorded by-catch should take place, and sudden appearance of ragged holes in nets suggests this idea to fishermen. On the other hand, some free ranging cetaceans, namely bottlenose dolphins, show evident signs of past by-catching. For instance, individuals bearing net marks were sighted repeatedly between Foros and Balaklava, south Crimea, in 1997 and 1998[177]. One dolphin had a loop of rope tightened around the tail stock, while another individual missed the left pectoral fin, probably as a result of traumatic amputation.

Almost all recorded by-catches are lethal. There is no published evidence of any dolphin or porpoise survived in fishing gears in Bulgaria, Georgia and Romania. Out of more than 2,000 by-caught cetaceans on record, 99.9% of have died in the nets in Russia and Ukraine in 1968-1993[170]. Only two bottlenose dolphins, entangled with their teeth and tail flukes in trap nets, were released alive in Ukraine in 1997-1999[175]. One more successful rescue operation relates to a harbour porpoise accidentally caught in a trammel net placed in shallow water in the southern Crimea[166]. A single case of a bottlenose dolphin by-

[182] *Birkun A., Jr. 2005. Bottom-set gillnet fisheries and harbour porpoises in the Black Sea: High-tech against cetaceans. FINS (the Newsletter of ACCOBAMS), 2(1): 10.*

caught in a bottom longline, but later rescued, was reported in the Marmara Sea[183]. There was also another incident in February 2012 when Turkish fishermen released five bottlenose dolphins caught in purse seine nets for anchovy in Zonguldak, southwestern Black Sea[184].

3.5.1.5. Estimated by-catch rates

Absolute numbers of population losses due to by-catch have not been estimated in Black Sea countries. This study, for the first time has attempted to do this in section 6.

The various by-catch rates estimated for different fisheries, locations and species in the Black Sea region prior to this study are summarised in Table 3.4. The values are considered a type of 'net danger index', or Catch per Unit Effort (CPUE), normally measured in the number of individuals caught per kilometre of net.

Table 3.4 Estimated by-catch rates reported in the Black Sea

Location	Species	Fishing gear	By-catch rate (individuals/km)	Reference
Russia	Cetaceans	Turbot & dogfish nets	0.09	Pavlov et al., 1996[170]
Ukraine	Cetaceans	Turbot & dogfish nets	0.12	Pavlov et al., 1996[170]
Romania	Porpoises	Illegal turbot nets (abandoned)	0.5	Radu et al., 2006[171]
Turkey: west coast	Cetaceans	Gillnets	0.43	Tonay and Öztürk, 2003[174]
Turkey: Central coast	Porpoises	Gillnets	4.14	Gönener and Bilgin, 2009[185]
Turkey: Southeast coast	Cetaceans	Gillnets	0.43	Bilgin et al., 2013[186]
Turkey: west coast	Porpoises	Turbot trammel nets	0.18-0.19	Tonay, 2011[181]
Turkey: west coast	Dolphins	Turbot trammel nets	0.01	Tonay, 2011[181]
Ukraine	Porpoises	Turbot nets	1.42-2.7	Birkun and Krivokhizhin, 2011[187]
Ukraine	Dolphins	Turbot nets	0.02	Birkun and Krivokhizhin, 2011[187]

[183] *Danyer E., Aytemiz I., Dede A., Tonay A. 2012. Rescue and rapid release operation of a bottlenose dolphin (Tursiops truncatus) bycaught in a longline fishery. Abstract book of 26th Annual Conf. European Cetacean Society, Galway, Ireland, p. 287.*

[184] *See: http://siz.net/hamsi-diye-cektiler-yunus-cikti-videosu/*

Ukraine	Porpoises	Dogfish nets	1.51-7.6	Birkun and Krivokhizhin, 2011[187]
Ukraine	Dolphins	Dogfish nets	0	Birkun and Krivokhizhin, 2011[187]
Bulgaria	Porpoises	Turbot nets	0.22	Mihaylov, 2011[189]
Bulgaria	Bottlenose dolphins	Turbot nets	0.02	Mihaylov, 2011[189]

Table 3.4 is now explained in more detail.

Supposedly, every year at least 2,000-3,000 harbour porpoises and 200-300 bottlenose dolphins are accidentally caught in Turkey[143,172]. For turbot and dogfish fisheries in Russia and Ukraine: they averaged, respectively, **9 and 12 by-caught cetacean individuals per 100 km of net per year**[170]. These values appear to significantly under-estimated.

A total of 20 by-caught porpoises were recorded in the abandoned illegal turbot nets about 40 km long found in Romania[171]. Therefore, in this particular case CPUE could be roughly estimated as high as 50 cetaceans per 100 km of net (**0.5 indiv./km**).

In the western Turkish Black Sea, 40 harbour porpoises and one bottlenose dolphin were extracted from 875 nets about 94.5 km long[174]; resulting 43 cetacean individuals per 100 km of net (**0.43 indiv./km**). In the middle of the Turkish Black Sea coast the by-catch rate for harbour porpoises was estimated as high as **4.14 indiv./km**[185], whereas in the southeastern Turkish Black Sea – **0.43 indiv./km**[186].

Operations of one fishing boat were examined in the western Turkish Black Sea during two fishing seasons from April till the end of July in 2007 and till mid-September in 2008[181]. A total of 24 harbour porpoises and one bottlenose dolphin by-caught in turbot trammel nets were recorded. The by-catch rate was found to be:

- **0.18 porpoise** and **0.01 dolphin per 1 km of net** in 2007
- **0.19 porpoise/km** in 2008.
- Absolute numbers of harbour porpoises by-caught in that fishing area could be as follows:
  - **361**±332 (CV0.92) in 2007
  - **608**±408 (CV0.67) in 2008 during legal fishing period (April and July)
  - **1829**±675 (CV0.37) in 2007
  - **2249**±790 (CV0.35) in 2008 during both legal and illegal periods of turbot fishing season[181].

In 2006-2009 in Ukraine, during a year-round on-board examination of 4,769 bottom-set gillnets (354.1 km) a total of 519 by-caught cetaceans (514 harbour porpoises and five bottlenose dolphins) were found,

185 Gönener S., Bilgin S. 2009 The effect of pingers on harbour porpoise, Phocoena phocoena by-catch and fishing effort in the turbot gill net fishery in the Turkish Black Sea Coast. Turkish Journal of Fisheries and Aquatic Sciences, 9: 151-157.

186 Bilgin S., Şahin C., Kalayci F., Köse Ö., Yeşilçiçek T., Ceylan Y., Bal H., Taşçi B. 2013. Interaction between the Black Sea dolphins and fisheries: stranded dolphins (Rize and Artvin coasts) and the effect of bottom gill nets for turbot. Ph.D Thesis, T.C. Recep Tayyip Erdoğan University (in Turkish).

whereas the catch of target fish species came to 5,080 turbot and 2,641 spiny dogfish[187]. Aggregate by-catch indices of those fishing operations were evaluated:

- **142 porpoises and 2 dolphins per 100 km** of turbot net
- **151 porpoises and 0 dolphins per 100 km** of dogfish net
- 65 porpoises and one dolphin per 1,000 turbot
- 70 porpoises per 1,000 dogfish.

Peaks of harbour porpoise by-catch occurred in June (**2.7/km in turbot nets**) and August (**7.6/km in dogfish nets**)[187]. It is of note that such statistics were obtained from **just one** fishing boat legally operating in small coastal area in the northwestern Black Sea.

Meanwhile, hundreds of vessels legally catch turbot and dogfish in the region. In addition to this, IUU fishing has become widespread in the Black and Azov Seas in the past two decades[188] suggesting that a significant share of cetacean by-catch takes place due to marine poaching[164].

During on-board observation program carried out in Bulgaria in April–July 2010 and 2011, a total of 982 turbot nets (88.4 km) were examined and 21 cetaceans – 19 harbour porpoises (90%) and two bottlenose dolphins (10%) – were by-caught[189]. The by-catch index of **porpoises was 22 per 100 km** net set and that of **bottlenose dolphins 2 per 100 km** net set or overall 24 cetaceans per 100 km net set. In terms of turbot caught the by-catch indices were 9.0 porpoises and 1.0 bottlenose dolphin per 1,000 turbot.

In summary, Table 3.4 shows that the highest overall by-catch rates were reported in Ukraine for porpoises in dogfish nets (7.6 individuals/km of net). This is followed by reports of porpoise by-catch from gillnet fisheries on the Turkish central coast (4.14 individuals /km of net). Other reports where there were >1 individual/ km of net were for porpoises in Ukrainian turbot nets (2.7 individuals/km of net) and again

The lowest reported overall by-catch rates were of dolphins from turbot trammel net fisheries off the western Turkish coast (0.01 individuals/km of net).

Generally, a very wide range of by-catch rates have been estimated for the Black Sea, for various species and fisheries (range of 0.01-7.6 individuals/km of net).

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[187] *Birkun, Jr., Krivokhizhin S. 2011. Cetacean by-catch levels in the northern Black Sea: results of onboard monitoring programme. P. 4 in: Abstr. 2nd Transversal Working Group on By-Catch (GFCM in collaboration with ACCOBAMS, 7-9 December 2011, Antalya, Turkey), 18 pp. http://151.1.154.86/GfcmWebSite/SAC/SCMEE-SCSA/WG_by-catch/2011/SAC-2011-By-Catch-Abstracts.pdf*

[188] *Shlyakhov V.A., Daskalov G.M. 2008. The state of marine living resources. Pp.321-364 in: State of the Environment of the Black Sea: 2001-2006/7 (Ed. by T. Oguz). BSC Publ., Istanbul, Turkey, 448 p.*

[189] *Mihaylov K. 2011. Development of national network for monitoring the Black Sea cetaceans (stranded and by-caught) in Bulgaria and identifying relevant measures for mitigation the adverse impact of fisheries: MoU ACCOBAMS, N° 01/2010: 70 p. (unpublished).*

3.5.1.6. Summary of existing cetacean by-catch data from the Black Sea

The earliest by-catch records for the Black Sea date back to the 19th century, with the first by-catch statistics only being collected in 1968. There is currently a paucity of quantitative by-catch information for Black Sea fisheries and the data presented in this section represent just a handful of studies utilising different methodologies, yielding a large range of results. Nevertheless, some conclusions can be drawn.

In terms of geographical location of these by-catch events, higher rates are reported from concentrated areas of bottom set gillnet fisheries, in the western waters off the Crimea, in concentrated areas off the Bulgarian coast, beyond Romania's territorial waters and in the southwest corner of the Black Sea. In terms of species, porpoises almost always dominate by-catches (often >90% of annual estimates) when compared to by-catches of common and bottlenose dolphins. As regards fishing gear type, bottom set gillnets for turbot are always recorded as the greatest threat to cetaceans although spiny dogfish set nets are also reported to be a problem. The seasons of greatest recorded by-catch often range between the March-June period.

Estimated by-catch rates fall within a very wide range, the highest rates being reported for Ukraine. As previously mentioned, various methodologies are used in each study and time periods of observation are sporadic.

Currently we are presented with a limited number of anecdotal reports and estimates of cetacean by-catch for the Black Sea which, while providing an indication of the fishing gears and species most likely to interact, are of little use in providing quantitative estimates of cetacean by-catch. For that purpose we must rely on more rigorously collected data. Some of this is presented in Section 6.

3.5.2. Alteration of cetacean feeding resources

Pelagic and coastal fisheries can affect Black Sea cetacean populations through excessive exploitation of fish species which represent the basic prey of harbour porpoises, common and bottlenose dolphins (Table 3.5). Overfishing, combined with eutrophication and the outburst of a raptorial invader, *Mnemiopsis leidyi* [190], has already led to the rapid decline of anchovy and sprat abundance. As a result, the total commercial catch of anchovy experienced a 12-fold drop (from an absolute maximum of 468,800 tonnes in the 1987-1988 fishing season to 39,100 tonnes in 1990-1991), while landings of sprat fell nearly by a factor of eight (from 105,200 tonnes in 1989 to 13,800 tonnes in 1993)[191]. Negative trends in abundance were also observed in indigenous mullets (*Lisa spp., Mugil cephalus*) and turbot, especially in the northern part of the Black Sea[190], where pressure from legal and illegal fisheries is clearly pronounced. Since the late 1980s the Turkish fishing effort in the Black Sea is the most important[191,192].

[190] *Zaitsev Y., Mamaev V. 1997. Marine Biological Diversity in the Black Sea: A Study of Change and Decline. United Nations Publ., New-York, 208 p.*

[191] *Prodanov K., Mikhailov K., Daskalov G., Maxim C., Chashchin A., Arkhipov A., Shlyakhov V., Ozdamar E. 1997. Environmental management of fish resources in the Black Sea and their rational exploitation. General Fisheries Council for the Mediterranean, Studies and Reviews, No. 68, FAO, Rome, 178 p.*

[192] *Kerestecioğlu M., Borotav Z., Ercan H. 1998. Black Sea Environmental Priorities Study: Turkey. UN Publ., New York, 177 p.*

Table 3.5 Target fish species of Black Sea cetaceans and commercial fisheries and their relative importance for the consumers[156]

Fish species	Consumers			
	Common dolphins	Bottlenose dolphins	Harbour porpoises	Fishery [f]
Anchovy, *Engraulis encrasicolus ponticus*	P[a,c,d,e,g,j]	S[a,c,d]	P[c,d,e,g,j], S[b,i]	P
Sprat, *Sprattus sprattus phalaericus*	P[a,c,d,e]	U	P[e,h,i]	P
Whiting, *Merlangius merlangus euxinus*	S[a,c,e], P[j]	P[c,g], S[a]	P[e,h,l,j], S[b]	S
Pelagic pipefishes, Syngnathidae *gen. spp.*	P[c], S[a]	U	U	U
Black Sea turbot, *Psetta maxima maeotica*	U	P[a,c]	U	P
Thornback ray, *Raja clavata*	U	P[a], S[c]	U	S
Indigenous mullets, *Liza spp.*	S [c]	P[d], S[a,c]	S[b]	P
Grey mullet, *Mugil cephalus*	U	P[d], S[a,c]	U	P
Far-east mullet, *Liza haematocheila*	U	P[e]	S[e]	P
Gobies, Gobiidae *gen. spp.*	U	U	P[a,b,e,i]	S
Red mullet, *Mullus barbatus ponticus*	S[a,c]	S[a,c]	S[a,i]	P
Bonito, *Sarda sarda*	S[a]	S[a,c]	U	P
Shad, *Alosa spp.*	S[c]	U	S[b,e]	P
Zander, *Lucioperca lucioperca*	U	S[a]	S[b]	U
Bream, *Abramis brama*	U	S[a]	S[b]	U
Bluefish, *Pomatomus saltator*	S[a,c]	U	U	P
Horse mackerel, *Trachurus spp.*	S[a,c,e,g], P[j]	S[g]	S[g,j]	P
Garfish, *Belone belone euxini*	S[e]	U	U	S
Mackerel, *Scomber scombrus*	S[c]	U	U	P
Wrasses, Labridae *gen. sp.*	S[c]	U	U	U
Blennies, Blenniidae *gen. sp.*	S[c]	U	U	U
Sea scorpion, *Scorpaena porcus*	U	S[a,c]	U	U
Corb, *Umbrina cirrhosa*	U	S[c]	U	U
Silverside, *Atherina sp.*	U	U	S[b]	U
Flounder, *Platichthys flesus luscus*	U	U	S[b]	S
Sole, *Solea nasuta* and *Solea sp.*	U	U	S[b,i]	U
European hake, *Merluccius merluccius*	U	U	S[i]	U
Pickarel, *Spicara smaris*	U	U	S[e]	U
Seahorse, *Hippocampus hippocampus*	U	U	S[j]	U

P – primary, S – secondary and U – undefined (non-target species)

[a] – Zalkin (1940a)[202]
[b] – Zalkin (1940b)[148]
[c] – Kleinenberg (1956)[134]
[d] – Tomilin (1957)[203]
[e] – Krivokhizhin *et al*. (2000)[197] and S.V. Krivokhizhin (pers. comm.)
[f] – according to Prodanov *et al*. (1997)[191], with additions
[g] – Çelikkale *et al*. (1988)[159]
[h] – Tonay and Öz (1999)[173]

[i] – Tonay *et al*. (2007a)[193]

[j] – A.A. Öztürk, A.M. Tonay and B. Öztürk (unpublished data)

Supposedly, the decline of forage resources, resulting in reduced prey availability, has a strong influence mainly on common dolphins and harbour porpoises[194]. The reduced prey availability coincided with four mass mortality events that affected all the three cetacean species in 1989-1997[195]. The correlation between the die-offs of Black Sea cetaceans and prey scarcity could signify that the reduced prey availability compromised the health of the cetaceans and increased their susceptibility to infection[164]. Since the mid-1990s the populations of anchovy, sprat and mullet started to recover; however, the concurrent growth of fishing efforts (including IUU fishing) is feared to result in collapse again[188]. This concern was clearly expressed a few years ago by the Commission on the Protection of the Black Sea Against Pollution[196].

Deliberately introduced far-east mullet, *L. haematocheila*, is an only example of positive influence of fisheries or, rather, aquaculture on Black Sea cetacean forage resources. The introduction of this species, originated from the Sea of Japan, was carried out during 1972-1984 in the lagoons and coastal waters of the northwestern Black Sea and the Sea of Azov[190]. Since the late 1980s this fish became abundant and widespread throughout the region and, at present, it is caught in all Black Sea countries. Bottlenose dolphins and, to a lesser extent, harbour porpoises include this new species in their diet[197,119].

3.5.3. Deterioration of cetacean habitats

The impact of fisheries on Black Sea cetacean habitats comprises all negative influences which are peculiar to small and medium-scale shipping (e.g., sewage, oil and noise pollution), but it also includes some specific extra threats. Actually, the widespread distribution of various types of fishing gear can be considered a peculiar kind of marine pollution by solid objects. That is true indeed regarding countless illegal nets and nets which were discarded or abandoned (ghost nets). High concentrations of fixed and floating fishing gear in some coastal areas result in the reduction of habitat space for harbour porpoises and bottlenose dolphins and represent a potential risk of entrapment[166].

One more problem relates to seafloor trawling. Bottom trawling in the proper sense has been prohibited in the Black Sea at the beginning of the 20th century when its harmful effect on benthic biocoenoses was recognized[198]. In the 1970s the riparian countries virtually recommenced this kind of fisheries under the new name of near-bottom trawling, allegedly specialized in the catching of sprat.

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[193] *Tonay A.M., Dede A., Öztürk A.A., Öztürk B. 2007a. Stomach content of harbour porpoises (Phocoena phocoena) from the Turkish western Black Sea in spring and early summer. Rapp. Comm. int. Mer Médit., 38: 616.*

[194] *Bushuyev S.G. 2000. Depletion of forage reserve as a factor limiting population size of Black Sea dolphins. Pp. 437-452 in: Ecological safety of coastal and shelf areas and a composite utilization of shelf resources. Proc. Marine Hydrophysical Institute, Sevastopol. (in Russian).*

[195] *Krivokhizhin S.V. 2009. State of cetacean populations in the waters of Ukraine. PhD thesis, Institute of Biology of Southern Seas, Sevastopol, Ukraine. 228 p. (in Russian).*

[196] *Black Sea Commission. 2009. Implementation of the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (2002-2007): A report by the Commission on the Protection of the Black Sea Against Pollution. Istanbul, Turkey, 252 p.*

[197] *Krivokhizhin S.V., Birkun A.A., Jr., Nessonova J.V. 2000. Prey species of Black Sea cetaceans. P. 229 in: P.G.H. Evans, R. Pitt-Aiken and E. Rogan (Eds.), European research on cetaceans – 14 (Proc. 14th Annual Conf. European Cetacean Society, Cork, Ireland, 2-5 April 2000). ECS, Rome, 400 p.*

[198] *Zaitsev Y.P., Fesyunov O.E., Sinegub I.A. 1992. Impact of bottom trawling on the ecosystem of Black Sea shelf. Doklady AN UkrSSR, 3:156-158. (in Russian).*

However, both near-bottom and pelagic trawls could be easily transformed into bottom trawls[199], and their modified use in the shelf area seems to be practically uncontrolled today. In other words, at present pelagic trawling obviously plays a role of legal "umbrella" for illegal bottom trawling aimed to the most valuable Black Sea fishes – sturgeons and turbot. Pelagic trawls are non-selective fishing gear due to their very small mesh (about 8-10 mm). Thus, their use on the bottom results in the elimination of not only adult, but also young fish of the mentioned long-living species. Besides, the detrimental effect of seafloor trawling also consists in direct mechanical damage inflicted on benthic communities and in the stirring up of sedimented pelitic matter, which causes a decrease of water transparency and buries bottom biocoenoses in neighbouring areas. It has been estimated that a 50-m-wide trawl dragged at a speed of three knots will in one hour plough up the top layer of soil over an area of 30 hectares[190]. The magnitude of bottom-trawling impact on cetaceans (including the decrease of forage grounds and prey accessibility) has not been estimated, although a priori both inshore species – the harbour porpoise and the bottlenose dolphin – should be much more influenced by this kind of fisheries than the common dolphin.

3.5.4. Modification of cetacean behaviour

It is known from Ukrainian and Georgian fishermen that marine fishing activities could be attractive for bottlenose and common dolphins, but, obviously, not for harbour porpoises[166]. Both dolphin species may use fisheries as additional food source and include their visits to fishing boats and stationary nets into their foraging strategy. Common dolphins reportedly interact predominantly with pelagic trawling of schooling fish; very often they hunt just in the immediate proximity to a hauling trawl. Bottlenose dolphins, by contrast, are interested in both active and passive fishing types operating inshore. Solitary individuals of this species were seen more than once foraging within trap nets in the Kerch Strait, and sometimes attempts to chase them away from traps were made by means of noise and oars. In spring 1999 one dolphin came every day during several days to a trammel net set near Cape Meganom, south Crimea; during each visit, the animal fed on red mullet caught in the net, leaving behind in the mesh only the fish heads. Bottlenose dolphins tend to gather around trawling boats, probably attracted by occasional discards (e.g., whiting); thus, cetaceans have an opportunity to take advantage of this non-used resource.

A supposed interspecific competition between Black Sea cetaceans caused by a reduction of common forage resources has not been confirmed[200,201].

3.5.5. Distortion of cetaceans distribution, migrations and reproduction

As shown above, fisheries degrade and confine living space and feeding resources of Black Sea cetaceans; some fishing operations/installations attract bottlenose and common dolphins providing them with an additional source of food; however, many individuals, especially harbour porpoises, perish from year to year in fishing nets. All these factors are likely to influence cetaceans distribution and migrations, which

[199] *Konsulov A. (Comp.) 1998. Black Sea biological diversity: Bulgaria. UN Publ., New York, 131p.*

[200] *Morozova N.N. 1982. Interrelations between species and ecology of Black Sea dolphins. Pp. 243-245 in: Abstr. 8th All-Union Conf. on the Research, Conservation and Rational Use of Marine Mammals (Astrakhan, USSR, 5-8 October 1982). Astrakhan, 435 p. (in Russian).*

[201] *Morozova N.N. 1986. Problem of interspecies relations of Black Sea dolphins. Pp. 281-282 in: Abstr. 9th All-Union Conf. on the Research, Conservation and Rational Use of Marine Mammals (Arkhangelsk, USSR, 9-11 September 1986). Arkhangelsk, 466 p. (in Russian).*

mainly depend on the distribution, migrations and abundance of prey stocks[202,134,203]. Certainly, solid data are needed to provide a better understanding of the mechanisms involved.

Turbot fishing operations in spring and summer could be defined not only as a significant anthropogenic factor of Black Sea harbour porpoises mortality, but also as a factor limiting their reproduction output[175,204]. The presence of near-term pregnant, postpartum and lactating females (respectively, 15, 19 and 50% of the total number of mature by-caught females examined) indicated that the turbot fishing season coincides with porpoise gestation and nursing period. Furthermore, the state of mature male and female gonads (except pregnant individuals) indicated that the breeding period occurs at the same time, in spring and early summer.

During the Bulgarian on-board observation program all four female harbour porpoises (100%) in June 2011 and two (50%) females in July 2011 recorded as by-catches were lactating[189].

Lethal by-catch of lactating harbour porpoises, obviously, results in live strandings and starvation death of neonate individuals[205,206].

3.6. Direct and indirect impacts of cetaceans on fisheries

Very little reliable information exists concerning the influence of cetaceans on commercial fisheries in the Black Sea and contiguous waters.

3.6.1. Depredation

Most leaders of fishing cooperatives and ordinary fishermen, interviewed in Ukraine, Russia, Bulgaria and Georgia, do not denounce militant dislike for cetaceans, nor consider them as their serious rivals[166]. Coastal fishermen have no claims against common dolphins, but usually express their discontent with incidental catches of harbour porpoises. Besides, they mention episodes in which bottlenose dolphins raise trouble by damaging their nets or catch, or stealing caught fish from the nets. The same problem is known to be occurring on the Turkish coast[143] and in Bulgaria[207].

Very limited statistics are available on such conflicts and ensuing financial losses, and no appropriate compensation is stipulated for fishermen from their governments. According to a study carried out in Sinop Bay (centre of the Turkish Black Sea coast) between April 2007 and February 2008 where red mullet

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[202] *Zalkin V.I. 1940a. Certain observations on biology of Azov and Black Sea dolphins. Bull. Moskovskogo Obshchestva Ispytateley Prirody (Biol. Div.), 49(1):61-70. (in Russian).*

[203] *Tomilin A.G. 1957. Mammals of the USSR and Adjacent Countries. Vol. IV. Cetaceans. USSR Acad. Science Publ. House, Moscow, 717 p. (in Russian).*

[204] *Birkun A., Jr., Krivokhizhin S., Komakhidze A., Mazmanidi N., Stanev T., Mikhailov K., Baumgaertner W., Joiris C.R. 2000. Causes of mortality in Black Sea harbour porpoises (Phocoena phocoena) from Bulgarian, Georgian and Ukrainian waters (1997-1999). P.262 in: P.G.H. Evans, R. Pitt-Aiken and E. Rogan (Eds.), European research on cetaceans – 14 (Proc. 14th Annual Conf. European Cetacean Society, Cork, Ireland, 2-5 April 2000). ECS, Rome, 400 p.*

[205] *Birkun A.A., Jr., Krivokhizhin S.V., Gridin V.Y., Zhbanov A.V., Zanin A.V., Masberg I.V. 2004. Strandings of neonate Black Sea harbour porpoises (Phocoena phocoena) as a probable consequence of the nursing females' death in fishing gear. Pp. 59-64 in: Marine Mammals of the Holarctic: Collection of Scientific Papers after the 3rd Internat. Conf. (Koktebel, Ukraine, 11-17 October 2004). Moscow, 609pp.*

[206] *Öztürk A.A., Tonay A.M., Raykov V., Dede A. 2012. High mortality of harbour porpoise neonates in the southwestern Black Sea in 2010 and 2011. Abstract book of 26th Annual Conf. European Cetacean Society, Galway, Ireland, p. 90.*

[207] *Mikhailov K. 2008. Overview on the current status of cetacean-fisheries conflicts including by-catch and depredation with a critical review of historical data: Bulgaria. International Workshop on Cetacean By-catch within the ACCOBAMS Area (Rome, Italy, 17-18 September 2008). Working paper, 10 p. (unpublished).*

(Mullus barbatus) fishing activities were conducted by use of commercial bottom gill nets[208], average loss was calculated for each fishing boat 2,191.72 TL (approx. EUR 877) throughout the season due to bottlenose dolphins.

Fishermen interviewed in Bulgaria claim catch losses incurred, due to cetaceans in coastal pound nets, totalling up to 100 tonnes of fish per season[207].

3.6.2. Hypothetical depletion of fishing resources by cetaceans

There are some estimations of yearly amounts of fish allegedly consumed by hypothetical whole populations of dolphins and porpoises[209,210,194]. In all estimates, related to the 1940s-1960s, the use of incorrect basic data on daily ration and population size of Black Sea cetaceans resulted in a doubtful conclusion that cetaceans represent the principal threat to fisheries because they are guilty of the depletion of fish resources. Those estimates were revised using more realistic figures on cetacean nutrition rates[194] and it was viewed that in the 1980s the annual consumption of fish by cetaceans was considerably less than the annual total harvest of Black Sea fisheries. In spite of the lack of any dependable proof, cetaceans are blamed for damage to fisheries in Turkey[118,143].

More than 30 fish species have been recorded in stomach contents of cetaceans inhabiting the Black and Azov Seas off the Crimea and Caucasian coasts (waters of present Ukraine, Russia and Georgia) (Table B3-2). Those studies were conducted on thousands of individuals, deliberately killed in the 1930s-1950s[202,148,134,203], and on over 120 animals, incidentally caught or stranded in the 1990s[197]. Certain prey species, recognized as the most important for cetaceans, also appear to be of high priority for the fisheries. In particular, small benthic (whiting, *Merlangius merlangus euxinus*, and gobies, *Gobiidae gen. spp*.) and pelagic schooling fishes (anchovy, *E. e. ponticus*, and sprat, *S. s. phalaericus*) make up a basic diet of harbour porpoises, but only the latter two species could be considered as the objects of perceived competition between porpoises and fishermen. The same fishes – anchovy and sprat – may cause a conflict of interests between pelagic trawling and common dolphins. The feeding needs of bottlenose dolphins are interacting mainly with the turbot (*P. m. maeotica*) and mullet (*Lisa spp., M. cephalus*) coastal fisheries. No true data are available on the adverse effects of such competitive interactions on fisheries. It is believed that marine mammals do not have essential influence on the abundance of Black Sea anchovy in comparison with the anthropogenic threats affecting its fodder plankton resource[211].

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208 Gönener S., Özdemir S. 2012. Investigation of the interaction between bottom gillnet fishery (Sinop, Black Sea) and bottlenose dolphins (Tursiops truncatus) in terms of economy. Turkish Journal of Fisheries and Aquatic Sciences 12: 115-126.

209 Morozova N.N. 1981. Contemporary state of Black Sea dolphins populations. Rybnoye Khozyaystvo, N4:45-46. (in Russian).

210 Zaitsev Y. 1998. The Most Blue in the World. UN Publ., New York, 142 p. (in Russian).

211 Andrianov D.P., Bulgakova V. 1996. The factors determining the abundance of the Black Sea anchovy. Pp. 13-15 in: B. Öztürk (Ed.), Proceedings of the First International Symposium on the Marine Mammals of the Black Sea (Istanbul, Turkey, 27-30 June 1994). ACAR Matbaacilik A.Ş., Istanbul, 120 p.

4. Review of the fishing fleet and fishing gears active in the Black Sea

4.1. Summary of national fleet statistics for Bulgaria, Romania, Turkey and Ukraine

The following section describes the historical and current capacity of the fishing fleets in the Black Sea, through data collected from each country on the number of active vessels, their power, tonnage and length. This provides a relatively low level of detail on its own but becomes very useful when combined with data from the fisherman's survey. The fishermen's survey provides a detailed snapshot of fishing capacity and effort in each country (i.e. for 150 vessels) and when extrapolated with information from the total active fleet (i.e. 6000 vessels), an idea of full operating capacity can be obtained.

The success in obtaining the same level of detail from each country varies due to differing national methods of data collection, so detail may be lost when trying to compare countries on an even platform. This will be discussed.

4.1.1. Data collection regimes

4.1.1.1 Bulgaria & Romania - Review of the EU Data Collection

As Member States of the European Union, Bulgaria and Romania collect, manage and publish fisheries data under the EU Data Collection Framework (DCF). Each country has a unique National Programme, which is regularly updated and published to the EC website. Excel spreadsheets of the data collected and by whom, under specific categories are also provided[212,213], such as national lists of identified métiers. Much of the information here has been extracted from the published National Programmes of Bulgaria[214] and Romania[215.]

4.1.1.1.1. Romania

In Romania, the National Agency for Fisheries and Aquaculture (NAFA) under subordination of the Ministry of Agriculture and Rural Development is the central public authority responsible for fisheries data collection relating to all active vessels. This includes data on commercial landings, biological data on marine fish species and data on fleet capacity. Here we focus on fleet capacity.

Data on fishing fleet capacity in Romania is obtained by NAFA staff by Census[216] and questionnaire, from various sources such as the NAFA Fishing Fleet Register (FFR), fishing licences and fishing logbooks. Data on the number of vessels is primarily obtained from the FFR but for vessels below 12m, data is obtained via logbooks. Data on the length (LOA), gross tonnage (GT), maximum engine power (Kw) and age of vessels is gathered from the FFR and fishing licences. Data on the number and types of gears operated on the active fleets are collected via logbooks.

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[212] *EC (2013). National Programme Romania Data Tables: http://datacollection.jrc.ec.europa.eu/documents/10213/ffadea39-c7ee-48d7-999e-9ee2eeada318*

[213] *EC (2013). National Programme Bulgaria Data Tables: http://datacollection.jrc.ec.europa.eu/documents/10213/bc82941b-b3d2-4ae4-bbef-81306def401e*

[214] *EC (2013). National Programme Bulgaria: http://datacollection.jrc.ec.europa.eu/documents/10213/b6220d6f-6810-49e3-a8c1-0bce4a69ef7d*

[215] *EC (2013). National Programme Romania: http://datacollection.jrc.ec.europa.eu/documents/10213/9130f43d-534f-449f-b339-68e28f15eb95*

216 EC data collection methods: See: https://www.wageningenur.nl/web/file?uuid=201c9f80-a8f6-4a86-997a-4b1c3a2c436a&owner=52bc99a0-ac7d-4855-b7c9-454f4ae33548

Included in Romania's National Programme are a set of proposed métiers, based on the country's unique fishing activity and gear types, at Level 6 ('Mesh size and other selective devices') of the EC's Mediterranean Sea and Black Sea Fishing Métier classification system[217].

Fisheries data in Romania are currently archived in a national database developed by the Institute for Research development for Aquatic Ecology, Fisheries and Aquaculture (IRDAEFA) and it is currently undergoing improvements. Data are submitted to several organisations, including STECF, DG MARE, SGMED and the AG FOMLR (Advisory Group on Environmental Aspects of Management of Fisheries and Other Living Resources) of the Black Sea Commission.

Other methods of obtaining fleet capacity data aside from National Programmes are through Eurostat, the EU Fleet Register and through EC data calls. For the population of the EU Community Fleet Register, each Member State will send every three months a copy, or ´snapshot´, of its national fleet register, including its historical dimension to the Community Register[218]. These data replace the previous snapshot.

Data collected by Member States are also uploaded to databases managed by the Joint Research Centre (JRC) in response to data calls issued by DG MARE. The resulting scientific advice is used to inform the Common Fisheries Policy (CFP) decision making process.

In analyses of the 2013 data call for economic data on the EU fishing fleet (MARE/A3/AC ((2013)[219], it was reported that Romania provided an incomplete list of active vessels, and various categories of capacity data, such as vessel power and tonnage were under-reported in in various years from 2010-2012, when compared to data from the EU Fishing Fleet Community Register (see Table 4.1 below)[219]:

Table 4.1 DCF data vs Fleet Register data by fleet segment and national totals for Romania 2008-2013

ROU	2008	% Dif.	2009	% Dif.	2010	% Dif.	2011	% Dif.	2012	% Dif.	2013	% Dif.
No. vessels												
MS	441	101%	440	101%	429	98%	488	103%	261	52%	275	141%
FS	441	101%	440	101%	429	98%	488	103%	261	52%	275	141%
EU FR	438		436		439		476		502		195	
Vessel power												
MS	8,717	110%	8,555	143%	5,447	78%	6,964	106%	5,864	76%	6,653	108%
FS	8,717	110%	8,224	137%	5,447	78%	6,964	106%	5,864	76%	6,653	108%
EU FR	7,900		5,988		6,952		6,600		7,670		6,153	
Vessel tonnage												
MS	2,340	98%	2,291	141%	1,047	58%	1,000	85%	735	79%	851	136%
FS	2,340	98%	2,291	141%	1,047	58%	1,000	85%	735	79%	851	136%
EU FR	2,384		1,621		1,819		1,183		935		628	

DCF submitted data as a percentage of Eurostat values

This may be due to a) fleet segments with low vessel numbers for which data is hard to obtain or for which there are confidentiality issues, b) only active fleets being submitted by Member States upon data call, as opposed to full fleets being represented on the Community Register, and c) differences in data representation from different sources (e.g. the Community Register includes all registered vessels as of

[217] *EC (2014). Fishing Activity Métiers: http://datacollection.jrc.ec.europa.eu/wordef/fishing-activity-métier.*
[218] *Introduction to the Fleet Register: http://ec.europa.eu/fisheries/fleet/index.cfm?method=AnIntroduction.menu*
[219] *EC (2013). 2013 DCF Call for Economic Data on the EU Fishing Fleet: Coverage Report. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/2013-dcf-call-economic-data-eu-fishing-fleet-coverage-report?search*

the 1st January, whereas other sources may represent the average fleet over a year). Differences can often be confirmed by consulting the data submitted by National Programmes.

It must be noted that when national teams were contacted for fleet capacity data, we were provided with direct links to and copies of EU Community Register data.

4.1.1.1.2. Bulgaria

In Bulgaria, the National Agency of Fisheries and Aquaculture (NAFA) under subordination of the Ministry of Agriculture and Food is the central public authority responsible for fisheries data collection relating to all fleet segments. As for Romania, this includes data on commercial landings, biological data on marine fish species and data on fleet capacity.

Fleet capacity data in Bulgaria is obtained by Census[220] from the national Fishing Vessel Register (FVR). The data collected include the number, mean length (LOA), mean and gross tonnage, mean and maximum continuous power, registration number, owner and mean age of registered vessels. The information stored on the FVR is updated in real-time and the data are submitted to DG MARE and the Community Register[218]. As there is no size limit of fishing vessels for registration in the FVR, full coverage of the fleet should be obtained.

Data on number and types of gear used are collected by different methods and from different sources but are generally from the fleet register, questionnaires and face-to-face interviews organised by the regional representatives of the NAFA network. Data on the number of nets are collected from the fleet register and questionnaires by Census or Probability Sample Survey, and data on the number of hooks and lines are collected from questionnaires by Probability Sample Survey.

As for Romania, a set of proposed métiers are presented in the National Programme, at Level 6 of the EC's Mediterranean Sea and Black Sea Fishing Métier classification system[221].

In analyses of the 2013 data call[222], it was reported that Bulgaria had not submitted a significant amount of capacity data, such as the number of vessels, tonnage (GT) and power (Kw) data from all years. However, this may be in part due to the fact that Bulgaria submitted data for the active fleet only (MS in Table 4.2[219]). Even when adjusted, there were still discrepancies between national fleet values and those reported in the EU Fishing Fleet Community Register (FR in Table 4.2[219]) and may be due to reasons a-c given for Romania above.

220 EC Types of Data Collection: A) Census, which attempts to collect data from all members of a population. This would include collection of data from administrative records, as well as other cases in which data are derived from sources originally compiled for non-statistical purposes.
B) Probability Sample Survey, in which data are collected from a sample of a population members randomly selected
C) Non-Probability Sample Survey, in which data are collected from a sample of population members not randomly selected. See: https://www.wageningenur.nl/web/file?uuid=201c9f80-a8f6-4a86-997a-4b1c3a2c436a&owner=52bc99a0-ac7d-4855-b7c9-454f4ae33548
221 EC (2014). Fishing Activity Métiers: http://datacollection.jrc.ec.europa.eu/wordef/fishing-activity-métier.
222 EC (2013). 2013 DCF Call for Economic Data on the EU Fishing Fleet: Coverage Report. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/2013-dcf-call-economic-data-eu-fishing-fleet-coverage-report?search

Table 4.2 DCF data vs Fleet Register data by fleet segment and national totals for Bulgaria 2008-2013.

BGR	2008	% Dif.	2009	% Dif.	2010	% Dif.	2011	% Dif.	2012	% Dif.	2013	% Dif.
No. vessels												
MS	854	34%	1,118	44%	1,383	63%	1,010	43%	1,192	51%	1,192	50%
MS (all vessels)	2,680	100%	2,421	100%	2,692	100%	2,345	100%	2,387	100%		
FS	2,680	105%	2,421	95%	2,692	122%	2,345	100%	2,387	102%	1,192	50%
EU FR	2,546		2,548		2,206		2,340		2,336		2,366	
Vessel power												
MS	31,831	49%	50,858	77%	48,381	80%	33,686	53%	37,557	61%	37,557	61%
FS	71,872	110%	81,458	124%	77,744	129%	62,061	98%	62,941	103%	37,557	61%
EU FR	65,512		65,871		60,380		63,444		61,307		61,365	
Vessel tonnage												
MS	5,385	65%	7,973	96%	7,481	97%	4,966	63%	5,115	69%	5,115	72%
FS	9,397	114%	10,891	132%	10,197	132%	7,511	95%	7,365	100%	5,115	72%
EU FR	8,233		8,276		7,702		7,931		7,373		7,061	

DCF submitted data as a percentage of Eurostat values

Additionally, some fleet segments have been reported without capacity data and with zero values. These fleet segments do not equate with those reported in Bulgaria's National Programme document214 and further highlight the large inter-annual variations in the data submitted by Bulgaria. It is therefore difficult to evaluate data coverage at the capacity and fleet segment level.

When national teams were contacted for fleet capacity data, we were provided with direct links to and copies of EU Community Register data.

4.1.1.2. Review of the Ukraine data collection programme

YugNIRO, the Southern Scientific Research Institute of Marine Fisheries and Oceanography is the principal governmental research institute under the State Committee for Fisheries of Ukraine involved in integrated marine fisheries research. One of its basic responsibilities is to carry out data collection[223].

Generally, there is an absence of data available on the structure and capacity of the Ukrainian fishing fleet, most likely due to the current political situation, whereby data reporting is not considered a priority. Prior to this however, the formation of a competitive fisheries environment may still be at an early stage due to the economics associated with developing a fishing industry i.e. the high costs of materials and machinery, high credit costs, taxation policies and the absence of laws concerning fisheries, amongst other issues[224].

Fleet capacity data are reportedly stored in the fishing vessels inventory of YugNIRO[225] and data on the number of registered vessels are kept in the State Register although the number of vessels registered in ports is reported to significantly exceed the number of active vessels[225]. Members of the Ukrainian national team[225] did provide estimates of the numbers of vessels in terms of length (LOA), tonnage (GT) and power (KW) for the active fleet (based on data from the Ukrainian Fishing Fleets Survey (UFFS) and YugNIRO) but these data were only obtainable for 2012.

Data on the number and types of fishing gear are reportedly regularly collected in Basin or Regional Fisheries Inspections at the ports of Sevastopol, Odessa, Kherson and Berdyansk but again, no data were available. However, national team members[225] provided detailed estimates of the numbers of gillnets, of varying mesh sizes used in the Ukrainian sector from 2009-2013. These estimates were based on a series

[223] *Trotsenko, B. G., Romanov, E. V., & Panov, B. P. (2004). The present and future of an integrated database on oceanology of the Southern Scientific Research Institute of Marine Fisheries and Oceanography (YugNIRO, Kerch, Crimea, Ukraine). THE COLOUR OF OCEAN DATA, 271.*

[224] *Duzgunes, E., & Erdogan, N. (2008). Fisheries management in the Black Sea countries. Turkish Journal of Fisheries and Aquatic Sciences, **8**(1), 181-192.*

[225] *Personal communication with Vladyslav Shlyakhov, Ukrainian national team member.*

of calculations using data obtained from the UFFS, YugNIRO and reports of the Ministry of Agrarian Policy and Food of Ukraine. The number of vessels operating gear types other than gillnets (i.e. mid-water trawls, long lines) was also estimated by the national teams[225] but is only applicable to 2012.

4.1.1.3. Review of the Turkey data collection system

In Turkey, the Turkish Statistical Institute is the authority responsible for fisheries data publication relating to fleet capacity. The Institute also compiles data on sea products by annual survey, applied during January and May. In the 2013 survey, fishermen were surveyed by two methods: full census for large scale fishermen and sampling for small scale fishermen. Fishermen were visited at their addresses by interviewers where questionnaires were completed[226].

Data on fleet capacity are published annually in TurkStat Fishery Statistics books online. The latest data at the time of writing was for 2012[227]. The data collected include the number of vessels in various categories of operating type (i.e. trawler, purse seiner), material, gross tonnage (GT), power (Kw) and length (LOA, m). It is these data that were provided by Turkish national team. A vessel registry also exists as part of Turkey's Fisheries Information System (FIS)[228], but this registry is not accessible. Fisheries data in Turkey are currently archived in the FIS centralised database[228].

Data on the number and types of gear in use in the active fleet do not appear to be available and were not provided by the national team on the project.

However, it has been reported by the General Fisheries Commission for the Mediterranean (GFCM) that Turkey's intention is to adopt the EU-CFP and DCF[229], which will inevitably improve timely and accurate fisheries data reporting.

4.1.2. Country Statistics

In the following section, a summary of each country's fleet capacity is presented in terms of past and current operation. The gear types operated currently in these fleets are also discussed and classified according to the EU Métier Classification System where necessary.

4.1.2.1. Romania

Temporal trends in fleet capacity

When searching for historical fleet capacity data for EU countries, various sources including the Eurostat database and viewable and downloadable data from the EU Community Fleet Register were utilised. Eurostat data refers to the situation of the national fleets on the 31st of December of the reference year

[226] *Personal communication with Arda Tonay, Turkish national team member.*
[227] *Turkish Statistical Institute (2012). Fishery Statistics 2012 [Online]. Available at: http://www.turkstat.gov.tr/Kitap.do?metod=KitapDetay&KT_ID=13&KITAP_ID=52 [Accessed 20.07.2014]. Database also available at: http://tuikapp.tuik.gov.tr/balikcilikdagitimapp/balikcilik.zul.*
[228] *FAO 2008-2014). Fishery and Aquaculture Country Profiles. Turkey (2008). Country Profile Fact Sheets. In: FAO Fisheries and Aquaculture Department [Online]. Available at: http://www.fao.org/fishery/facp/TUR/en [Accessed: 29.07.2014].*
[229] *GFCM (2012). First Meeting of the GFCM ad hoc Working Group on the Black Sea. Constanta, Romania, 16-18 January 2012. [Online]. Available from: http://151.1.154.86/GfcmWebSite/SAC/WGBS/2012/GFCM-Background-Doc-BlackSea-Fisheries.pdf [Accessed 29.97.2014].*

and were last updated on the 18th of December 2013[230]. Data from the Community Fishing Fleet Register can be searched by specific dates and are available from 2007 to the present day[231] for Bulgaria and Romania. Length (LOA) of vessels is not used as an indicator of fleet capacity in this case as EU databases only publish summarised data on the number of vessels, power and tonnage.

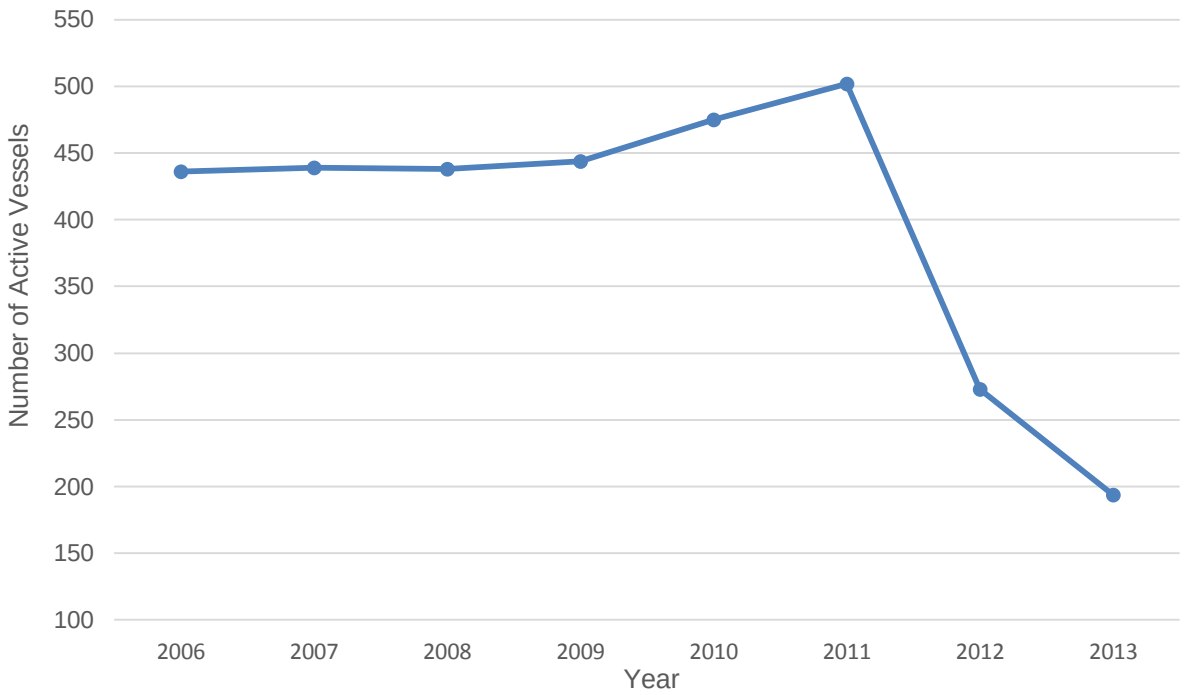


Figure 4.1 Historical Trend in the Size of the Active Fleet in Romania. Source Eurostat. Data refers to the situation of the national fleets on the 31st of December of the reference year.

[230] *European Commission Eurostat Database: Select Agriculture, forestry and fisheries >> Fisheries (fish) >> and select the Fishing fleet (fish_fleet) data explorer. [Online] Available: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database [Accessed 15.08.2014].*

[231] *European Commission Fleet Register on the Net: Select country under 'Simple search' option and filter results as necessary. [Online]. Available: http://ec.europa.eu/fisheries/fleet/index.cfm?method=Search.SearchSimple [Accessed 15.08.2014].*

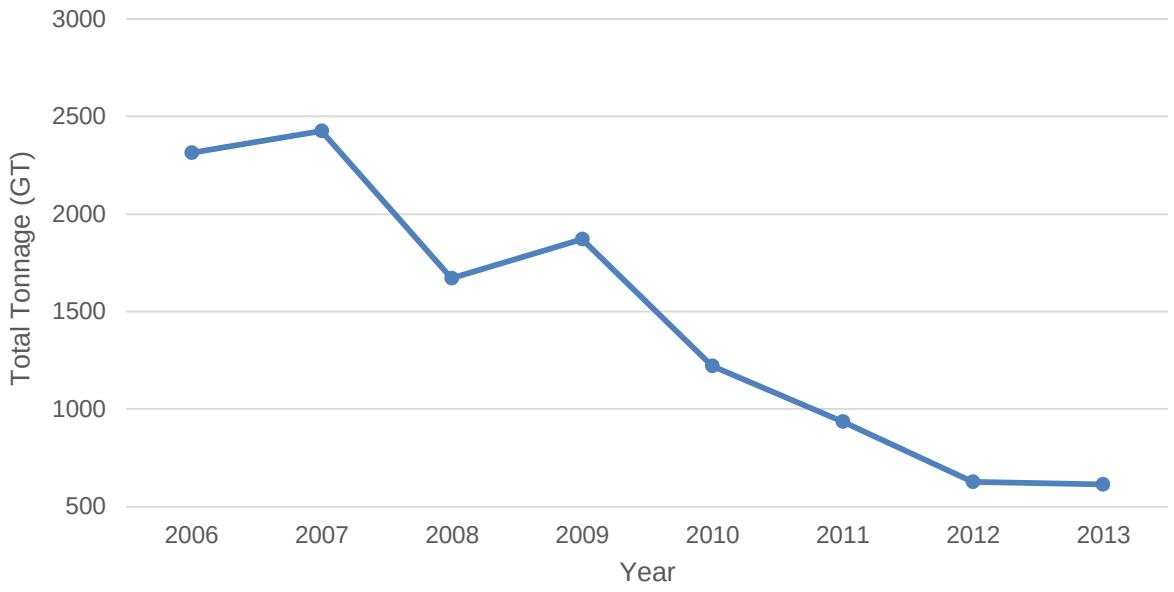


Figure 4.2 Historical Trend in Total Tonnage (GT) in the Romanian Active Fleet. Source Eurostat. Data refers to the situation of the national fleets on the 31st of December of the reference year.

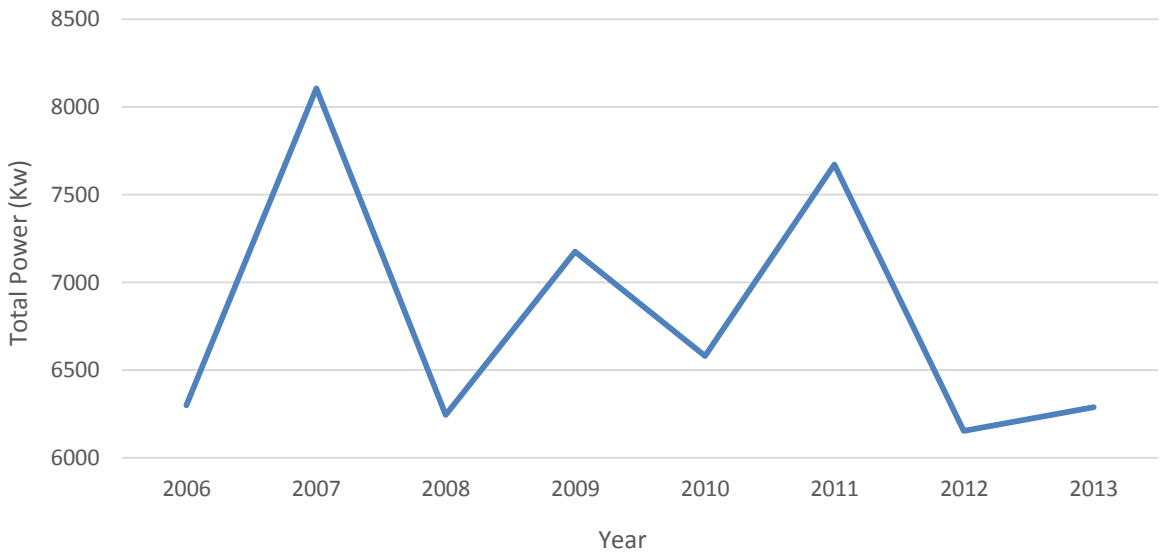


Figure 4.3 Historical Trend in Total Horsepower (Kw) in the Romanian Active Fleet. Source Eurostat. Data refers to the situation of the national fleets on the 31st of December of the reference year.

Figure 4.1 indicates that Romania's fleet has decreased in size since 2006 and particularly since 2011. The fleet in 2013 was at 38% of its size than in 2011.

Figure 4.2 shows that Romania's total tonnage (GT) has declined steadily since 2006, indicating that fish holding capacity has decreased over the years. There was no sharp decline in fish holding capacity in 2011, which suggests that the vessels that became inactive were those of the smaller tonnage classes.

Figure 4.3 shows peaks in total fleet horsepower in 2007, 2009 and 2011, indicating greater power available for fishing gear.

Generally, the capacity of Romania's fishing fleet and subsequently, the level of active fishing has declined. It has also been specifically reported that there are fewer larger fishing vessels in the active fleet. In 2010, there were 20 vessels with LOA between 24-40m registered, but in the past years, only one or two vessels were active for a very short period of time. Also depending on the years, only 1 or 2 vessels of LOA over 12m have been active in Romania[232].

Current fleet capacity

Table 4.3 below represents the current capacity of the Romanian active fleet. Data were obtained from the EU Fleet Community Register on 29/7/2014. This information is more up-to-date than that published in Romania's National Programme.

Note here that length, tonnage and power data have been grouped into categories based on those used by the Turkish Statistical Institute. Turkish vessel data are not available in raw form (i.e. individual vessel length, tonnage and power records are already published to grouped categories) so sorting by EU DCF categories was not possible.

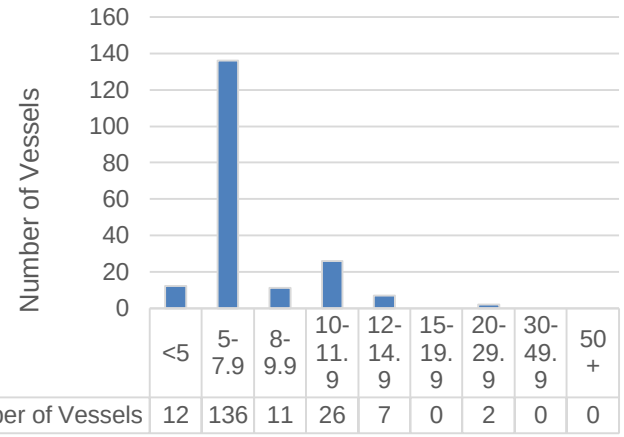
Table 4.3 Current Romanian Fleet Capacity (28/5/2014)

Length/LOA (m)	Number of Vessels
<5	12
5-7.9	136
8-9.9	11
10-11.9	26
12-14.9	7
15-19.9	0
20-29.9	2
30-49.9	0
50+	0
Tonnage (GT)	**Number of Vessels**
<1	102
1-4.9	82
5-9.9	2
10-29.9	3

[232] *Cervera, J., Salz, P., Alberti-Schmitt, C., Petereit, C. and Azorin, E. (2014). Country Report: Fieldwork Mission to Romania. Contract: "Field work specific contract for Lithuania, Romania, Spain and United Kingdom", has been implemented within the framework contract, MARE/2009/08 "Assistance for the monitoring of the implementation of national programmes for the collection, management and use of data in the fisheries sector", funded by the DG Mare. [Online]. Available: http://ec.europa.eu/fisheries/documentation/studies/data/documents/romania-report_en.pdf [Accessed 15.08.2014].*

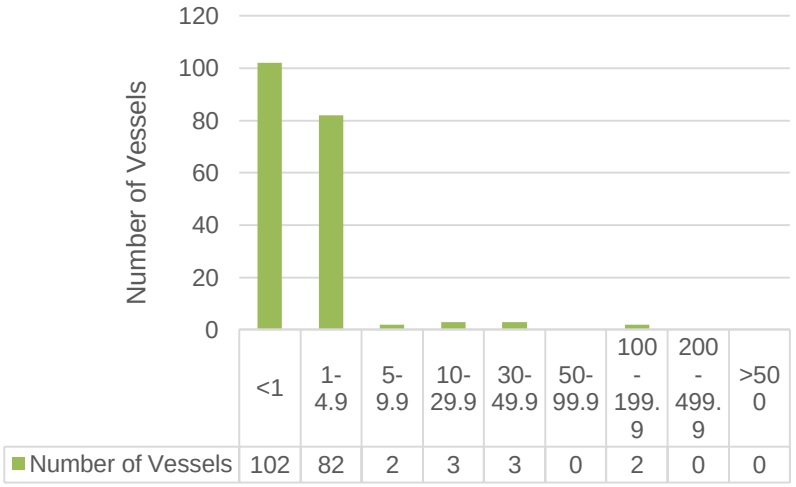
30-49.9	3
50-99.9	0
100-199.9	2
200-499.9	0
>500	0
Kw	**Number of Vessels**
0	63
1-9.9	53
10-19.9	17
20-49.9	26
50-99.9	14
100-199.9	17
200-499.9	3
>500	1
Total number of Active Vessels	**194**

a) Length (m)



Active Vessels: 194

b) Tonnage (GT)



c) Power (Kw)

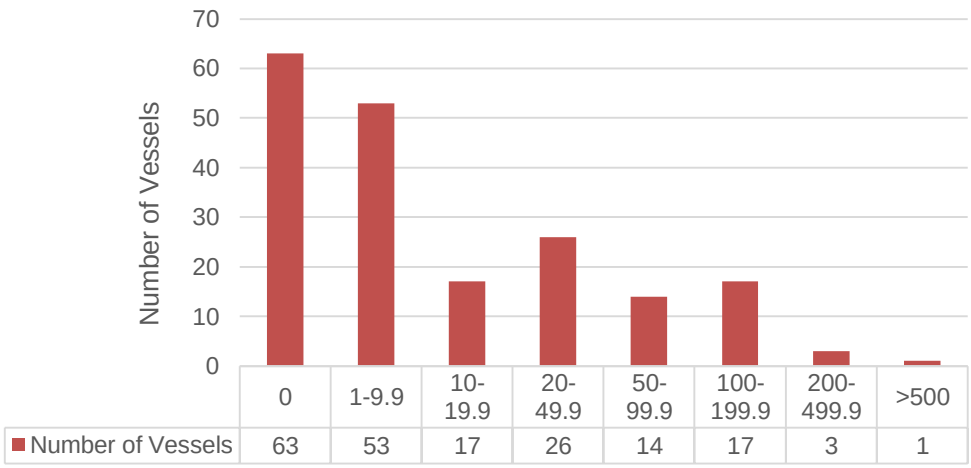


Figure 4.4 Romanian Fleet Capacity: Length (m), Tonnage (GT) and Power (Kw) of the Active Fleet (as of 29/07/2014).

Figure 4.4a above indicates that the majority (70%) of the fleet are between 5 and 7.9m in length, followed by a small number (13%) between 10 and 11.9 m. There are no vessels over 30m and very few under 5m. Figure 4.4b indicates that the majority (94%) of the fleet have a gross tonnage less than 4.9, and no vessels with a GT of over 20. Figure 4.4c indicates that the fleet exhibits a range of power across the categories but that most vessels (69%) are under 9.9 Kw.

Gear Types and Métiers

Figure 4.5 below represents the number of vessels operating specific gear types. They are presented as main and secondary gear types. Data were downloaded from the EU Fleet Community Register on 28/5/2014. See Table 4.4 for EU gear code descriptions.

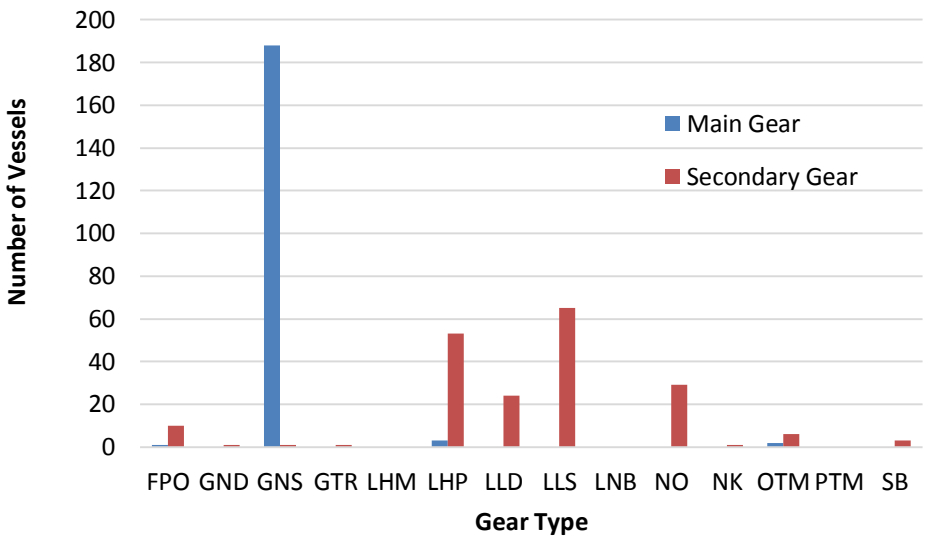


Figure 4.5 Gear Type Utilisation in the Romanian Active Fleet (As of 30th July 2014)

Table 4.4 EU Gear Code Descriptions

EU Gear Code	Gear Type Description
FPO	Pots and traps
GND	Drift nets
GNS	Set gillnets (anchored)
GTR	Trammel nets
LHM	Hand lines and pole-lines (mechanised)
LHP	Hand lines and pole-lines (hand operated)
LLD	Drifting long lines
LLS	Set long lines

LNB	Boat-operated lift nets
PS	Purse seines
DRH	Hand dredges operating from a boat
NO	No gear
NK	Unknown gear
OTM	Mid-water otter trawls
OTB	Bottom otter trawls
PTM	Mid-water pair trawls
SB	Beach seines

Figure 4.5 shows a peak in the GNS category, indicating that most of the active fleet (96%) are using set gillnets as their main gear type. Other common gear types are various types of hooks and lines.

According to the National Programme of 2013, the Romanian fleet uses only selected métiers. As active gears, mid-water otter trawls (OTM) and beach seines (SB) are used. As passive gears, stationary uncovered pound nets (FPN) and pots and traps (FPO) are applied. Other passive gear types are gillnets (GNS), long lines (LLS) and hand and pole lines (LHM).

Figure 4.5 above indicates that similar gear types are being utilised to those in 2013, except for uncovered pounds nets (FPN) that were reported in 2013 only, and drifting long lines that are now being operated in 2014. It must be noted that FPN does not exists as a gear type on the EU Fleet Register and may be grouped into the pots and traps (FPO) category.

Romania proposed the following métiers at level 6 of the EC's Mediterranean Sea and Black Sea Fishing Métier classification system[221] in their National Programme of 2013[215] (Table 4.5).

Table 4.5 Métiers operated in the Romanian Fleet (2013). Table adapted from that published in Romania's National Programme.

Métier Level 6	National métier	Target species	Space strata	Time strata
OTM_MPD_14_0_0	Mid-water otter trawls targeting mixed pelagic and demersal fish	Sprat	37.4.2	Quarterly, estimates between April and November.
'Misc._FPN_MPD_14_0_0	Stationary uncovered pound nets targeting mixed pelagic and demersal fish	Sprat, anchovy, horse mackerel	37.4.2	Quarterly, estimates between April and September.
GNS_DEF_400_0_0	Set anchored gillnets targeting demersal fish	Turbot	37.4.2	Quarterly, estimates between March and November.

LHP-LHM_FIF_0_0_0	Hand operated and mechanised hand-lines and pole-lines targeting finfish	Gobies	37.4.2	Quarterly, estimates between April and October.
LLS_DEF_0_0_0	Set long lines targeting demersal fish	Gobies and dogfish	37.4.2	Quarterly, estimates between April and October.

The métier level 6 code FPN_MPD_14_0_0 was changed to Misc_FPN_MPD because there were no combinations of the gear FPN with the target species MPD in the Commission decision 949/2008[215].

In summary, according to the latest EU Fleet Register data, the Romanian active fleet appears to consist mainly of small (<7.9m, <4.9 GT, <49.9Kw) boats operating set gillnets.

4.1.2.2. Bulgaria

Temporal trends in fleet capacity

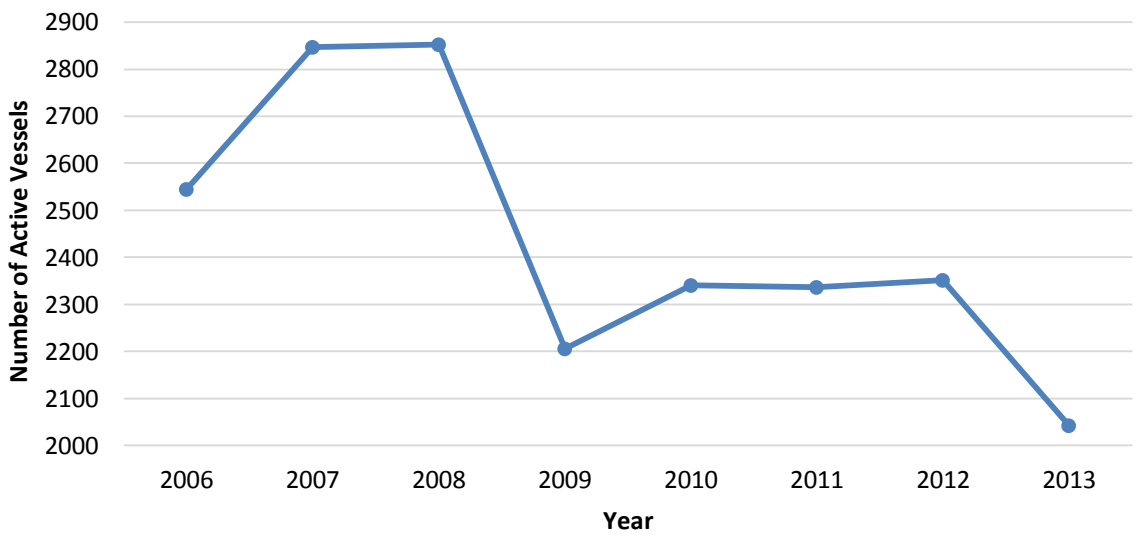


Figure 4.6 Historical Trend in the Size of the Active Fleet in Bulgaria. Source Eurostat. Data refers to the situation of the national fleets on the 31st of December of the reference year.

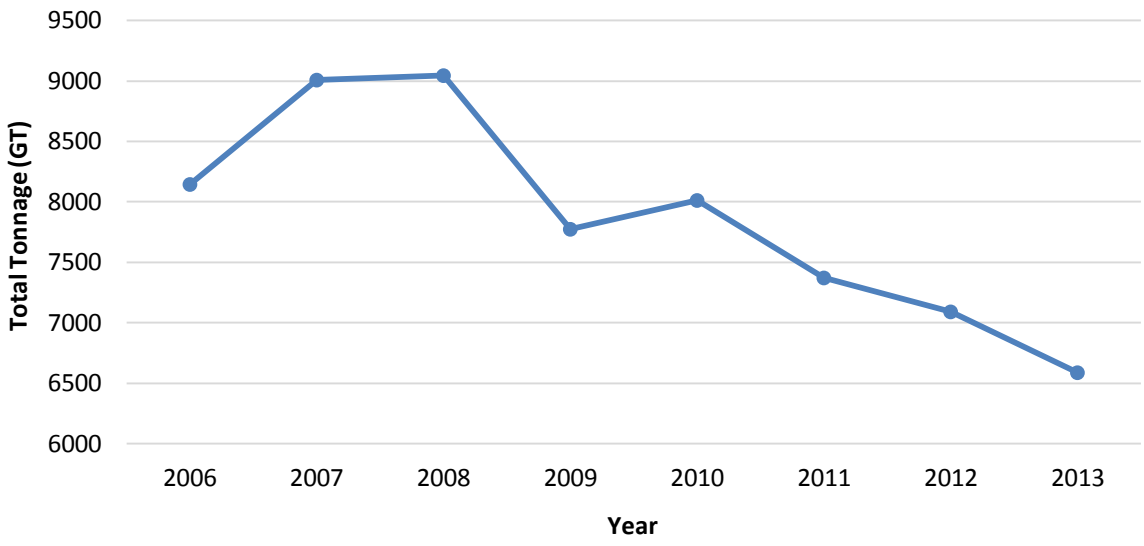


Figure 4.7 Historical Trend in Total Tonnage (GT) in the Bulgarian Active Fleet. Source Eurostat. Data refers to the situation of the national fleets on the 31st of December of the reference year.

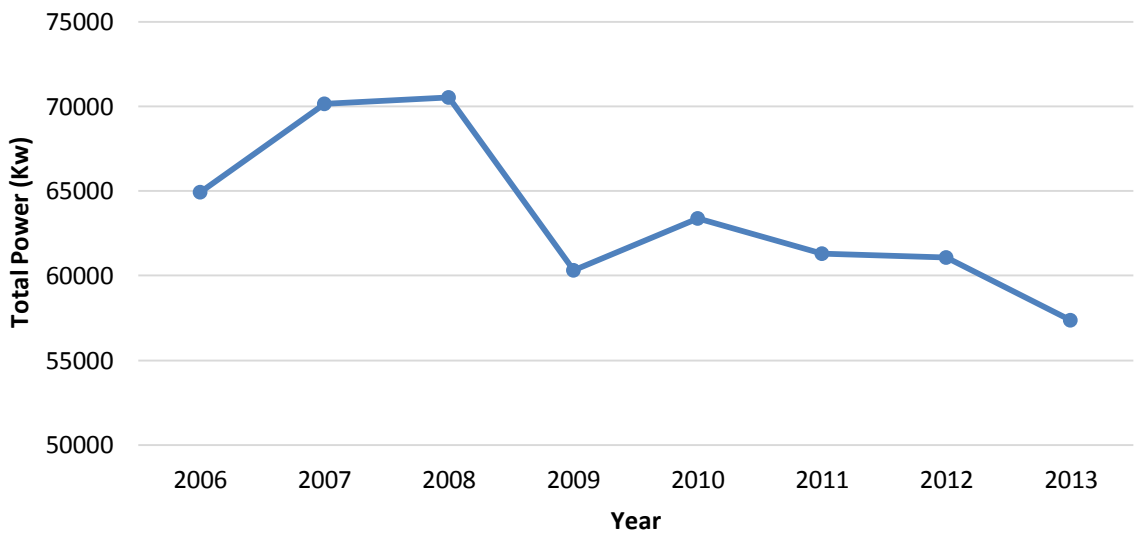


Figure 4.8 Historical Trend in Total Horsepower (Kw) in the Bulgarian Active Fleet. Source Eurostat. Data refers to the situation of the national fleets on the 31st of December of the reference year.

Figure 4.6 indicates that overall, Bulgaria's fleet has decreased in size since 2006 by around 500 vessels. Fleet size increased since from 2006-2008 (the fleet contained a maximum of number of 2852 vessels) and from 2009 to 2011/12. Figures 4.7 and 4.8 show similar trends, indicating that fish holding capacity and power available for fishing gear has decreased over the years in the Bulgarian fleet.

These figures must be interpreted with caution as it has been reported that in in 2008, only 716 vessels were actually active[229].

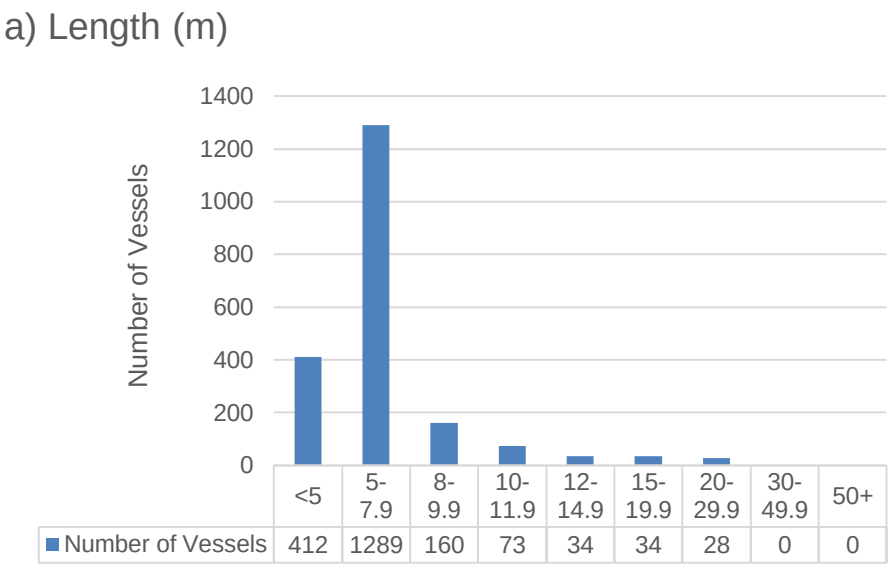
Current fleet capacity

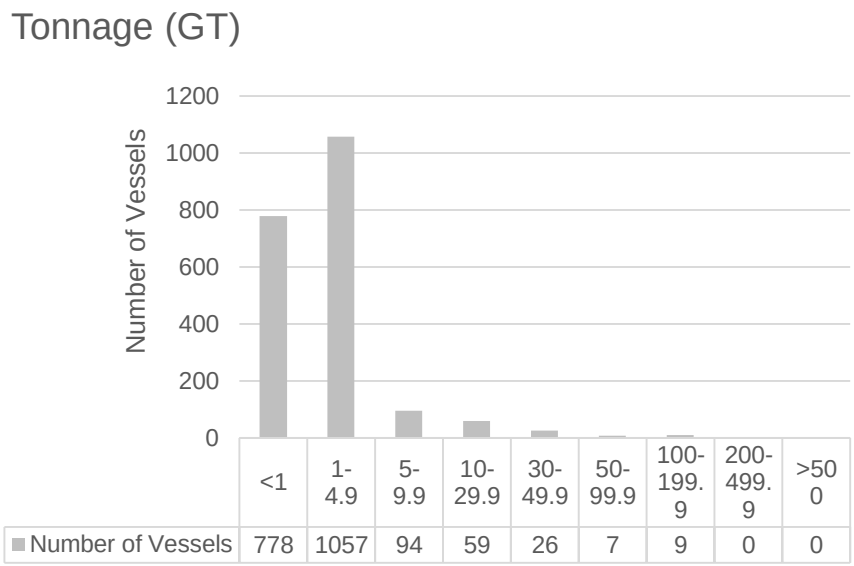
Table 4.6 and Figure 4.9 below represent the current capacity of the Bulgarian active fleet. Data were obtained from the EU Fleet Community Register on 29/7/2014. This information is more up-to-date than that published in Bulgaria's National Programme, representing data from 2011-2013.

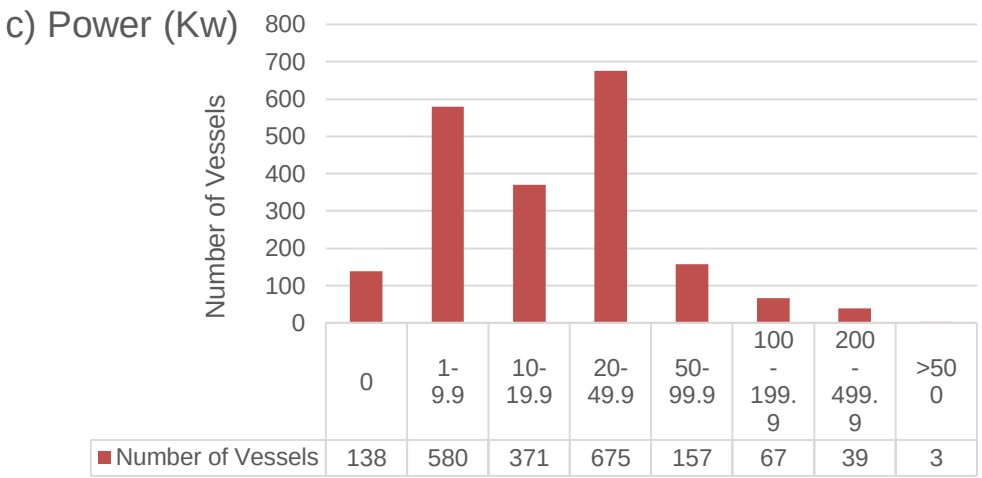
Table 4.6 Current Bulgarian Fleet Capacity (28/5/2014)

Length/LOA (m)	Number of Vessels
<5	412
5-7.9	1289
8-9.9	160
10-11.9	73
12-14.9	34
15-19.9	34
20-29.9	28
30-49.9	0
50+	0
Tonnage (GT)	**Number of Vessels**
<1	778
1-4.9	1057
5-9.9	94
10-29.9	59
30-49.9	26
50-99.9	7
100-199.9	9
200-499.9	0
>500	0
Kw	**Number of Vessels**
0	138
1-9.9	580
10-19.9	371
20-49.9	675
50-99.9	157
100-199.9	67
200-499.9	39
>500	3

Total number of Active Vessels	**2030**







Active Vessels: 2030

Figure 4.9 Bulgarian Fleet Capacity: Length (m), Tonnage (GT) and Power (Kw) of the Active Fleet (as of 29/07/2014)

Figure 4.9a above indicates that the majority of the fleet (84%) are below 7.9m in length. There are no vessels over 30m. Figure 4.9b indicates that nearly all vessels have a GT under 4.9. Figure 4.9c indicates that the fleet exhibits a range of power across the categories but most vessels (80%) have values between 1 and 49.9 Kw.

Gear types and métiers

Figure 4.10 below represents the number of vessels operating specific gear types. They are presented as main and secondary gear types. Data were downloaded from the EU Fleet Community Register on 28/5/2014. See Table 4.4 for descriptions of EU gear codes.

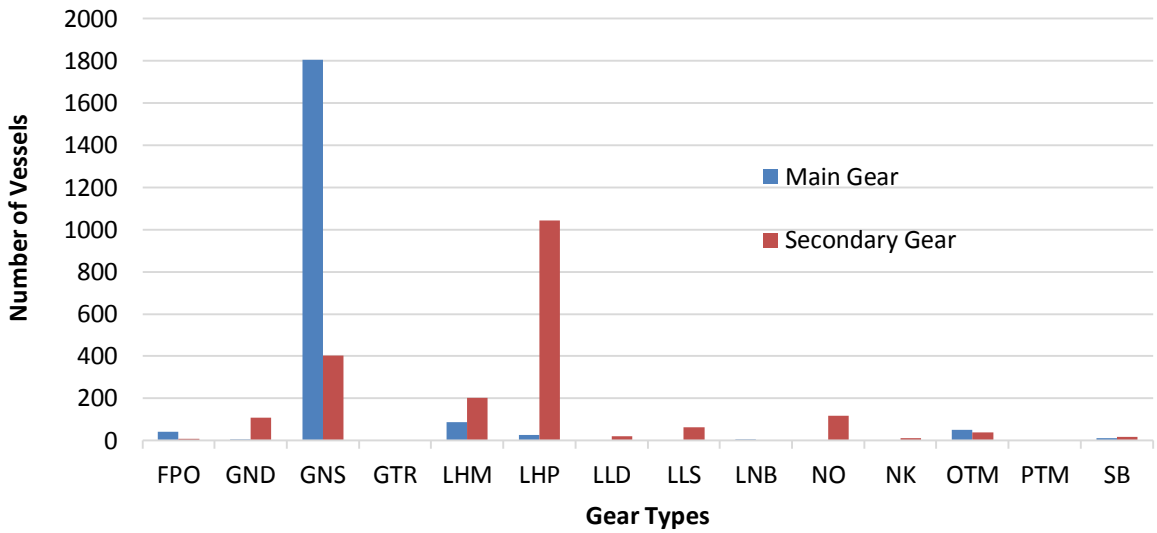


Figure 4.10 Gear Type Utilisation in the Bulgarian Active Fleet (As of 30th July 2014)

Figure 4.10 shows a peak in the GNS category, indicating that most of the active fleet (89%) are using set gillnets as their main gear type. Other common gear types are hand-lines and pole-lines, as secondary gears.

Various métiers, based on Bulgaria's fishing activity were proposed in Bulgaria's latest National Programme (2013), but are based on 2009 data. In 2009, the majority of the active fleet (90%) operated set gillnets (GNS) as their main gear. Other gears in use included mid-water otter trawls (OTM), set long lines (LLS) and stationary uncovered pound nets (FPN). It was also reported that generally, vessels between 12 and 24m LOA were reported to perform pelagic trawling and gillnet fishing.

Figure 4.10 above indicates that set gillnets are still the most widely used gear type. The use of GNS has also increased since 2009 – currently 1805 vessels operate the gear type compared to 1307 vessels in 2009. Changes in gear types over the years are also seen whereby hand lines and pole lines are now widely used (1042 vessels using LHP as secondary gear, 2014), as opposed to the use of set long lines in 2009. The numbers of vessels using mid-water otter trawls has reduced from 67 in 2009 to 51 in 2014. See Table 4.7 below for the detailed 2009 segmentation of the Bulgarian active fleet.

Table 4.7 Segmentation of the Bulgarian active Fishing Fleet per category of fishing technique (main fishing gear) and length. Data based on 2009[176].

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	LOA classes (m)						
Activity	Gear classes	Gear group	Gear type	Target assemblage	Mesh size and other selective devices	< 6	6 > 12	12 > 18	18 > 24	24 > 40	40 +	Total
Fishing activity	Trawls	Pelagic trawls	Mid-water otter trawl [OTM]	Mixed demersal and pelagic species	13-20_0_0	0	9	31	17	10	0	**67**
	Hooks and Lines	Long lines	Set long lines [LLS]	Demersal fish	0_0_0	4	10	9	10	0	0	**33**
	Traps	Traps	Stationary uncovered pound nets [FPN]	Pelagic fish	12-16_0_0	11	27	0	0	0	0	**38**
	Nets	Nets	Set gillnet [GNS]	Small and large pelagic fish	400_0_0	473	786	34	14	0	0	**1307**
				Demersal species								

Bulgaria proposed the following métiers at level 6 of the EC's Mediterranean Sea and Black Sea Fishing Métier classification system221 in their National Programme of 2013214. These data are based on those from 2008 (Table 4.8). The same level of detail is not given as it is for Romania.

Table 4.8 Métiers operated in the Bulgarian Fleet (2009). Table adapted from that published in Bulgaria's National Programme[176].

Métier Level 6	National métier	Fishing ground
OTM_MPD_13-20_0_0	Mid-water otter trawls targeting mixed pelagic and demersal fish.	GSA29
GNS_DEF_400_0_0	Set anchored gillnets targeting demersal fish	GSA29
Misc_FPN_MPD	Stationary uncovered pound nets targeting mixed pelagic and demersal fish	GSA29
LLS_DEF_0_0_0	Set long lines targeting finfish	GSA29

In summary, according to the latest EU Fleet Register data, the Bulgarian active fleet appears to consist mainly of small (<7.9m, <4.9 GT, <49.9Kw) boats operating set gillnets and hand/pole lines.

4.1.2.3. Ukraine

Temporal trends in fleet capacity

With no official or national data reporting in Ukraine relating to fleet capacity, historical changes in this sector can only be estimated from various reports. This is summarised in Table 4.9 below.

Table 4.9 Historical Estimates of Ukrainian Fleet Size.

Year	Estimated Number of Fishing Vessels in the Black Sea	Source
1991	600	World Fishing and Aquaculture233
1999	123 (industrial oceanic fleet only)	World Fishing and Aquaculture233
2006	142	GFCM229
2007	135	GFCM229
2008	123	GFCM229
2008	2300	Duzgunes, E., & Erdogan, N. (2008)224
2013	3 (industrial oceanic fleet only)	World Fishing and Aquaculture233

Results are difficult to interpret as sometimes only sections of the fleets are reported (i.e. industrial oceanic sector). Estimates also vary dramatically for 2008, which may be due to the reported value of 2300 considering both inactive and active vessels. The original source of this value was not provided by Duzgunes, E., & Erdogan, N. (2008)[224] so cannot be validated.

One identifiable trend is seen in the GFCM data whereby estimates suggest that from 2006 to 2008, there was a reduction (13.4%) in the number of fishing vessels. It has also been reported that over the last few years the Ukrainian fishing fleet has almost disappeared, due to a lack of funding for its modernisation[233].

It is therefore assumed that the Ukrainian fleet has limited capacity, which has been declining since at least 2006.

However, a new state program involving the restoration of natural fish spawning grounds and the reduction of taxes on domestic fishermen, amongst other plans, should create conditions for the recovery of the Ukrainian fishing fleet. If successful, the program will involve the construction of 5 trawlers before 2016, expected to operate in the Black Sea region[233].

Current fleet capacity

Table 4.10 and Figure 4.11 below represent the capacity of the Ukrainian active fleet, as of 2012. Data were obtained from the Ukrainian national teams. Up-to-date information was not available.

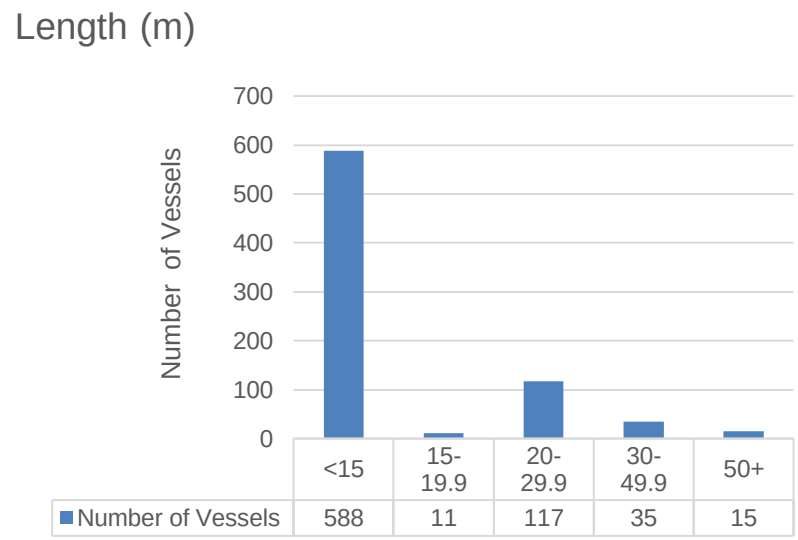
Table 4.10 Current Ukrainian Fleet Capacity (2012[187])

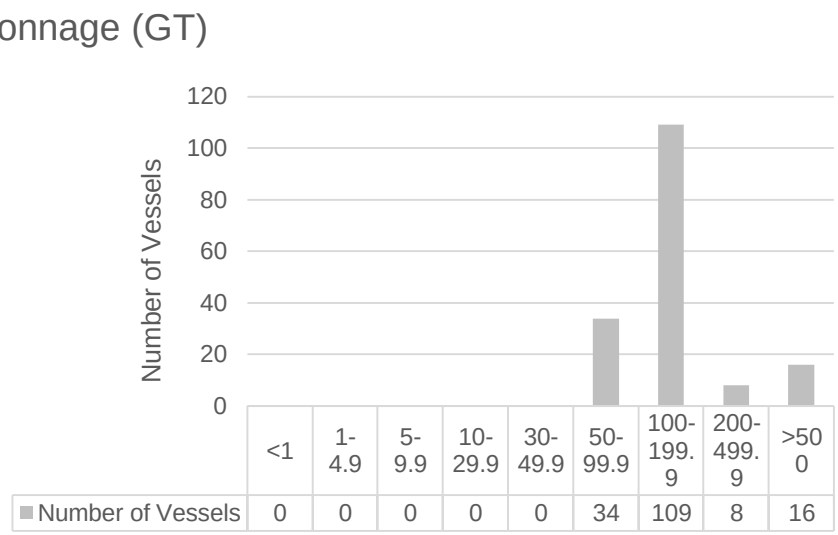
Length/LOA (m)	Number of Vessels
<5	
5-7.9	
8-9.9	
10-11.9	
12-14.9	588
15-19.9	11
20-29.9	117
30-49.9	35
50+	15
Tonnage (GT)	**Number of Vessels**
<1	
1-4.9	
5-9.9	No data
10-29.9	3

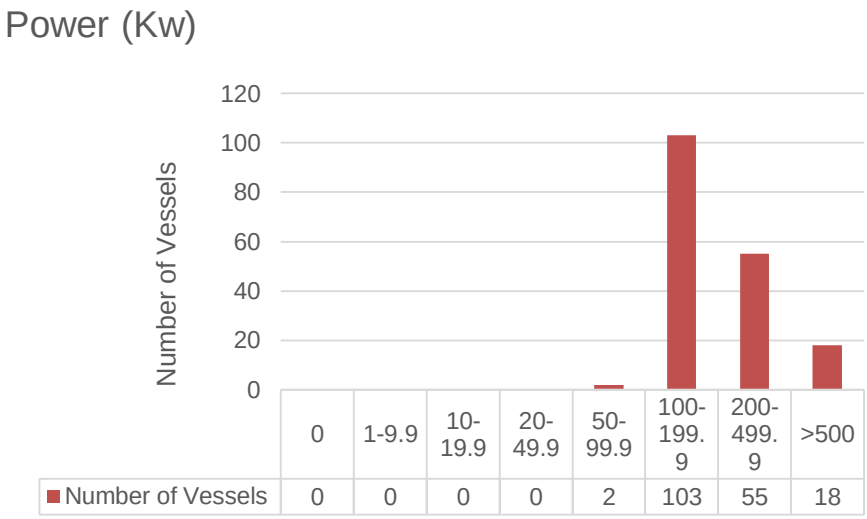
[233] *World Fishing and Aquaculture (2013). Development Plans for Ukrainian Fisheries (Article) [Online]. Available: http://www.worldfishing.net/news101/regional-focus/development-plans-for-ukranian-fisheries [Accessed 18.08.2014].*

30-49.9	8
50-99.9	34
100-199.9	109
200-499.9	8
>500	16
Kw	**Number of Vessels**
0	
1-9.9	
10-19.9	
20-49.9	No data
50-99.9	2
100-199.9	103
200-499.9	55
>500	18
Total number of Active Vessels	**766**

Note: the total number of active vessels differs between length, tonnage and power groupings as no data were given for the low power and low tonnage classes. The size of the active fleet has been estimated from the maximum given; [766.]







Active Vessels: 766

Figure 4.11 Ukrainian Fleet Capacity: Length (m), Tonnage (GT) and Power (Kw) of the Active Fleet.

Figure 4.11a above indicates that the majority (76%) of the fleet are below 15m in length, although 15% of the fleet range between 20 and 29.9 m. There are very few vessels over 50m. There are no tonnage or power data for the under 15m sector of the fleet and the full active fleet is not presented in Figures 4.11b and 4.11c. However, the data provided indicate that a significant proportion of the fleet fall in the 100-199.9 GT and Kw category.

Gear types and métiers

Data regarding the possible gear types and métiers in use in the Ukrainian fleet have been estimated by national teams[225]. Table 4.11 and Figure 4.12 below show this information.

Table 4.11 The list of permitted for the Black Sea (except of Zones of Integral Protection) fishing gears[187]

No	Target species	Fishing grounds	Fishing gears
1	*Alosa pontica*	The Black Sea (except the Karkinitsky Bay), the Dniester, Dnieper and Bug Limans	Shad gillnets **(S)**
2	*A. caspia*	Dnieper and Bug Limans	Gill nets **(S)**
3	*Clupeonella cultriventris, Gobiidae*	Dnieper, Bug and Berezansky Limans	Burilo (small trawls) **(S)**
4	*Engraulis encrasicolus ponticus, Mugilidae, Mugil soiuy, Sarda sarda, Scomber scombrus, Pomatomus saltator*	The Black Sea (except the Karkinitsky Bay)	Purse seines **(PD)**
5	*E. e. maeoticus*	In the Black Sea eastwards of the meridian which passes through Khersones Cape	Purse seines **(PD)**
6	*Gobiidae*	The Black Sea, in the Black Sea estuaries	Trap nets **(S)**, beach seines **(S)**, gobies gillnets **(S)**
7	*Merlangius merlangus, Sprattus sprattus*	The Black Sea (except grounds closed for the trawl fisheries)	Midwater **(PD)** and midwater pair trawls **(PD)**
8	*Mugilidae*	The Black Sea	Trap nets **(S)**, beach seines **(S)**
9	*Mugilidae*	In the Black Sea limans, except Dniester, Dnieper and Bug Limans	Beach seines **(S)**
10	*Mugil soiuy*	The Black Sea	Trap nets **(S)**

11	*M. soiuy, Trachurus mediterraneus ponticus*	The Black Sea	Cast nets **(S)**
12	*M. soiuy, Platichthys flessus luscus*	The Black Sea (except the Karkinitsky Bay)	Gill nets **(S)**
13	*Mullus barbatus*	The Black Sea	Beach seines **(S)**
14	*Psetta maxima*	The Black Sea	Turbot gillnets **(PD)**
15	*Rajiformes, Squalus acanthias*	The Black Sea southwards the line joining Tarkhakut Cape and the Dniester-Tzargorod Lighthouse and eastwards the meridian 30° 00' E	Long lines **(PD)**, bottom nets for dogfish **(PD)**
16	*Trachurus mediterraneus ponticus*	The Black Sea from Meganom Cape to Cape Lukul	Lift cone-shaped nets with electric light attraction **(S)**,
17	*Mytilus galloprovincialis, Rapana venosa*	The Black Sea	Hand harvesting **(S)**
18	*M. galloprovincialis, R. venosa*	The Black Sea (except the Karkinitsky Bay)	Khizhyak's dredge **(S)**
19	*Natantia*	The Black Sea	Beach seines **(S)**, hand harvesting **(S)**
20	*Amphypoda*	The Black Sea, in the Black Sea Limans	Beach seines, hand harvesting **(S)**
21	*Phyllophora spp*	The Black Sea (except the Karkinitsky Bay)	Kitran's trawl **(PD)**
22	*Zostera marina, Cystoseira barbata*	The Black Sea	Reaping-hooks **(S)**, mowers **(S)**, hand harvesting of stormy discards **(S)**
23	Non target fishing	The Black Sea	Pound nets **(PD)**, Bottom trap nets **(S),** Beach seines **(S)**

* **PD** – potential risk of cetacean by-catch; **S** – no risk of cetacean by-catch.

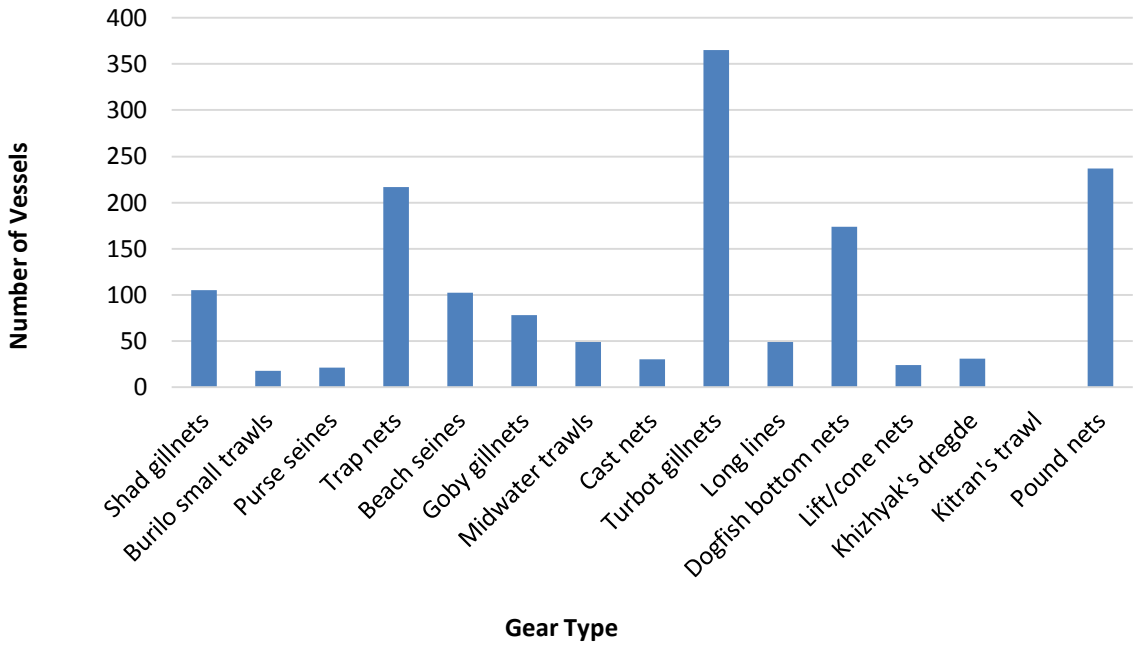


Figure 4.12 Gear Type Utilisation in the Ukrainian Active Fleet (As estimated by national teams in May 2014[187])

Gear types have been matched to EU Gear Codes as closely as possible to enable subsequent comparison between countries. This is shown below in Table 4.12 and Figure 4.13.

Table 4.12 Gear Types Utilised in the Ukrainian Fleet and Matched to EU Gear Codes.

Gear Type	Corresponding EU Gear Code	Number of Vessels
Shad gillnets	GNS – Set gillnets (anchored)	105
Burilo small trawls	OTB – Bottom otter trawls	18
Purse seines	PS – Purse seines	21
Trap nets	FPO – Pots and traps	217
Beach seines	SB – Beach seines	102
Goby gillnets	GNS - Set gillnets (anchored)	78
Mid-water trawls	PTM – Mid-water pair trawls	49
Cast nets	NK – Unknown gear	30
Turbot gillnets	GNS - Set gillnets (anchored)	365
Long lines	LLS – Set long lines	49
Dogfish bottom nets	GNS - Set gillnets (anchored)	174
Lift/cone nets	LNB – Boat-operated lift nets	24
Khizhyak's dredge	DRH – Hand dredges operated from a boat	31
Kitran's trawl	OTB – Bottom otter trawls	0
Pound nets	FPO – Pots and traps	237

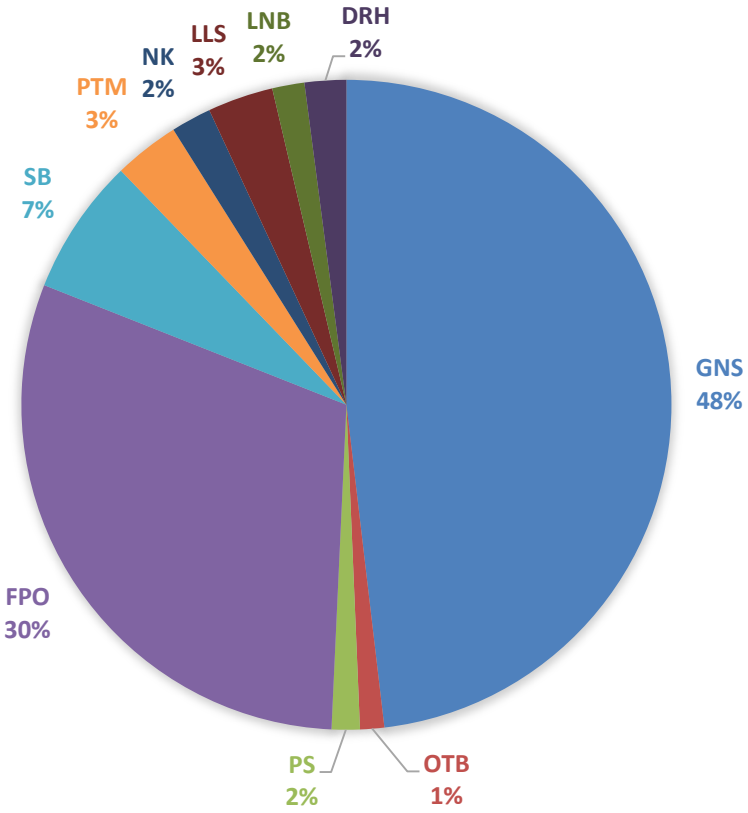


Figure 4.13 The Number of Vessels Utilising Different Gear Types (in terms of EU codes) in the Ukrainian Fleet.

It is important to note that the total number of vessels assigned to various gear types here (1500) exceeds the total given by national teams for fleet capacity data (788). These data rely on estimations from personal observations of the national teams[225] and therefore, results must be interpreted with caution. The true size of the active fleet is unknown.

Together Figures 4.13 and 4.12 indicate that nearly half (48%) of the fleet are likely to be using set gillnets, mostly targeting turbot (24%), but also dogfish (12%), shad (7%) and gobies (5%). A significant proportion of the fleet appear to be operating gear in the FPO category (30%), which consist of pound nets and trap nets targeting mullet and other non-target demersal species. A small proportion of the fleet (7%) appear to operate beach seines targeting gobies, mullet, shrimp and other non-target demersal species.

National team members[225] also provided data in greater detail, specifically for the number of turbot gillnets in use, as these nets are known to be the greatest risk to cetaceans in terms of by-catch. These estimates were based on a series of calculations using data obtained from the UFFS, YugNIRO and reports of the Ministry of Agrarian Policy and Food of Ukraine and are shown below in Table 4.13 (data selected for 2013).

Table 4.13 Distribution of boats by length and the number of gillnets in use with a mesh size of 180-200 mm[187].

Length (m)	Vessel number	Number of Turbot Gillnets
5-7,9	229	4580
8-9,9	66	1320
10-11,9	65	1300
12-14,9	1	100
15-19,9	2	200
20-29,9	2	200
Totals	365	7700

The following main métiers have been proposed for Ukraine's fleet, based on data provided by national teams and from the GFCM[234] that has been matched to EU métier classification[221]:

Table 4.14 Proposed Métiers operated in the Ukrainian fleet (2012-14) based on the EU métier classification.

Métier Level 6	National métier	Target Species
GNS_DEF_100-200_0_0	Set anchored gillnets targeting demersal fish	Turbot, shad, dogfish, gobies.
FPO_ DEF_0_0_0	Pots and traps targeting demersal fish	Mullet and other non-target demersal species.
BS_DEF_0_0_0	Beach seines targeting demersal fish	Mullet and other non-target demersal species.
PTM_SPF_0_0_0	Mid-water pair trawls targeting small pelagic fish	Sprat and whiting

In summary, according to the data provided by the national team, the Ukrainian fleet appears to consist mainly of small boats under 15m, albeit without any data for tonnage and power. This sector of the fleet is likely to operate the set gillnet métier. The larger boats for which tonnage and power data have been provided, may operate other métiers, such as the mid-water trawls.

[234] *GFCM. Database on National Fisheries Legislation: Ukraine. [Online]. Available at: http://nationallegislation.gfcmsecretariat.org/index.php?title=Ukraine [Accessed: 01.08.2014].*

4.1.2.4. Turkey

Temporal trends in fleet capacity

Historical data relating to fleet capacity is limited and is based on that published in various reports. This is summarised below.

Table 4.15 Historical Estimates of Turkish Fleet Size.

Year	Estimated Number of Fishing Vessels in the Black Sea	Source
2007	6631	Saglam and Duzgunes (2010)[235] via Turkish Statistical Institute
2008	7308	Duzgunes, E., & Erdogan, N. (2008)[224]
2008	6597	Turkish Statistical Institute[227]
2009	5973	Turkish Statistical Institute[227]
2010	5937	Turkish Statistical Institute[227]
2011	4993	Turkish Statistical Institute[227]
2012	5113	Turkish Statistical Institute[227]

[235] *Saglam, N. E., & Duzgunus, E. (2010). Comparative approach to analyze fishing fleet profile of Turkey and European Union as an indicator of fishing effort.Scientific Research and Essays, 5(21), 3572-3584.[Online]. Available: http://www.academicjournals.org/article/article1380534981_Saglam%20and%20Duzgunes.pdf [Accessed 18.08.2014].*

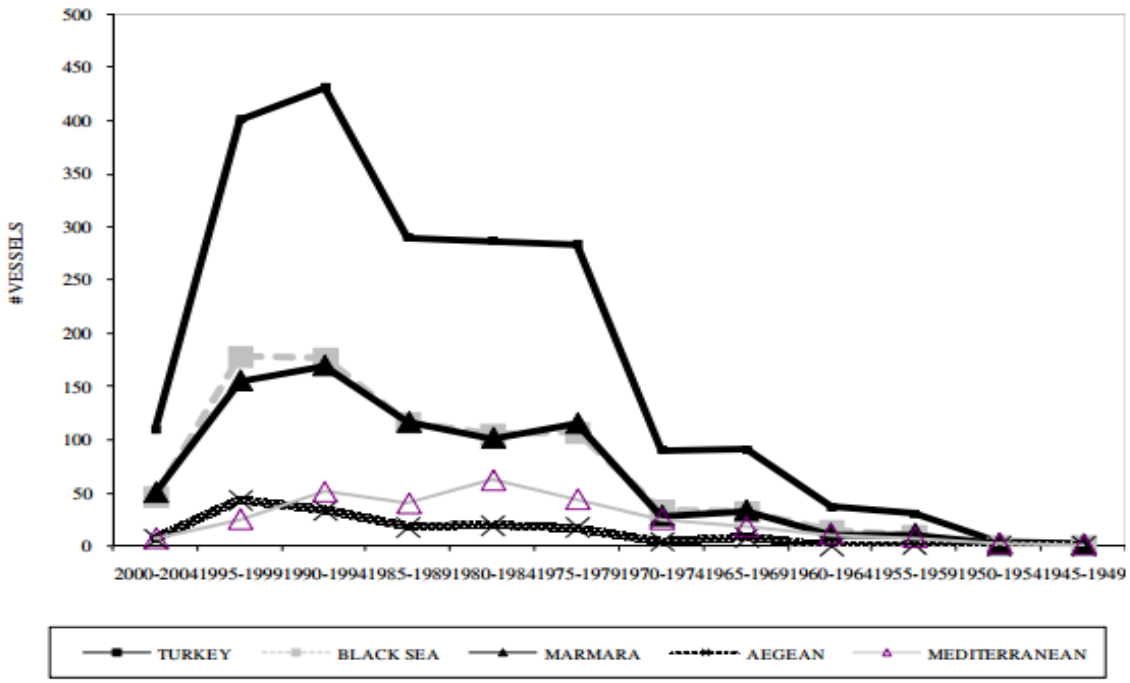


Figure 4.14 Historical Estimates of Turkish Fleet Size 1945-2000. Source: Saglam and Duzgunes (2010)[197]

Figure 4.14 shows that the Black Sea Turkish fleet experienced two main growth periods in the 1970s and from 1990 to 1994. In 1980, the abolition of custom duties and low interest credits induced the development of a trawl fleet, with larger vessels and fishing gear. This period of rapid expansion caused a dramatic decline in the target species of trawl fisheries (including whiting, red mullet and turbot) in the Black Sea region and the stocks collapsed in the 2000s[236].

After 2000, subsidized fishery credits proved not to have been a driver for fishing pressure and since 2002, it has not been possible to obtain new licences[229]. The more recent data provided by the Turkish Statistical Institute from 2007-2012 (Table 4.15) show that the size of the fleet has decreased (by 1484 vessels), indicating a reduction in capacity over the years. The government now purchases fishing vessels which are not in use to decrease the overall fishing capacity.

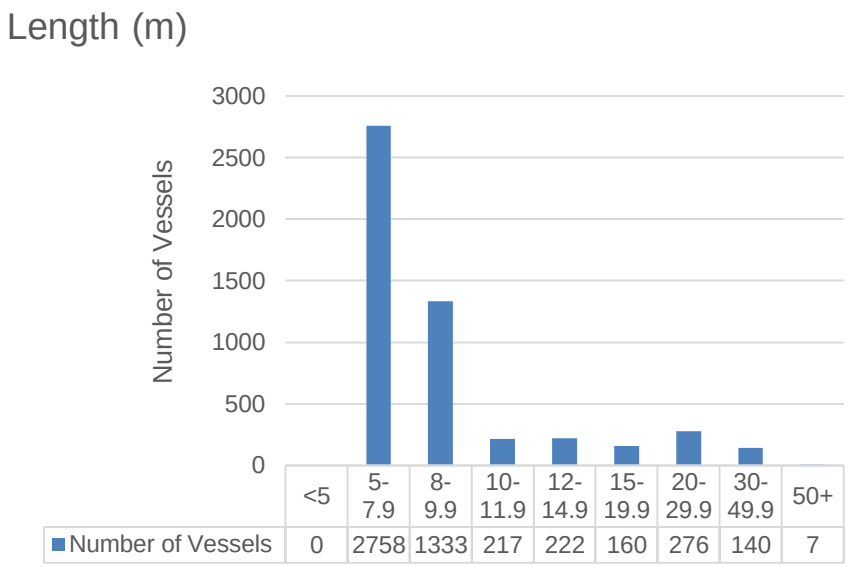
Current fleet capacity

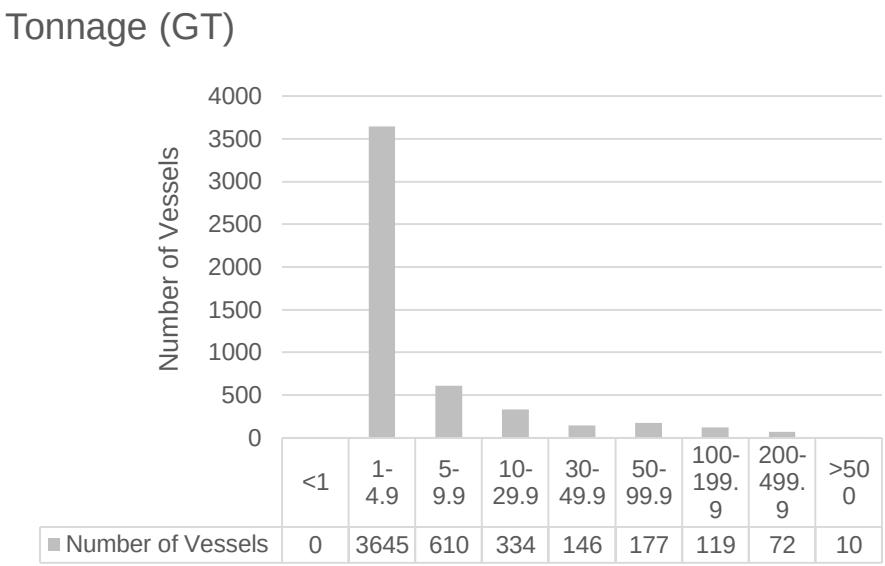
Table 4.16 and Figure 4.15 below represent the capacity of the Turkish active fleet, as of 2012. Data were obtained from the Turkish national teams, via the TurkStat Fishery Statistics Book, 2012[227]. Up-to-date information was not available.

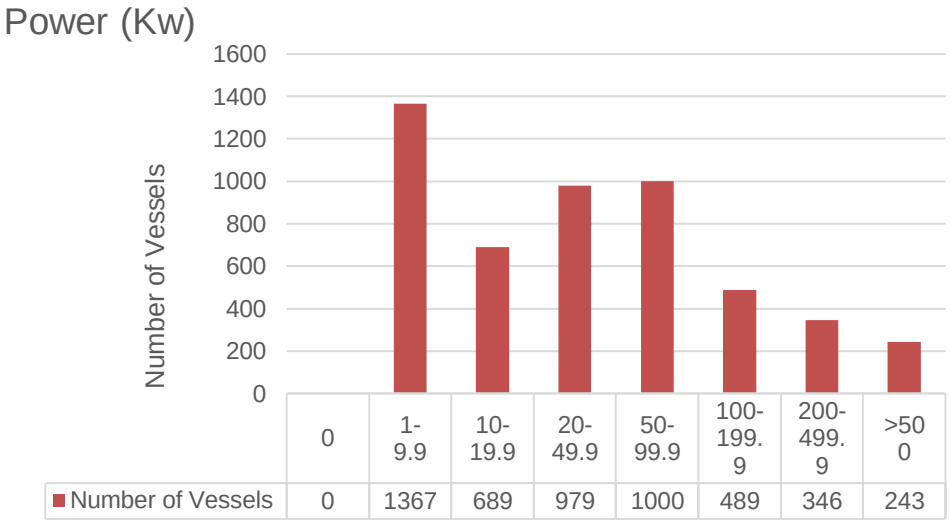
[236] *Zengin, M. (2014). Last Three Decades of the Turbot Fisheries in the Turkish Black Sea Coast. In: Duzgunes, E., Ozturk, B., and Zengin, M. (Eds) (2014). Turkish Fisheries in the Black Sea. Published by Turkish Marine Research Foundation (TUDAV), Publication number: 40, Istanbul, Turkey.*

Table 4.16 Turkish Fleet Capacity (2012[189])

Length/LOA (m)	Number of Vessels
<5	0
5-7.9	2758
8-9.9	1333
10-11.9	217
12-14.9	222
15-19.9	160
20-29.9	276
30-49.9	140
50+	7
Tonnage (GT)	**Number of Vessels**
<1	0
1-4.9	3645
5-9.9	610
10-29.9	334
30-49.9	146
50-99.9	177
100-199.9	119
200-499.9	72
>500	10
Kw	**Number of Vessels**
0	0
1-9.9	1367
10-19.9	689
20-49.9	979
50-99.9	1000
100-199.9	489
200-499.9	346
>500	243
Total number of Active Vessels	**5113**







Active Vessels: 5113

Figure 4.15 Turkish Fleet Capacity: Length (m), Tonnage (GT) and Power (Kw) of the Active Fleet

Figure 4.15a above indicates that the majority of the fleet (80%) in 2012 was between 5 and 9.9m in length. There were no vessels under 5m and very few over 50m. Figure 4.15b indicates that the majority of the fleet (71%) have a gross tonnage of between 1 and 4.9, no vessels with a GT under 1 and none with a GT over 50. Figure 4.15c indicates that the fleet exhibit a wide range of power across the categories but that most vessels have a horsepower of between 1 and 99.9 Kw.

Gear types and métiers

The only data regarding gear types provided by the Turkish national teams is shown in Table 4.17 below. The data given refers to the Black Sea coast.

Table 4.17 Turkish Vessel Operating Types (2012[189]) on the Black Sea Coast.

Total	2008	2009	2010	2011	2012
Trawler	147	152	280	281	289
Purse seiner	374	323	241	195	158
Trawler-Purse seiner	192	160	168	189	181
Carrier vessel	130	107	80	112	112
Other	5744	5231	5168	4216	4373
Total	6587	5973	5937	4993	5113

The 'other' category is likely to be small boats operating mixed gears (gillnetters, anglers and small purse seiners)[226].

The GFCM also report the following: "The Turkish legislation (Fisheries Regulation 22223) regulates in particular the use of surrounding nets (Art. 16); light fishing (Art. 17); and seine nets, gillnets and other fishing nets (Art. 18). Mesh size of cod-end in trawl nets should be 44 mm (diamond) or 40 mm (square). The use of drift-net is also prohibited (Art. 21.k). At least a 40mm mesh size opening for the whole demersal trawl cod-end is implemented and the use of deep trawl nets fisheries at depths beyond 1000 m of depth is prohibited in accordance (Notification 2/1 Regulating Commercial Fishing, Art.10 (ç-2) and (ç-7)).”[237]

4.1.3. Comparisons between countries

In this section, the fleet capacity and the gear types in use will be compared between countries to identify trends and differences in the current fishing activities of the Black Sea.

[237] *GFCM. Database on National Fisheries Legislation: Turkey. [Online]. Available at: http://nationallegislation.gfcmsecretariat.org/index.php?title=Turkey#Fishing_gear_and_methods [Accessed: 01.08.2014].*

4.1.3.1. Temporal trends in fleet capacity

Recent data (2006/8 to current) show that the capacity of all fleets have been in decline. This can be seen in terms of fleet size, horse power and gross tonnage for Bulgaria and Romania but not for Ukraine and Turkey, where declines are seen in terms of fleet size only.

In general, it is reported that the EU's fishing fleet capacity has declined fairly steadily since the 1990s, in terms of both tonnage and engine power[238]. In Turkey, this appears to have been caused by a decline in fisheries resources which is likely to have also affected fleet capacity in the other countries.

4.1.3.2 Current fleet capacity

Number of active vessels

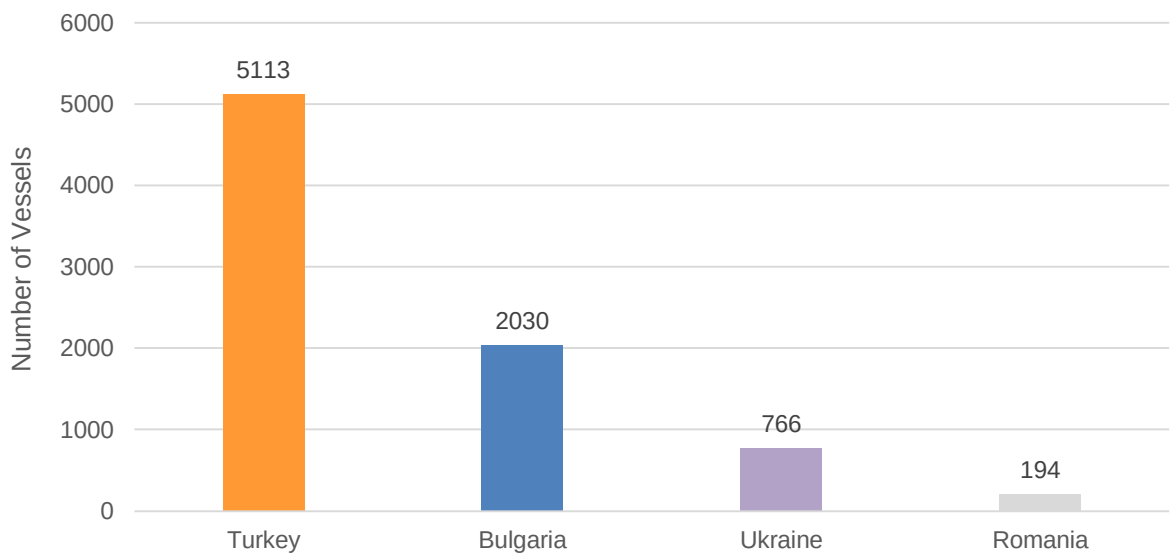


Figure 4.16 Estimated Number of Active Vessels in All Countries.

Figure 4.16 above indicates that the Turkish active fleet is significantly larger than the active fleets in Bulgaria, Ukraine and Romania. The sizes of the active fleets presented here will not be fully representative of the current fleet activity, for reasons that vary between countries.

In Turkey the numbers are based on data from 2012 and are therefore not up-to-date.

In Bulgaria and Romania, the number of active vessels are up-to-date but can only be considered as estimates due to: a) fleet segments with low vessel numbers for which data is hard to obtain or for which there are confidentiality issues, b) only active fleets being submitted by Member States upon

[238] *Eurostat (2013). Agriculture, forestry and fishery statistics, 2013. [Online]. Available: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-FK-13-001/EN/KS-FK-13-001-EN.PDF [Accessed 18.08.2014].*

data call, as opposed to full fleets being represented on the Community Register, and c) differences in data representation from different sources (i.e. the Community Register and National Programmes).

In Ukraine, the numbers of vessels have been estimated by the national team, based on 2012 statistics, so are out-of-date.

Vessel length

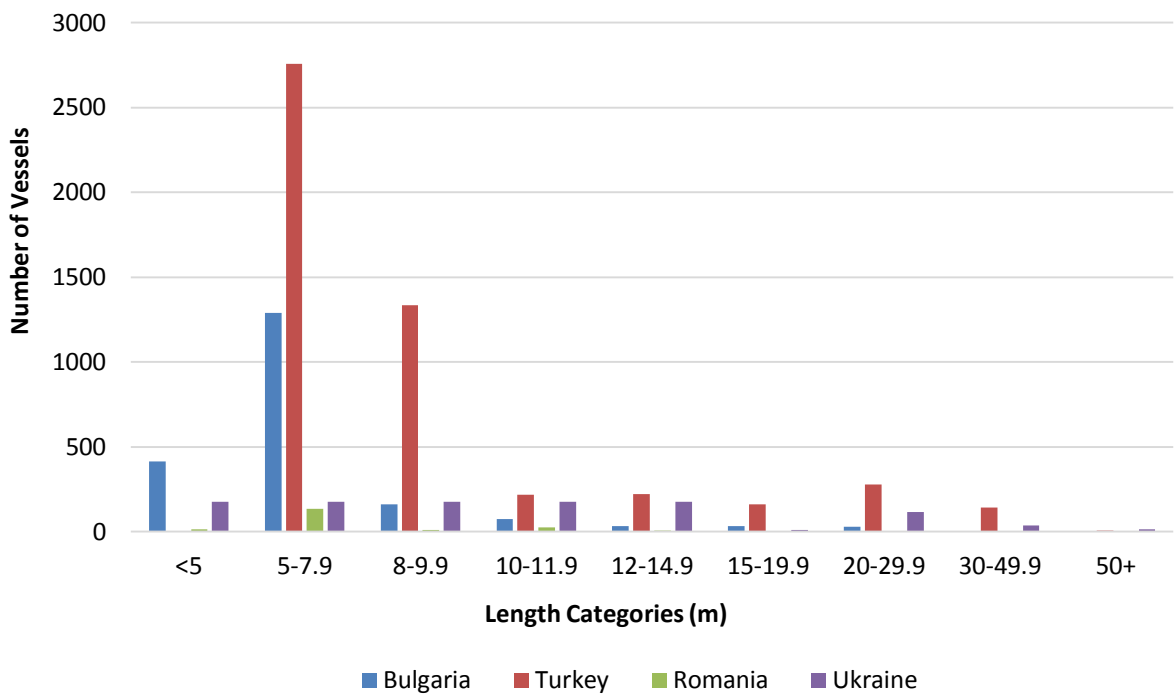


Figure 4.17 Estimated Number of Active Vessels in All Countries Over Various Length Categories.

Figure 4.17 indicates that the majority of fleets are dominated by small sized vessels (5-9.9 m in length). Bulgaria's fleet has largest number (412) of <5m vessels and Ukraine's fleet have the largest number of >50m vessels. Note for Ukraine that national teams reported 588 vessels across the first 5 length categories, so equal numbers of vessels (177.6) have been placed in each of these categories, although the actual distributions of vessels are likely to vary between these categories.

Vessel tonnage

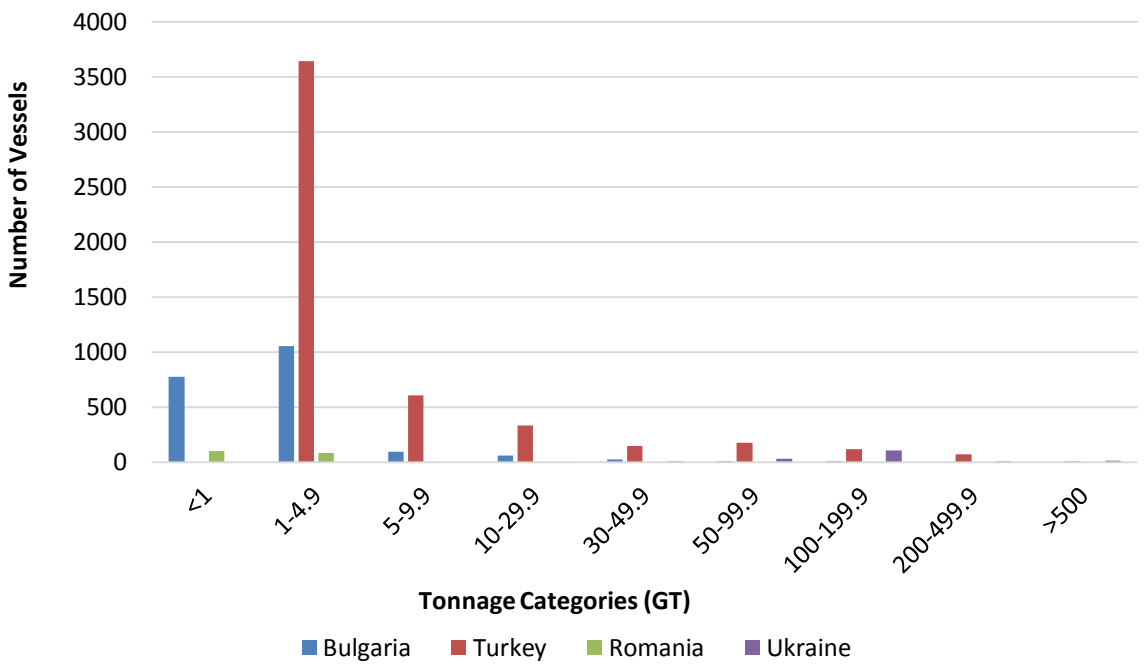


Figure 4.18 Estimated Number of Active Vessels in All Countries Over Various Tonnage Categories.

Figure 4.18 indicates that the majority of fleets are dominated by small tonnage vessels (<1-9.9 GT). Bulgaria's fleet has largest number (778) of <1 GT vessels and Ukraine's fleet have the largest number of >500 GT vessels. However the actual distribution of vessels in the Ukrainian fleets are not likely to represent the current situation as Ukrainian national teams reported that there were no data on the distribution of vessels in the GT categories below 9.9 GT.

Vessel power

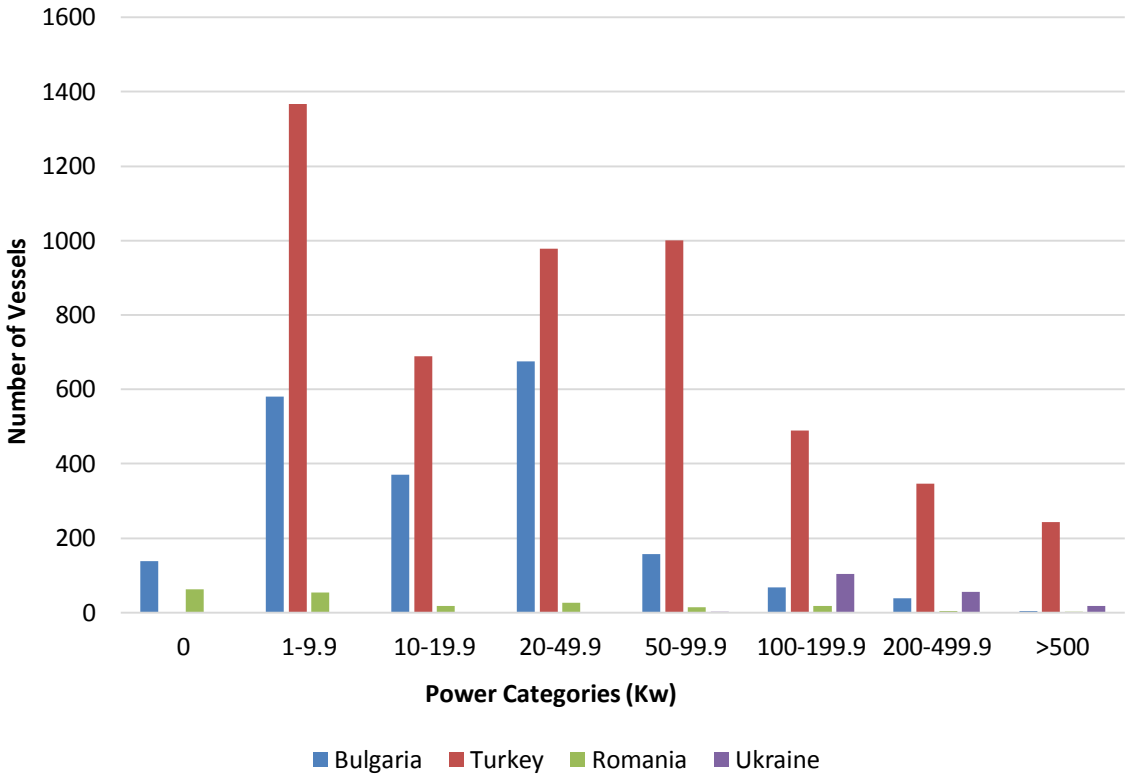


Figure 4.19 Estimated Number of Active Vessels in All Countries Over Various Power Categories.

Figure 4.19 indicates that the all fleets demonstrate a wide range of horse power. This suggests that smaller boats in the Black Sea can operate a multitude of fishing practices and gears, as the majority of fleets appear to consist of small vessels (see above in this section). Bulgaria's fleet has largest number (138) of vessels with no horsepower and Turkey's fleet has the largest number of maximum power (>500 Kw) vessels. Note that Ukrainian national teams reported that there were no data on the distribution of vessels in the Kw categories below 49.9 Kw.

Gear types and métiers

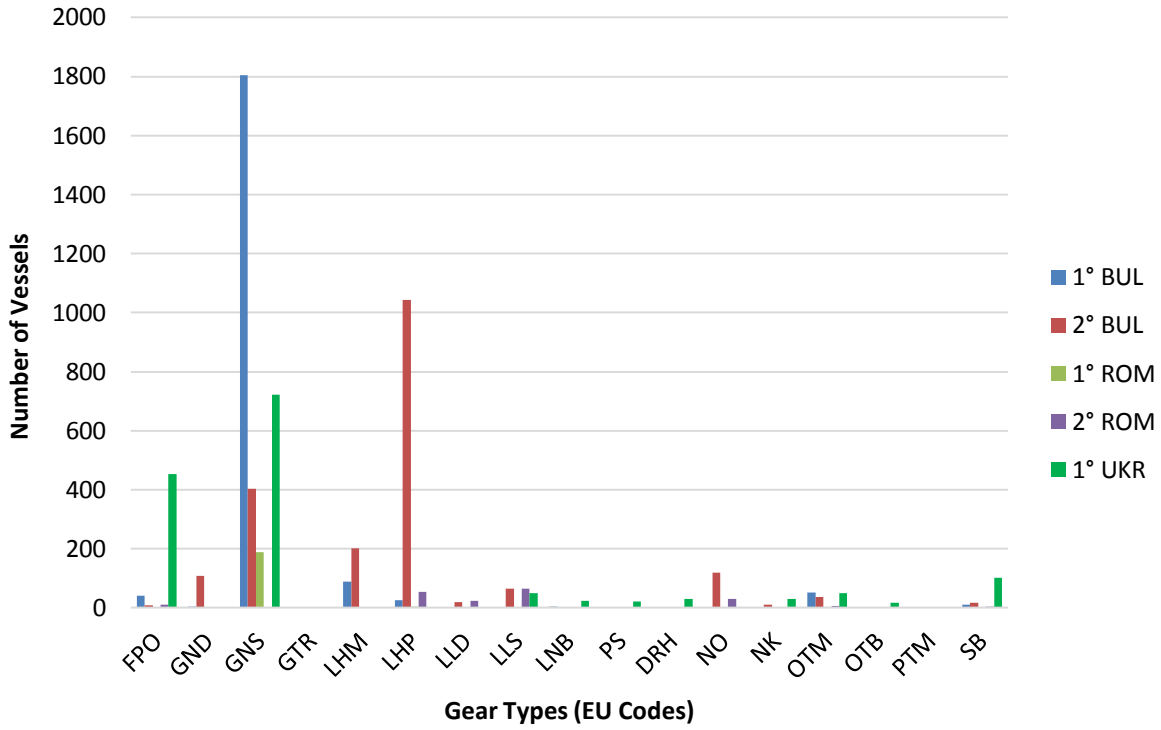


Figure 4.20 Gear Type (EU classified) Utilisation in Bulgaria, Romania and Ukraine. See Table X for gear code descriptions.

Figure 4.20 above shows the number of vessels utilising different gear types (matched to EU gear types for Ukraine) in all fleets bar Turkey. The most widely used gear type across the countries are set gillnets (GNS). Hand-lines and pole-lines (LHP, LHM) are widely used in Bulgaria, as are pots and traps (FPO) in Ukraine.

4.2. Quantification of fishing gear in use in the Black Sea

As presented above, the national fleet statistics provided by some countries were not sufficiently detailed to provide information about the distribution of fishing fleets, let alone the level of detail needed to determine effort or dimensions and properties of fishing gear used. As such, the fishermen's survey is a critical component of the project, providing a detailed snapshot of fishing capacity, effort and marine mammal by-catch in each country. When the information collected from the fishermen's survey is extrapolated with information from the national statistics (i.e. the total size of the active fleet), an idea of full operating capacity in the Black Sea can be obtained.

4.2.1. Methodology

Figure 4.21 below illustrates the process by which data from the fishermen's were collected:

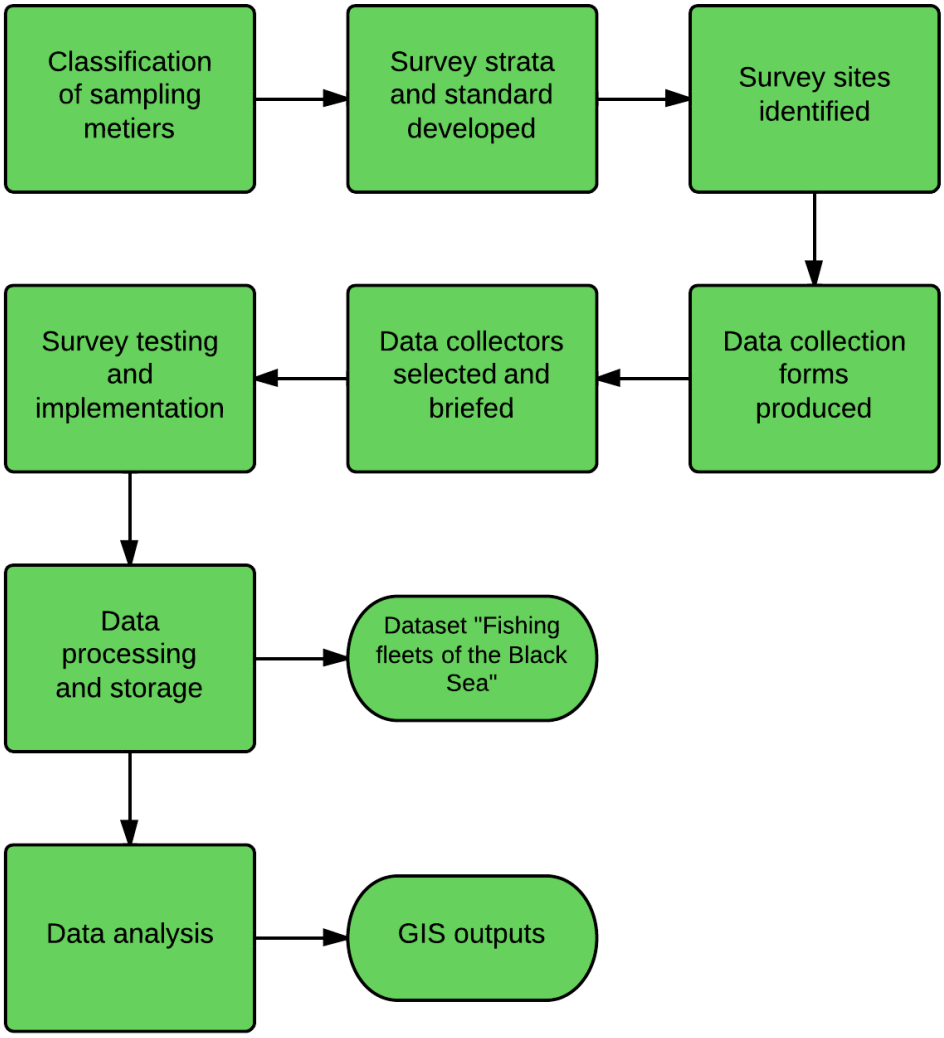


Figure 4.21 Approach applied to develop dataset (included as electronic annex to this report) and which will provide foundation for analysis of effort and active gears in study area within the Black Sea

Initially, based on discussions with national experts, survey standards were set and a data collection form was developed in Excel by the technical and management units (see Annex 2). Once finalised, a member of the national teams travelled to pre-identified fishing harbours in their respective countries to conduct the survey through interviews with fishing vessel owners and fishermen. Information was obtained primarily from owners of vessels, of whom the majority were also the skipper or master of the fishing vessel. Harbours surveyed tended to be larger harbours, which were the home port of a broad variety of vessels in terms of vessel size, gears deployed and number of fishing units. Sampling sites were also based on how representative each site was in terms of the structure of the national fleet. Surveys took place during March and April in Bulgaria, Romania and Ukraine, while surveying in Turkey took place during August and September.

Figures 4.22, 4.23 and 4.24 below show the distribution of these sampling sites for various data categories in the survey. The large number of sites in Turkey were aggregated into east Black Sea and west Black Sea to reflect data representation in the Turkish National Fisheries Statistics.

Figure 4.22 Number of vessels surveyed in each region in the Black Sea. CRS: WGS 84

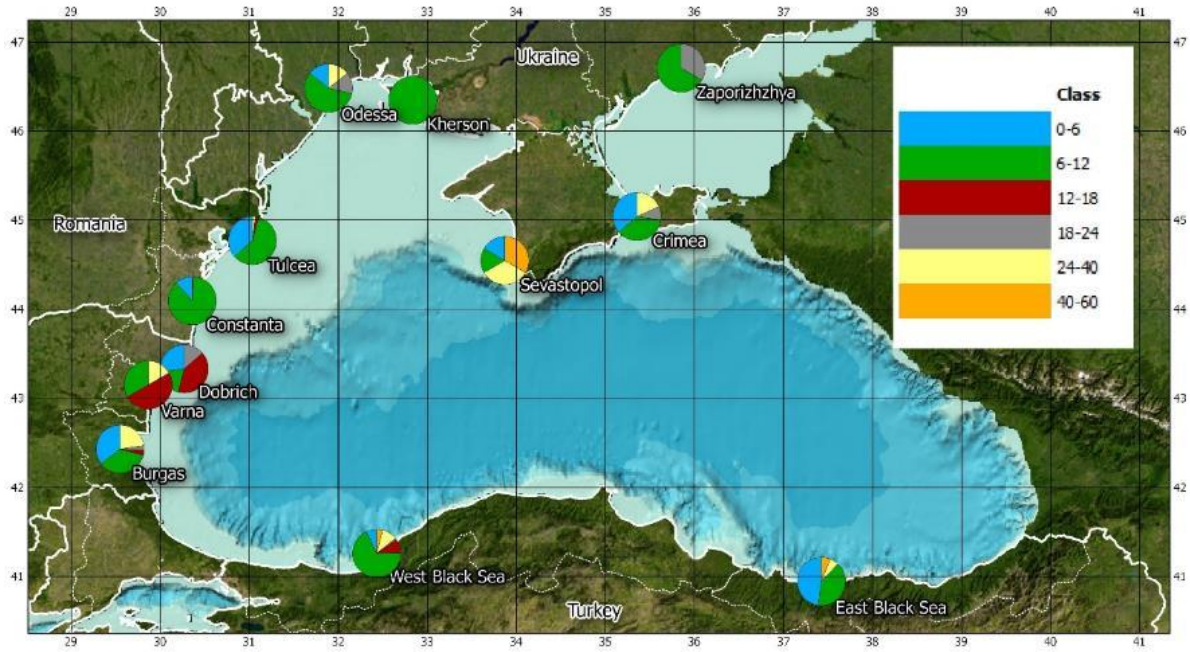


Figure 4.23 Distribution of vessel size classes of all vessels surveyed in the Black Sea. CRS: WGS 84.

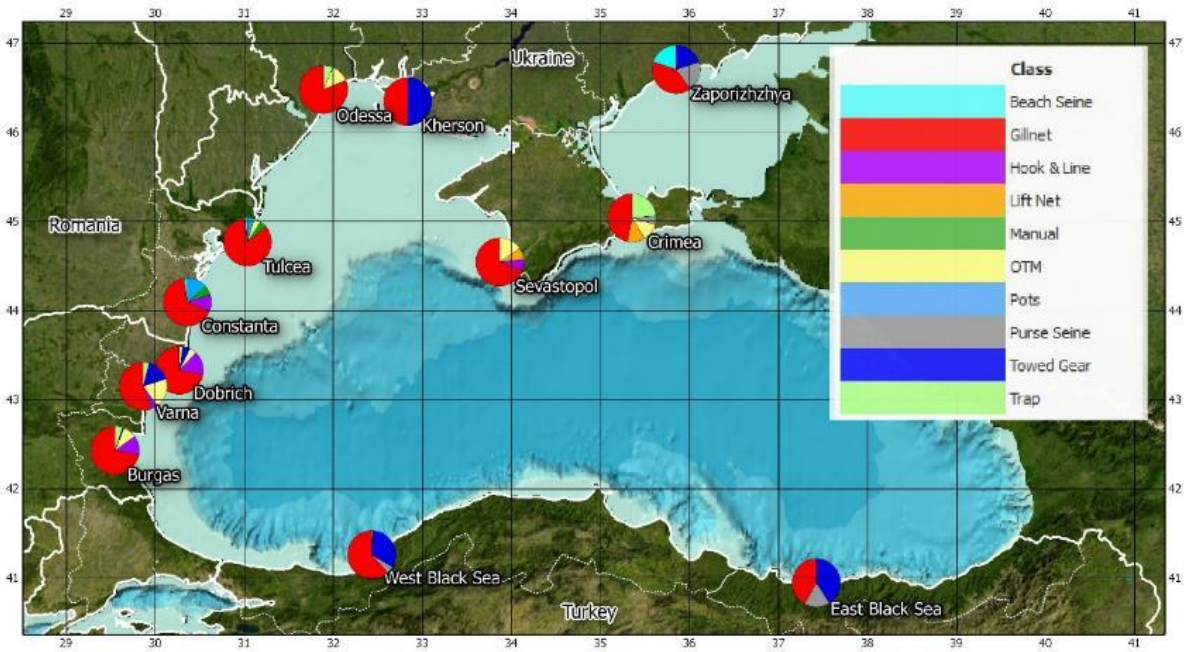


Figure 4.24 Distribution of each gear class across the Black Sea. CRS: WGS 84.

Data were sent electronically to MEP as completed MS Excel questionnaire sheets. A Quality Assurance check was carried out and the data were subsequently collated into one spreadsheet. This spreadsheet was then transferred into an MS Access database, which holds also data collected from the survey.

4.2.2. Data Collected

The fishermen's survey dataset has provided insight into the both the nature of the fishing fleets operating in the study area and into the interaction of these fisheries with cetaceans in the Black Sea.

In general, the survey sought to provide information on three main data categories including fishing effort, interactions with marine mammals and seasonality. Most questionnaire responses provided information under unique vessel, port and gear type identifications, so it was possible to group and analyse data by fleet segment or métier.

The specific types of data collected in each category are summarised below:

Fishing Effort:

- Vessel length
- Days fished per month
- Crew size
- Trip length
- Métiers operated

Individual boats can operate several métiers targeting different species and as a result, data relating to the effort of that métier included, for example, mesh or hook size, the average number of fleets or strings deployed, the average length of floatline, depth fished and soak time. Data were also collected

on the average weight of landings, including an estimate of the weight of a 'good' and 'bad' landing. This approach was followed as it can provide an insight into the estimate of average catch provided.

Mammal Interactions:

- Mammal species encountered
- Frequency and time of damage
- Number of trips affected by mammals
- By-catch species encountered
- Opinions on the management of mammals
- Awareness of legislation regarding mammals

4.2.3. Outputs

The resulting database of fishing effort, seasonality and associated marine mammal interaction from the fishermen's survey has enabled the characterisation of the following:

- The definition of fleet segments in the Black Sea
- Annual fishing days per fleet segment
- Maximum dimensions of fishing gears currently in use
- Fisheries or fishing gears with the highest by-catch rates
- Distribution of reported and observed fishing effort
- Estimation of by-catch rates (by gear type and species) produced for the survey area
- Estimates of cetacean mortality and impact on populations

Some of these outputs will be presented using GIS maps. For example, by using effort data from the survey in conjunction with an estimate of the distance travelled from the home port to the most distant fishing grounds, fishing effort within a given distance from a home port by gear type can be shown.

4.2.4. Defining fleet segments

In order to define the fleet segments operating in each country, data on fishing effort, seasonality and marine mammal interaction has been analysed by métier. Métiers have been initially based on the data collected during the fishermen's survey, which provided information on gear type, target species and other selective devices such as mesh size.

The EC already set a métier classification system and the data from the fishermen's survey were grouped to match this. There is a specific classification for the Mediterranean and Black Sea (Commission Decision 2008/949/EC)[239] that has been applied (Table 4.18).

[239] *EC. Commission Decision 2008/949/EC. Adopting a multiannual Community programme pursuant to Council Regulation (EC) No 199/2008 establishing a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the common fisheries policy. [Online]. Available: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:346:0037:0088:EN:PDF#page=23 [Accessed 28.08.2014].*

Table 4.18 Mediterranean and Black Sea Fishing Activity Métier Classification. Taken from EC[201].

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Activity	**Gear classes**	**Gear groups**	**Gear type**	**Target assemblage**	**Mesh size and other selective devices**
Fishing Activity	**Dredges**	Dredges	Boat dredge [DRB]	Molluscs	
	Trawls	Bottom trawls	Bottom otter trawl [OTB]	Demersal species	
				Deep water species	
				Mixed demersal species and deep water species	
			Multi-rig otter trawl [OTT]	Demersal species	
			Bottom pair trawl [PTB]		
			Beam trawl [TBB]		
		Pelagic trawls	Midwater otter trawl [OTM]	Mixed demersal and pelagic species	
			Pelagic pair trawl [PTM]	Small pelagic fish	
	Hooks and Lines	Rods and Lines	Hand and Pole lines [LHP] [LHM]	Finfish	
				Cephalopods	
			Trolling lines [LTL]	Large pelagic fish	
		Longlines	Drifting longlines [LLD]	Large pelagic fish	
			Set longlines [LLS]	Demersal fish	
	Traps	Traps	Pots and Traps [FPO]	Demersal species	
			Fyke nets [FYK]	Demersal fish	
				Demersal species	
			Stationary uncovered pound nets [FPN]	Large pelagic fish	
	Nets	Nets	Trammel net [GTR]	Demersal species	
			Set gillnet [GNS]	Small and large pelagic fish	
				Demersal species	
			Driftnet [GND]	Small pelagic fish	
				Demersal species	
	Seines	Surrounding nets	Purse seine [PS]	Small pelagic fish	
				Large pelagic fish	
			Lampara nets [LA]	Small and large pelagic fish	
		Seines	Fly shooting seine [SSC]	Demersal species	
			Anchored seine [SDN]		

			Pair seine [SPR]		
			Beach and boat seine [SB] [SV]		
	Other gear	Other gear	Glass eel fishing	Glass eel	
	Misc. (Specify)	Misc. (Specify)			
Other activity than fishing				Other activity than fishing (OATF)	
Inactive				Inactive	
Recreational fisheries				Only for these species: Blue tuna, Eels (BFTE)	Not applicable

Métiers are usually expressed by the fishing gear, target species and mesh size. For example, OTB_DEF_>105 translates to a vessel or group of vessels targeting demersal species, using bottom otter trawls with a mesh size of less than 105 mm.

Table 4.18 shows no official classification for Black Sea mesh sizes, so appropriate classes have been assigned based on a combination of those proposed in EU National Programmes (Bulgaria and Romania), on expert input from the national teams and on classes reported in the fishermen's survey.

The mesh sizes given in the EU National Programmes are often based on legal mesh size limits but in reality, other mesh sizes for the same target species will be in operation as part of the illegal fishery. The fishermen's survey has accounted for this and therefore provides the greatest level of detail for some métiers at EC Métier Level 6. It is important to segregate to mesh size as different nets, such as those targeting gobies will pose different risks to cetaceans than those nets targeting turbot.

An example of the gillnet métier is now used to demonstrate how métiers were assigned to the fishermen's survey data, thereby creating fleet segments.

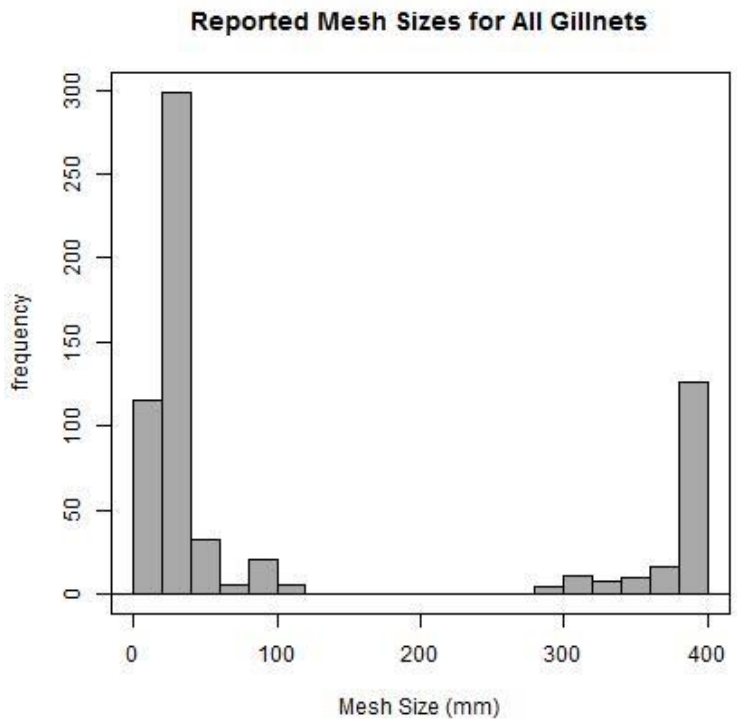


Figure 4.25 The frequency of different gillnet mesh sizes (mm) reported in the fishermen's survey.

Figure 4.25 shows 2 groups of gillnet net mesh sizes as reported in the fishermen's survey. These were subsequently grouped under the EU classification system as GNS_<150 – vessels operating gillnets of less than 150mm, and GNS_ >280 - vessels operating gillnets greater than 280mm.

It is of note here that 200mm mesh sizes have been reported for Black Sea fleets but were not sampled by the fishermen's survey. These gillnet mesh sizes represent the dogfish gillnet fisheries, which are known to pose a significant threat to cetaceans. Although this métier clearly exists, (GNS_DEF_150-280), there is a lack of associated fishing effort and by-catch data from national statistics or the fishermen's survey to analyse its impact in detail.

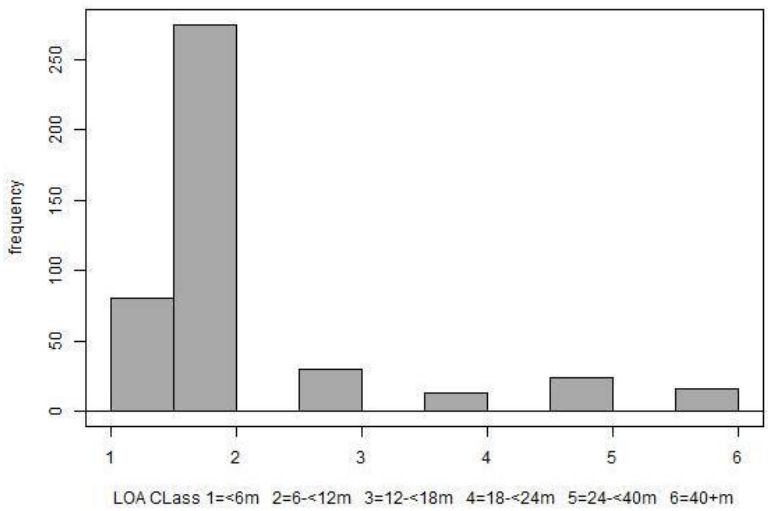


Figure 4.26 The frequency of different vessel lengths (m) reported in the fishermen's survey.

Métiers were also assigned by vessel length to EU LOA classes. Figure X shows the distribution of vessel lengths from the fishermen's survey in these categories. All métiers identified in the fishermen's survey are presented below.

In total there were 438 boats and 1075 boat-métier combinations. All métiers identified in the survey are presented below.

Table 4.19 All survey métier types

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	LOA Classes (m)					
Activity	**Gear Class**	**Gear Group**	**Gear Type**	**Target Assemblage**	**Mesh Size and other selective devices**	**< 6**	**6 - < 12**	**12 - < 18**	**18 - < 24**	**24 - < 40**	**40 & +**
Fishing	Dredges	Dredges	Boat dredge	Molluscs				5	2	1	
				Not Specified				1			
	Hooks& lines	Longlines	Set longlines	Demersal		2	37				
		Rods and lines	Hand lines	Demersal		13	11				
				Mixed Demersal and Large Pelagic		2					
				Not Specified			1				
	Nets	Lift net	Boat lift net	Demersal			2				
				Small Pelagic						1	
		Nets	Set gillnets	Demersal	<150	26	115	1	1	2	
					>280	19	135	10	3	5	
				Freshwater	<150			1			
				Large Pelagic	<150		72	2			
				Mixed Demersal and Large Pelagic	<150		3				
				Mixed Demersal Small Pelagic	<150	23	31				
				Small and Large Pelagic	<150	2	1	6			

				Small Pelagic	<150	36	115				
				Not Specified		2	6				
			Drift gillnets	Large Pelagic	<150	9	19	8	2		
	Other gear	Other gear	Manual harvest	Molluscs		4	19	1		1	
				Not Specified			2				
	Seines	Seines	Boat seine	Demersal			2				
				Mixed Demersal and Large Pelagic			4				
				Mixed Demersal Small Pelagic		2	2				
			Purse seine	Large Pelagic	14-60	14	45	3	3	8	
				Small Pelagic	<14	6	15		1	17	17
				Not Specified		1	3				
	Traps	Traps	Pots and traps	Demersal		4	45	1		1	
			Pound net	Freshwater				1			
				Mixed Demersal and Large Pelagic			1				1
				Mixed Demersal Small Pelagic		6	27	1			3
				Small and Large Pelagic		1					1
				Small Pelagic		15	26				
	Trawls	Bottom trawl	Bottom otter trawl	Demersal				6	2	2	
		Pelagic trawls	Burilo	Small Pelagic				1			
			Midwater otter trawl	Mixed Demersal and Large Pelagic			1	2		2	
				Mixed Demersal Small Pelagic						1	

				Small and Large Pelagic			1	6	2	6	
				Small Pelagic					1	3	2
					Totals	187	741	56	17	50	24

4.2.5. Maximum dimensions of fishing gear used

Investigating the overall dimensions of the fishing gears in operation in the western Black Sea is important for estimating the maximum total fishing capacity and for understanding cetacean by-catch. There are two distinct elements that will need to be determined:

1. The total quantity of the gear used by a single fishing boat to determine total fishing capacity of a fleet. Table 4.20 describes what information is required to estimate this.

Table 4.20 Information required for estimating total fishing effort

Fishing Gear	Dimensions	Calculation
Gillnets	Total surface area	$(Headline\ length\ of\ a\ net\ (m) \times\ Net\ height\ (m)$ $\times$ $(No.of\ nets\ in\ a\ string\ \times\ No.of\ strings\ per\ vessel)$
Longline	Total number of hooks	$No.hooks\ per\ line\ \times No.lines\ per\ vessel$
Trawl	Net opening	$Width\ trawl\ doors\ (m) \times\ Height\ of\ trawl\ (m)$
Purse Seine	Total surface area	$Headline\ length\ (m) \times\ Net\ height(m)$

2. Specifics of the fishing gear used which will determine their potential impact on cetacean by-catch. Table 4.21 describes what information is required to estimate this.

Table 4.21 Information required for each fishing métier that could affect cetacean by-catch rates

Fishing Gear	Dimensions	Information Required
Gillnets	Mesh size hanging ratio	The common mesh sizes and hanging ratios
Longline	Hook size and type	The common hook sizes and types
Trawl	Mesh sizes	The cod end and wing mesh sizes
Purse Seine	Mesh size	The common mesh sizes

To obtain the most accurate information on total fleet capacity, the data from the fishermen's survey was supplemented with other sources. All data sources are reviewed below in Table 4.22.

Table 4.22 Sources of Information used to determine maximum dimensions of fishing gear

Data Source	Suitability
National Statistics	Data compiled by each country for its national statistics are not typically as detailed as required to determine total fishing capacity. For example national statistics under the EU system will list the number and size of vessels operating specific métiers, yet none of the countries in the survey area provided specific details on the quantity of gear in operation. Romania and Bulgaria do provide details of various mesh sizes through the EU data reporting system for their métiers, yet there is no way of verifying the vessels are using the reported mesh size for each métier. No details of mesh size or hook size are available for Ukraine or Turkey
Fishermen's Survey	To expand on the data provided by national statistics a survey of 438 fishing vessels in Ukraine, Romania, Bulgaria and Turkey was carried out. Information was provided by fishermen regarding the quantity and specific dimensions of fishing gears for each métier operated by a vessel. Although the enumerators were not able to verify the information provided it is assumed that the sample size allows for an accurate representation of the fishing gear in operation in the Western Black Sea at least.
Expert Opinion	To verify the data provided by national statistics and the fishermen's survey a panel of experts were asked to check the results based on their experience. The expert panel was made up from the national team members.

The maximum dimensions and quantities of fishing gear used, as calculated from the fishermen's survey, are presented below. The results are presented by the fleet segments (or most common métiers) identified in this survey. See Section 4.2.4 for more information relating to how fleet segments were defined.

4.2.5.1. Gillnet fisheries

Gillnets have been identified as high risk fishing gear for cetaceans worldwide, but particularly in the Black Sea. A number of studies have also shown that cetaceans in the Black Sea are more susceptible to large mesh sizes, such as those used in the turbot fishery (see Section 3).

In the Western Black Sea, gillnets are used in a mixed fishery for small pelagics, a large pelagic fishery for blue fish and bonito, a mixed fishery for small demersal species and a single target fishery for Black Sea turbot.

Nets are set in strings and are either anchored to the sea bed for targeting demersal species, set as trammel nets for targeting pelagic species, or set as drift nets on the surface when targeting pelagic fish. See Figure 4.27 below for the range of setting location for gillnets.

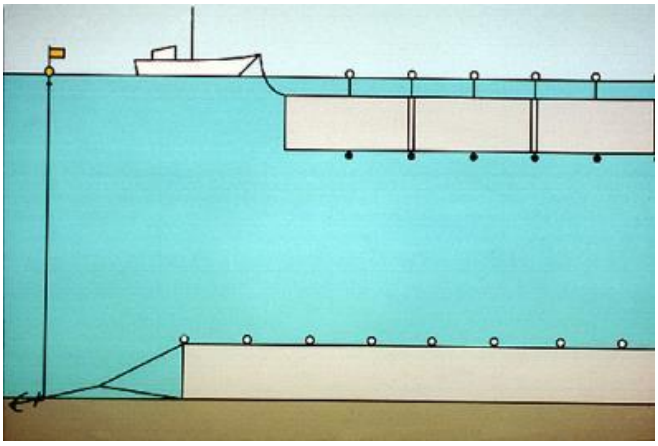


Figure 4.27 Drift and Set Gillnets

The fishermen's survey was not able to distinguish between set gillnets, set trammel nets or drift nets and all gillnets are categorised in this study as GNS. GNS is the EU métier labelling for set gillnets.

Some of the pelagic nets may be operated as drift nets by some fishermen although this practise is reported to have been in decline in recent years in Bulgaria[240] which has a historic drift net fishery for bonito. Romania and Bulgaria would be required to cease all drift net operations if a proposed EU wide ban on drift nets came into force. The proposal is at the time of writing in public consultation.

When calculating the maximum dimensions of gillnets, this study looked at two factors:

1. The amount of net: The amount of net a vessel can operate depends on a number of factors such as vessel size, number of crew and the required soak time of the gear. Governments may also limit the fishing capacity of individual vessels through legislation relating to the amount of net.

2. The mesh size: Gillnet mesh size is a key factor when distinguishing between fishing segments as demersal gillnets, targeting a different species set to pelagic gillnets, will have a different mesh size. This in turn provides a differential risk to cetaceans.

The gillnet métiers identified in this study are subsequently provided below.

4.2.5.1.1 Turbot gillnet fishery (GNS_DEF_>280)

The turbot fishery in the Black Sea is predominantly targeted by bottom set gillnets which are operated in strings of nets.

Seasonality

The turbot fishery is seasonally closed from the 15th April to the 15th June. However, almost all Bulgarian, Romanian and Turkish fishing vessels reported to fish In May, and some also in March and June, strongly suggesting that illegal activity is prevalent. The closed season does not appear to be enforced. The closed season for turbot falls exactly at the time of spawning; the fish are the easiest to catch at this time.

The highest fishing effort for Bulgarian vessels falls between December and May – fishing effort sharply drops off over the summer, and begin to pick up again in September. Romanian vessels

[240] *Ref. Ares(2014)1501393 - 12/05/2014 - Evaluation of driftnet fisheries – Bulgaria Case study report*

reported to fish from January to September and not at all from October to December. Turkish fishing vessels fished mainly in spring between March and May, with effort significantly reducing throughout the summer and winter.

Total quantity of net used by a single fishing vessel

Turbot remains live whilst caught in the net so soak times are often longer than a month. This allows fishermen to keep large amounts of net in the water at any one time. The average reported soak time for all regions surveyed was **245 hours**. The total estimated quantities of turbot gillnet used in each national fleet is estimated below. See Section 4.2.5 for the formula used to calculate the totals.

Table 4.23 Estimations of length in meters of a single GNS_DEF_>280 net and the total amount of net that vessels operate in each country and Length (LOA) class. LOA classes: 1=<6m, 2=6-<12m, 3=12-<18m, 4=18-<24 and 5=24-<40m

Country	LOA Class	Average Single Float Line Length (m)	Average Total Float Line Length (m)
Bulgaria	1	100	4000
	2	100	6700
	3	100	22700
	4	100	35000
	5	100	20000
	Mean	**-**	**12,400**
Romania	1	90	4400
	2	90	7300
	3	100	24000
	4	100	20000
	5	100	24000
	Mean	**-**	**7,500**
Turkey	1	100	9500
	2	100	12500
	3	100	10000[241]
	Mean	**-**	**11,400**
Ukraine	1	100	5000
	2	90	4275
	4	100	25000
	5	100	15000
	Mean	**-**	**7850**

[241] *Due to a small sample size for this length class the figure was corrected by the national team.*

Table 4.23 shows that fishing vessels under 12 meters targeting turbot might operate between 4 and 7 km of net. There is minimal variation between the countries. Vessels under 12m tend to operate several types of fishing gear with only a few crew members. They will also have a restricted range from port which limits the amount of net they can operate.

Vessels over 12 meters in Romania, Bulgaria and Ukraine operate between 15 km and 35 km of net. The Turkish turbot gillnet fleet is known to be dominated by smaller boats, with the larger vessels operating purse seines instead of gillnets. This explains why the amount of nets per vessel was low.

Within these data is was seen that in some cases, larger vessels use less net than smaller ones, and in these cases, turbot gillnets are likely to be the secondary gear operated on a vessel that mainly practices pelagic fishing.

Mesh size

The turbot gillnet fishery operates nets with a large mesh size and in many countries there are regulations on a minimum mesh size to reduce catches of juvenile fish. Bulgaria and Romania have adopted a minimum mesh size of 400mm that has come into force since the survey. However, it is unknown what the level of compliance is. Turkey is planning to introduce a 400mm minimum mesh size in 2016. The range of reported mesh size identified for the Black Sea turbot gillnet fisheries are presented below.

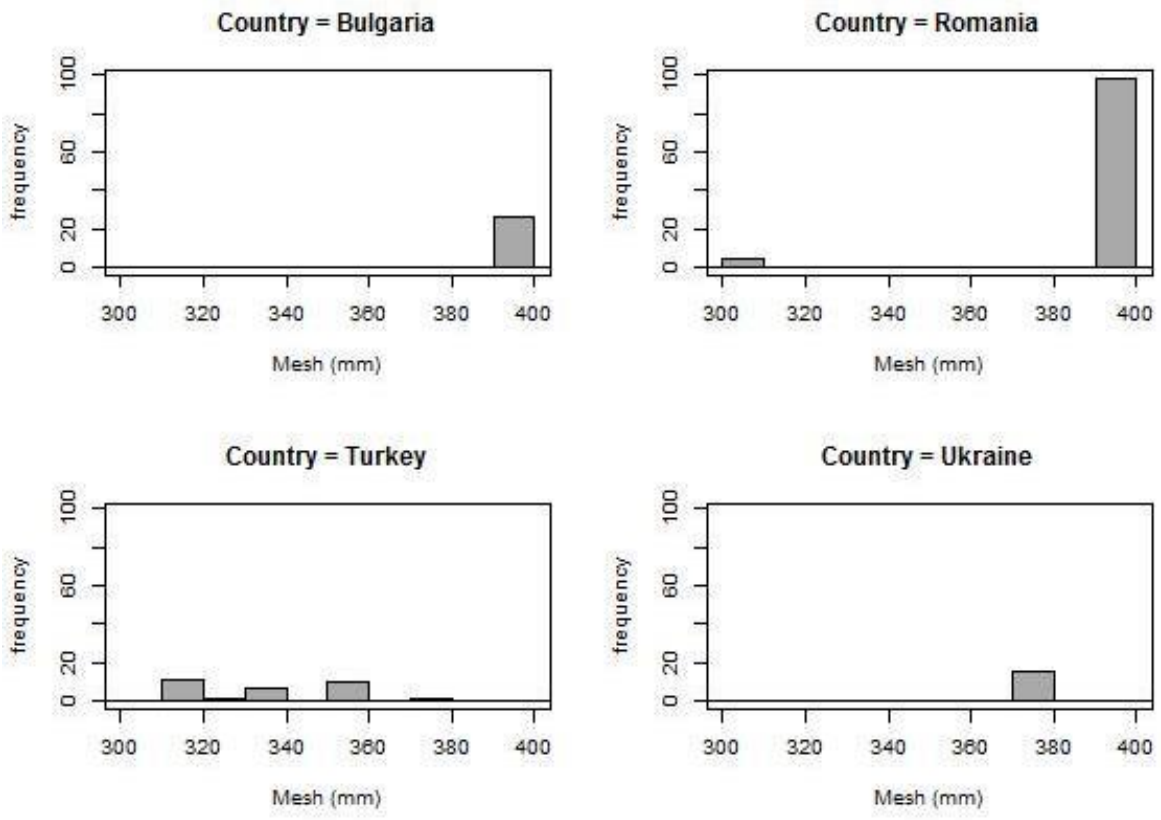


Figure 4.28 Recorded Mesh Sizes by Country in the Turbot Fishery (Métier: GNS_DEF_>280)

Not all fishermen were willing to answer what mesh size they operated and in some cases, some gave the square measurement rather than the knot to knot measurement (Figure 4.29) of mesh size was provided. It was only after consultation with the national teams that this was identified. As a result,

the sample size is relatively small. Figure 4.28 shows that in Turkey, where a 400mm mesh size limit is yet to be introduced - a wider range of mesh sizes are reported.

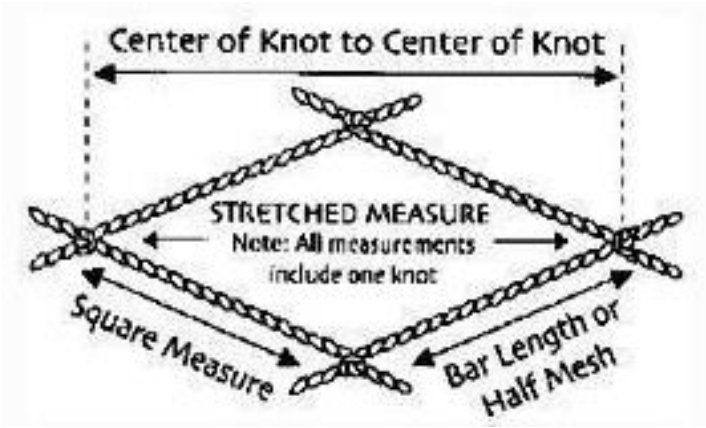


*Figure 4.29 Knot-Knot vs Square measurement of mesh size**Error! Bookmark not defined.***

4.2.5.1.2. Mixed demersal gillnet fishery (GNS_DEF_<150)

The mixed demersal set gillnet fishery predominantly catches demersal species such as goby, dogfish, whiting and red mullet. Catch compositions and target species vary between countries.

Seasonality

Bulgarian, Romanian and Ukrainian vessels appear to fish all year round for goby, dogfish, whiting and red mullet with demersal gillnets. In Turkey, fishing effort also spans most of the year, with less reported from September to November. This fishery does not appear to be seasonally driven.

Total quantity of net used by a single fishing vessel

Table 4.24 shows that in comparison to the vessels operating turbot gillnets (see Table 4.23 above), generally each fishing vessel uses less net overall to catch mixed demersal species. This is directly related to soak time. Generally longer soak times mean that fishermen are able to manage and control greater quantities of net during fishing operations. Due to the longevity of turbot in gillnets, soak times can be longer (**245 hours** was the average soak time for the Black Sea region) and fishermen are able to utilise more net. The longevity of goby, dogfish, whiting and red mullet in gillnets limits the soak time (**58 hours** was the average) and in turn the amount of net used in this métier. The total estimated quantities of mixed demersal gillnet used in each national fleet is estimated below. See Section 4.2.5 for the formula used to calculate the totals.

Table 4.24 Estimations of length in meters of a single GNS_DNF_<150 net and the total amount of net that each vessel operates in each country and length (LOA) class. LOA classes: 1=<6m, 2=6-<12m, 3=12-<18m, 4=18-<24 and 5=24-<40m.

Country	LOA Class	Average Single Float Line Length (m)	Average Total Float Line Length (m)
Bulgaria	1	80	2700
	2	100	3200
	Mean	-	**2900**

Romania	1	90	1100
	2	90	1200
	4	100	5000
	Mean	-	**1300**
Turkey	1	100	3500
	2	100	5200
	3	100	9100
	Mean	-	**4900**
Ukraine	1	80	400
	2	70	2000
	5	100	4500
	Mean	-	**2200**

Turkey appears to operate the greatest amount of mixed demersal gillnets and Ukraine the least.

Mesh size

The mixed demersal fishery targets a wide size range of fish, so as expected there is also a large spread of mesh sizes ranging between 20mm and 120mm. These are shown below.

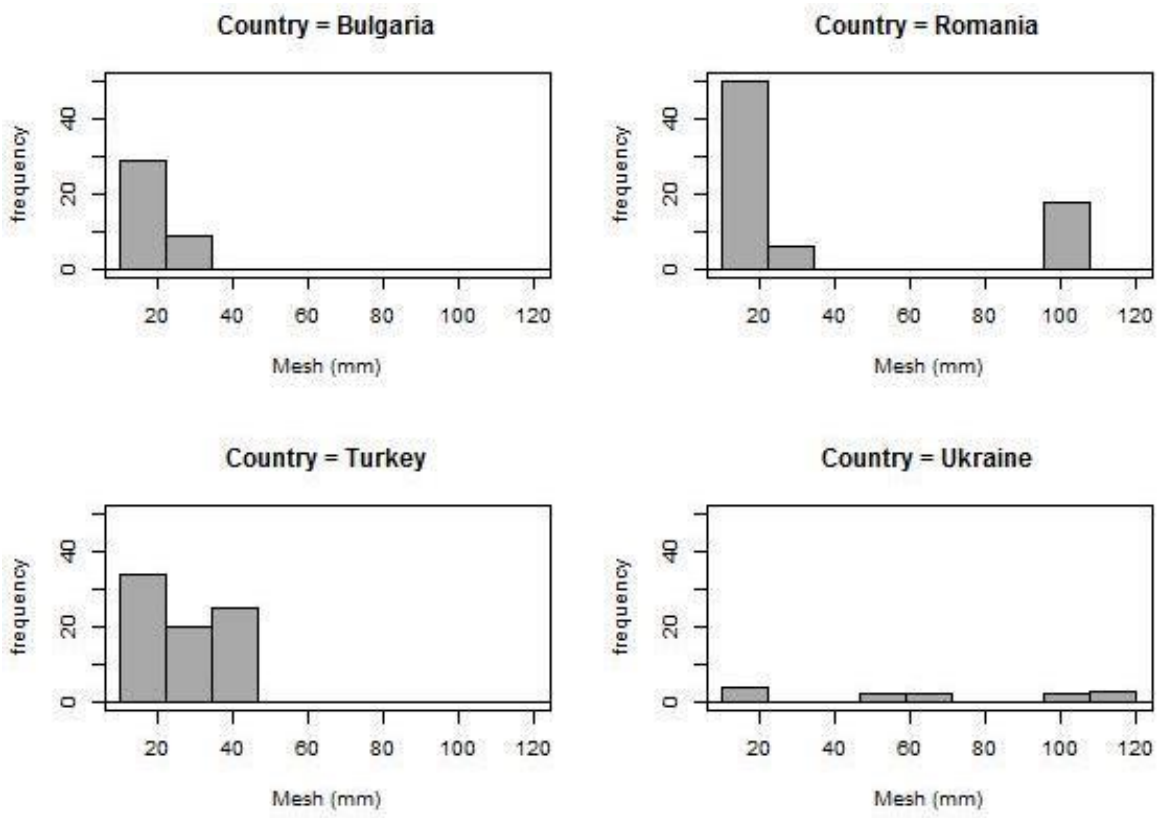


Figure 4.30 Recorded Mesh Sizes by Country in the Mixed Demersal Gillnet Fishery (Métier: GNS/GND_DEF_<150).

4.2.5.1.3. Pelagics gillnet fishery (GNS/GND_LPF or GNS_SPF)

This pelagic gill net fishery targets several species of pelagic fish in the Black Sea, including the Black Sea sprat, the Black Sea anchovy, shad, horse mackerel, blue fish and bonito in shallow waters. Although the survey did not differentiate between set and drift nets, both have been reported to be in operation by national experts.

Seasonality

Bulgarian, Romanian and Ukrainian vessels appear to fish all year round for pelagic fish with this métier. Turkey on the other hand, show a marked seasonal effort here, fishing mainly from September to November. This is reported to be a drift fishery for bonito. Adult bonito enter the Black Sea from the Marmara Sea in May–August for spawning and feeding, giving quantities of young fish that move along the Turkish coast. These movements and their migrations back to the Marmara Sea in autumn to the Marmara Sea are likely to be the driver of the seasonality seen in this fishery[242].

Total quantity of net used by a single fishing vessel

The average soak time for this métier across all countries was 35 hours. The total estimated quantities of pelagic gillnets used in each national fleet is estimated below. See Section 4.2.5 for the formula used to calculate the totals.

Table 4.25 Estimations of length in meters of a single GNS/GND_LPF / GNS_SPF net and the total amount of net that each vessel operates in each country and length (LOA) class.

Country	LOA Class	Average Single Float Line Length (m)	Average Total Float Line Length (m)
Bulgaria	1	100	2200
	2	100	3500
	3	90	3600
	4	80	4000
	Mean	-	**3200**
Romania	1	90	7700
	2	90	3200
	Mean	-	**4200**
Turkey	1	100	550
	2	100	650
	Mean	-	**650**
Ukraine	1	80	800
	2	60	1200
	Mean	-	**1000**

[242] *GFCM (2012) Background document on the Black Sea Fisheries: http://151.1.154.86/GfcmWebSite/SAC/WGBS/2012/GFCM-Background-Doc-BlackSea-Fisheries.pdf [Accessed 31.10.2014]*

As for other métiers, short soak times and the use of drift nets may restrict the quantity of net fishermen operate when targeting small pelagics. Romania appeared to operate the greatest amount of pelagic gillnet. Turkey operated significantly less pelagic gillnet than other countries.

Mesh size

Mesh size varies with target species. Shad and horse mackerel were reported to be caught using this métier with mesh sizes of 25 – 70mm whereas nets reported to be targeting bonito and bluefish generally have larger mesh sizes of between 60mm and 100mm. The spread of pelagic gillnet mesh sizes reported in the fishermen' survey are provided below.

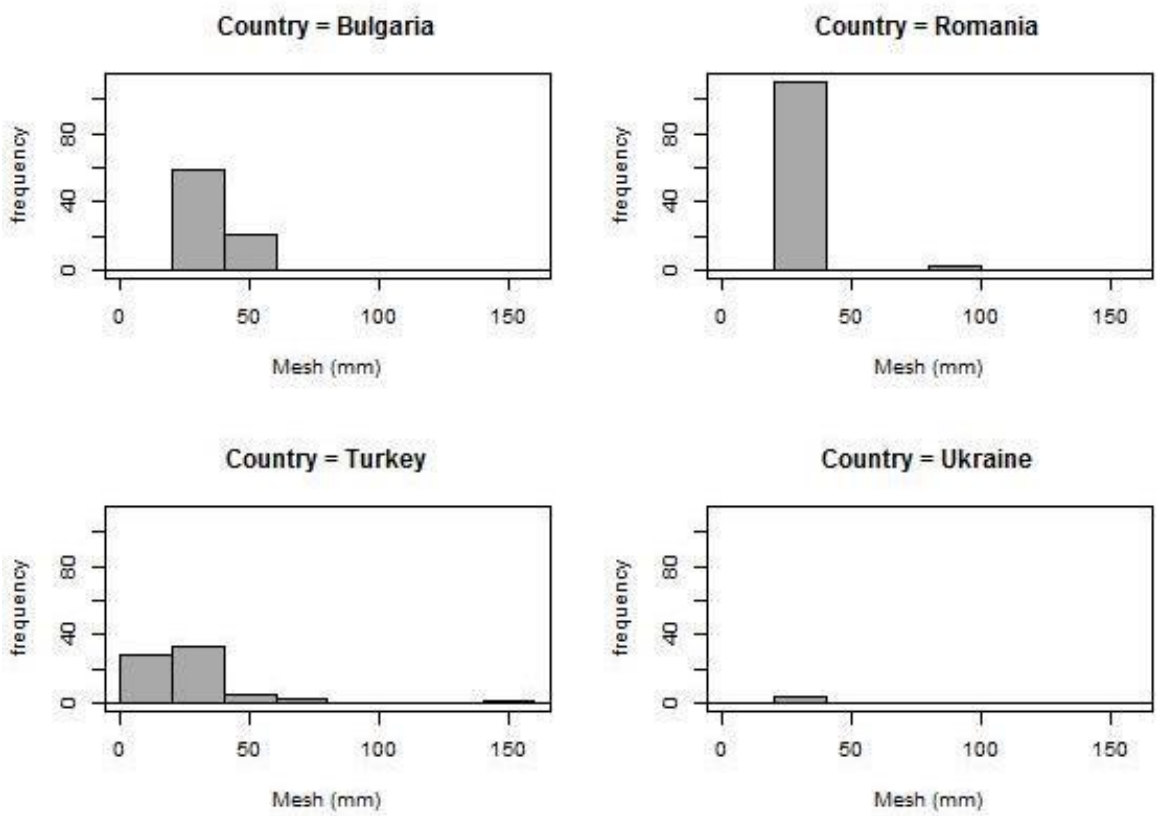


Figure 4.31 Recorded Mesh Sizes by Country in the Pelagic Gillnet Fishery (Métier: GNS_LFP/GNS_SPF)

All gillnet mesh sizes identified by this study in the Western Black Sea are summarised below. Estimates have been obtained from the fishermen's survey and from national team members with an expert knowledge of national fisheries and their associated legislation.

4.2.5.1.4. A summary of mesh sizes used in the Western Black Sea

Table 4.26 A summary of mesh sizes used in the Western Black Sea.

Métier	Country	Mesh Size (mm)
Turbot Fishery (GNS_DEF_>280)	Ukraine	360-400
	Romania	310 - 400
	Bulgaria	350 – 400
	Turkey	310 – 400[243]
Small Demersals Fishery (GNS_DEF_<150)	Ukraine	15 – 20 & 50 – 70 & 100 - 120
	Romania	15 – 25 & 110
	Bulgaria	15 – 25
	Turkey	10 - 50
Large Pelagics Fishery (GNS/GND_LPF)	Ukraine	-
	Romania	100
	Bulgaria	60
	Turkey	100
Small Pelagics Fishery (GNS_SPF)	Ukraine	13-30[244]
	Romania	30
	Bulgaria	25 - 60
	Turkey	10 - 75

[243] *Lower limits provided by fishermen's survey, upper limits from reports of national team members.*
[244] *Lower limits provided by reports of national team members, upper limits from fishermen's survey.*

4.2.5.2. Trawl fisheries

There are two principal trawling activities in the western Black Sea: mid-water otter trawls targeting small pelagic fish (the Black Sea sprat, the Black Sea anchovy, shad, horse mackerel, blue fish and bonito) and bottom otter trawls targeting demersal fish (turbot, whiting, picked dogfish and Rapa whelk) . To a lesser extent, beam trawls are reportedly used in Bulgaria and Eastern Turkey yet none of the vessels identified in the survey were beam trawlers. The only pair trawling activity identified in the survey was a small (40 – 50 pairs of vessels[245]) mid-water trawl sprat fishery operating in Turkey's Eastern Black Sea.

The key factor determining the maximum size for trawl gear is size of the trawl door opening. The speed that the trawl is operated at is also of interest when considering cetacean by-catch rates. The fishing survey collected information on the width of the trawl doors, the average speed of the trawl and the average duration of a tow and these are presented below for each métier.

Seasonality

In Turkey, the bottom trawl fishery is reported to run all year round except in the summer months from June to August. This fits with previous reports of this seasonal fishery[242]. Interestingly, in Turkey, the use of trawls is banned between May and September and in certain zones, fishing within three miles from the coastline is prohibited[246]. Illegal trawling may have been identified by the fishermen's survey in this case. The use of bottom trawls is currently prohibited in the other riverine countries[246]. In Ukraine, the pelagic trawl fishery was reported to be seasonal from in the fishermen's survey yet other reports suggest that April-October is the season for catching pelagic species such as sprat[242].

[245] *Turkish Fisheries in the Black Sea – Turkish Marine Research Foundation, Publication 40 - 2014*

[246] *Duzgunes, E., & Erdogan, N. (2008). Fisheries management in the Black Sea countries. Turkish Journal of Fisheries and Aquatic Sciences, 8(1), 181-192.*

4.2.5.2.1. Mid-water otter trawl fishery (OTM_SPF)

The fishermen's survey identified vessels using mid-water otter trawls in Ukraine, Bulgaria and Romania. Mid-water trawling is not as common as purse seining for targeting small pelagics in Turkey.

The typical size of vessel operating this gear in the study area was **18 – 24 meters** and deployed a trawl with an otter door spread of between **34 - 60 meters**. It was reported by the country experts that the typical door width for a bottom otter trawl in the Black Sea is around 45 meters, so this falls within the range of the survey's estimates. Typically the trawls are towed at **3.2 knots** for **2.5 hours**.

4.2.5.2.2. Bottom otter trawl fishery (OTB_DEF)

Bottom otter trawling is not currently active in Romania or Bulgaria but occurs in both Turkey and to a lesser extent in Ukraine. The fishermen's survey obtained information from 10 vessels using this métier, all of which were from Turkey.

The average trawl door spread was 109 meters however the corrected average width is expected to be around **70 metres**[247]. The average tow speed was **3 knots** and the average duration of a tow was reported as **4.2 hours**.

4.2.5.2.3. Beam trawl fishery (TBB_DEF)

A large-scale fishery for Rapa whelk begun in Turkey's eastern region in the mid-1980s with landings increasing substantially during the 2000s. This fishery uses a form of dredge resembling a beam trawl with twin dredges of around **3 meters** being operated by the fishermen.

Bulgaria has also been developing a beam trawl fishery for this species since 2012 when the fishery was legalised[242]. The beams used in this fishery are reported to be between **5** and **7 meters** wide.

4.2.5.3. Long line fishery (LLS_DEF)

Long liners operating in the Black Sea were reported to be mostly small (6-12 metre) vessels from Romania and Ukraine, targeting mixed demersal species, such as goby and picked dogfish. These vessels also tended to operate other gear types in mixed fishery operations.

Set long lines are anchored to the sea bed. Vessels tended to deploy an average of **80 lines** with lengths of around **25 hooks per line.** This provides an estimate of an average of **2000 hooks per boat**. The most commonly reported hook size was a 'No. 1 hook' which varies slightly in size depending on the manufacturer.

Seasonality

Romanian long liners reportedly (fishermen's survey) fished mainly in the autumn and winter periods (from October to January). Only a small number of vessels reported to fish in the spring and summer periods. Ukrainian vessels in the fishermen's survey reported to fish all year round despite other reports stating that picked dogfish is mainly harvested in the spring and autumn[242]

[247] *Personal communications with Bulgarian national team members*

4.2.5.4. Purse seine fisheries

The Black Sea purse seine fisheries are dominated by small pelagic species consisting primarily of Black Sea anchovy (72% of landings) and Black Sea sprat (20% of landings)[248] but also pilchards, bonito and blue fish[242]. Purse seiners account for a large amount of the Black Sea landings of these small pelagics, the largest fleet being from Turkey. For example, Turkey is responsible of more than 97% of total Black Sea anchovy catch[242].

Seasonality

In Turkey, effort appears to be concentrated from September to November and to a lesser extent over the winter. This fishery is not prevalent in the summer in Turkey and be due to some of the larger purse seiners moving to the Mediterranean in May and June to catch blue fin tuna[242]. There are very little data for Ukraine, and Bulgaria and Romania did not report to operate this métier.

Mesh size variations

The fishermen's survey identified 142 vessels operating purse seine gear, of which 139 were in Turkey. In Ukraine, 3 of the vessels surveyed used purse seines and at present it has been reported that there are no active purse seine vessels in Bulgaria or Romania.

As explained above, the Turkish purse seiners reportedly fished two target pelagic groups: small species such as sprat and anchovy and large pelagic species such as bonito. These mesh sizes ranges are shown below.

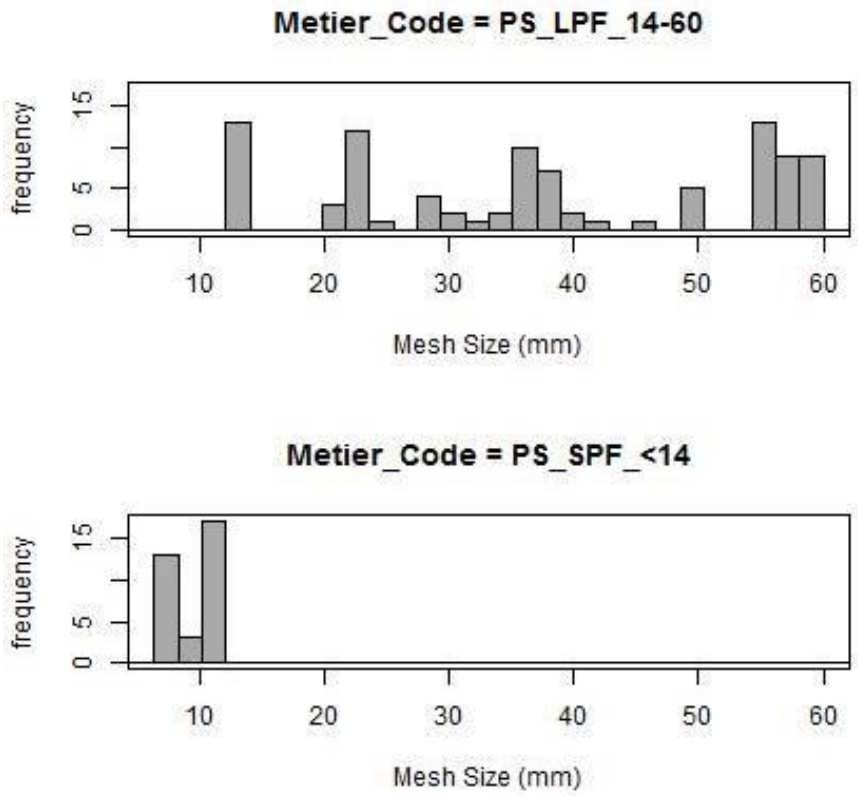


Figure 4.32 Results of the fishermen's survey: Histogram of reported mesh sizes (mm) for purse seine métiers..

[248] *GFCM production statistics database 2012*

4.2.5.4.1. Small pelagics purse seine fishery (PS_SPF_<14)

Purse seiners targeting small pelagics reported an average mesh size of **10mm**. The average reported headline length for this métier was **615 meters** (with a range of 100-1500m). The drop of the net is a measurement from the headline to the depth the net reaches before it is drawn shut. This measurement was not reported in the survey yet country experts estimate the drop is between **80m and 160m**. The variation would depend on the target species and size of the vessel.

4.2.5.4.2. Large pelagics purse seine fishery (PS_LPF_14-60)

Vessels operating purse seines and targeting large pelagics will primarily be catching bonito with a mesh size of between **14mm and 60mm**. The average reported headline length for a purse seine with mesh sizes between 14mm and 60mm was **600 meters** (with a range of 100-1200m). Similarly to the small pelagic purse seine fishery, the nets will have a drop between **80m and 160m**.

4.2.6. Total fishing capacity and fishing effort

The overall objective of this section of the study is to determine the total fishing effort by fleet segment in the western Black Sea. This is important when estimating the potential risk to cetaceans. See 4.2 – 'Defining fleet segments' above for more details on how fleet segments were defined for this study.

4.2.6.1. Methodology

Total fishing effort for each fishing métier has been measured by three separate influencing factors: 1) the amount or size of the fishing gear, 2) the time spent fishing, and 3) the number of fishing vessels.

1. **Amount of fishing gear**:

This information was obtained from the fishermen's survey and through expert advice from the national teams. This information has been provided in Section 4.2.5 – maximum dimensions of fishing gear used.

2. **Time spent fishing**:

As shown in Section 4.2.5, many of the fisheries in the Black Sea are seasonal and the number of days a fishermen can fish is constrained by availability of fish, weather and fishing regulations. The fishermen's survey included questions on the number of days a year a fishermen operate each métier.

It was revealed by national teams and the fishermen's survey that some types of fishing gear are left in situ for days to weeks, including static gears like gillnets, long lines and traps. On these occasions it is not possible to distinguish between total soak time and days fished so for the purpose of this study fishing effort is measured by the reported number of days fished per year for each métier. See below.

Table 4.27 Average number of days per year fished for each métier, reported in the fishermen's survey for each métier identified.

Métier	Country	Average Reported Days Fished per Year per vessel
GNS_DEF_<150	Bulgaria	127
	Romania	40
	Turkey	126

	Ukraine	*97
GNS_DEF_>280	Bulgaria	114
	Romania	**44
	Turkey	61
	Ukraine	110
GNS/GND_LPF_<150 / GNS_SPF_<150	Bulgaria	155
	Romania	***98
	Turkey	105
	Ukraine	85
LLS_DEF	Romania	57
	Ukraine	102
OTB_DEF	Turkey	140
OTM_SPF	Bulgaria	213
	Romania	48
	Ukraine	154
PS_LPF_14-60	Turkey	56
PS_SPF_<14	Turkey	71
	Ukraine	*****100

*was originally 121 from the fishermen's survey but Ukrainian national teams stated that the numbers were about 20% too large, so value has been reduced by 20%.

**was originally 37 from the fishermen's survey but Romanian national teams analysed the data according to the EC data call from 2013 and numbers have subsequently been revised.

*** was originally 35 from the fishermen's survey. See ** above.

**** was originally 40 from the fishermen's survey. See ** above

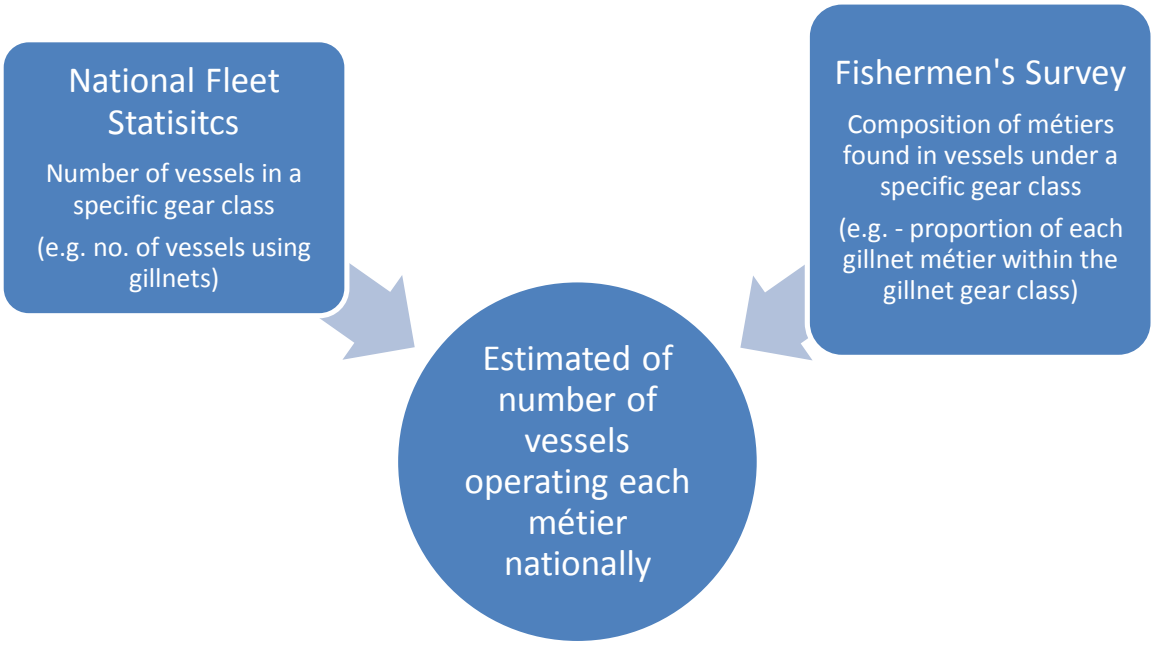
***** was originally 90 from the fishermen's survey but Ukrainian national teams stated that the numbers were about 20% too small, so value has been reduced by 20%.

3. **Number of fishing vessels**:

As detailed in Section 4.1 the total number of vessels operating specific gear types in a country's active fleet are reported, yet resolution varies between countries. Yet when this data is combined with the detailed data in the western Black Sea from the fishermen's survey, an idea of full operating capacity can be obtained.

To standardise the information and estimate the number of vessels operating each métier in each country, a model was designed based on the composition of the métiers identified in the fishing survey.

For this section it was decided to focus solely on purse seine and gillnet fisheries in each country as these were considered the greatest threats to cetaceans. Also, data provided by the national statistics lacked detail for these fisheries. The model is presented below.



The following formula was used to obtain estimates for the total number of vessels operating a specific métier. Data from the fishermen's survey was extrapolated using numbers from national statistics.

$$\boldsymbol{V_M = (FS_x \times M_V) \times (SaM \div SaM_t)}$$

Where $\boldsymbol{V_M}$ is the estimated number of vessels using a specific métier i.e. GNS_DEF_>280.

$\boldsymbol{FS_x}$ is the reported number of vessels in a fleet segment (i.e. gillnetters)

$\boldsymbol{M_V}$ is the average number of métiers used by each vessel in the fleet segment (calculated from the fishermen's survey results)

$\boldsymbol{SaM}$ is the number of the specific métiers sampled in the survey

$\boldsymbol{SaM_t}$ is the total number of métiers sampled in the survey that are within the designated fleet segment (i.e. classified as gillnetters)

This method provides an estimate of the number of occurrences in the national fleet of each métier and subsequently an understanding of the potential fishing effort in each country. However, due to the relatively small sample size and potential inaccuracies in the national statistics (true sizes of active fleets are unknown) these results should be interpreted with caution.

4.2.6.1.1. Turkey

Turkey classifies its fishing fleet in its national statistics into 5 categories: trawler, purse seiner, trawler-purse seiner, carrier vessel and other. The category 'other' refers to the small scale mixed gear fishing vessels. To better understand the 'other' category, the fishermen's survey was used to estimate the composition of vessels that did not fall into the categories of trawler, purse seiner, trawler-purse seiner and carrier vessel.

In the total Black Sea region there are reportedly 5113 active vessels of which 4373 (86%) are categorised as 'other'. In the ports of Rize, Sinop and Rumeli Feneri, 150 vessels were surveyed; of these 112 (75%) would be categorised as 'other'.

Table 4.28 The estimated proportion of each gillnet métier (identified in the fishermen's survey) operated by the national Turkish fleet category 'other' and the estimated number of vessels operating these métiers.

Métier	Métier Code	Proportion Based on the Survey	Number of vessels operating each métier in the national fleet
Pots and Traps	FPN_SPF_LPF	n/a	2[249]
Gillnet Turbot	GNS_DEF_>280	16%	1119
Gillnet Mixed Demersal	GNS_DEF_<150	45%	3148
Gillnet Small Pelagic	GNS_SPF_<150	2%	140
Gillnet Large Pelagic	GNS/GND_LPF_<150	37%	2589

[249] *The estimate for the number of vessels operating Pound Nets remains static at 2. It was reported by the Turkish team that there are only two pound nets in operation near the port of Rumeli Feneri, both fishermen using them were interviewed in the survey.*

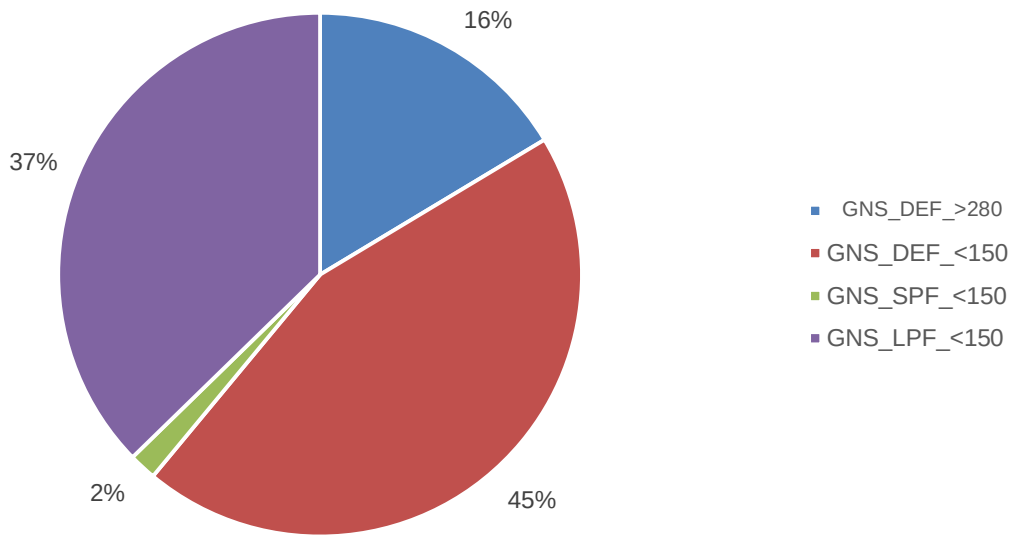


Figure 4.33 Proportion of each gillnet métier (identified in the fishermen's survey) operated in the Black Sea by the national Turkish fleet category 'other'.

The Turkish fleet operates as a mixed fishery with each vessel operating more than one métier either at the same time or shifting between them seasonally. The fishermen's survey showed that on average each vessel operates 1.6 gillnet métiers meaning that from the 4373 active vessels, an estimated 6996 gillnet/vessel combinations would be in operation in the Black Sea annually.

Using the fishermen's survey as a sample of the Turkish Black Sea fleet it is possible to extrapolate to the number of vessels that might be operating each métier as one or more of their fishing gears.

Turkey also has a large purse seine fleet which is reportedly (national statistics) comprised of purse seiners or trawler-purse seiners. This information does not specify the target species or the mesh size of these purse seines so the same extrapolation can be applied to estimate the quantities of each métier used in the Turkish fleet.

Table 4.29 The estimated proportion of each purse seine métier (identified in the fishermen's survey) operated by the national Turkish fleet category 'purse seiners and trawler-purse seiners' and the estimated number of vessels operating these métiers.

Métier	Métier Code	Proportion Based on the Survey	Number of vessels operating each métier
Purse Seine Large Pelagic	PS_LPF_14-60	75%	355
Purse Seine Small Pelagic	PS_SPF_<14	25%	120

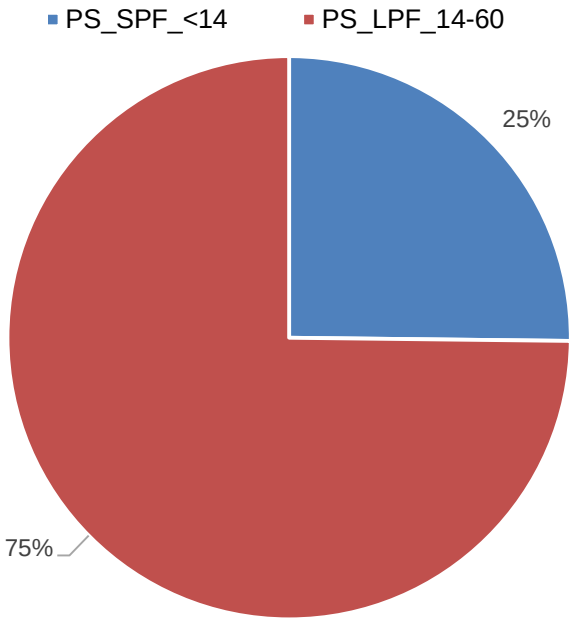


Figure 4.34 Proportion of each purse seine métier (identified in the fishermen's survey) operated in the Black Sea by the national Turkish fleet category 'purse seiners and trawler-purse seiners'

Figure 4.34 above shows the proportion of each purse seine métier, identified in the fishermen's survey being used in the Turkish national fleet. The majority of purse seine used are those for small pelagics.

National statistics revealed that 339 vessels were reported to be using purse seine métiers in Turkey. The fishermen's survey showed that there were, on average 1.4 purse seine métiers being used per vessel. Using the proportions shown in Figure 4.34, it was possible to obtain an estimate of the number of vessels in the national fleet using specific types of purse seine métier. Table 4.29 shows that an estimated 355 vessels were targeting large pelagics with purse seines, and 120 were targeting small pelagics with purse seines.

Table 4.30 shows that a greater proportion of the fleet operate purse seines that target large pelagic fish (primarily bonito). However, when the time spent fishing is studied, the purse seine métiers targeting small pelagic fish are operated for more days per year (71 vs 56 days per year).

A resulting assumption is that the large pelagics purse seines may be a more commonly used secondary or tertiary métier (operating in mixed gear operations), used opportunistically to target valuable Bonito during its short fishing season (September-November[250]), hence the higher occurrence of this métier. The purse seines targeting smaller pelagic fish are more of a primary métier, with the vessel being specifically set up for this specialised operation, hence the smaller numbers used but for longer fishing periods.

[250] *Zengin, M., & Dinçer, A. C. (2006). Distribution and seasonal movement of Atlantic Bonito (Sarda sarda) populations in the southern Black Sea coasts.Turk J Fish Aquat Sci, 6, 57-62.*

4.2.6.1.2. Romania

The national statistics from Romania (EU data) aggregated all vessels operating gillnets together with no classification for the target species or mesh size. The fishermen's survey has subsequently been used to extrapolate figures for each gillnet métier identified in Romania.

Table 4.30 The estimated proportion of each gillnet métier (identified in the fishermen's survey) operated by the national Romanian fleet category 'GNS' and the estimated number of vessels operating these métiers.

Métier	Métier Code	Proportion Based on the Survey	Number of vessels operating each métier
Gillnet Turbot	GNS_DEF_>280	35%	118
Gillnet Mixed Demersal	GNS_DEF_<150	26%	88
Gillnet Small Pelagic	GNS_SPF_<150	39%	132
Gillnet Large Pelagic	GNS/GND_LPF_<150	0%	0

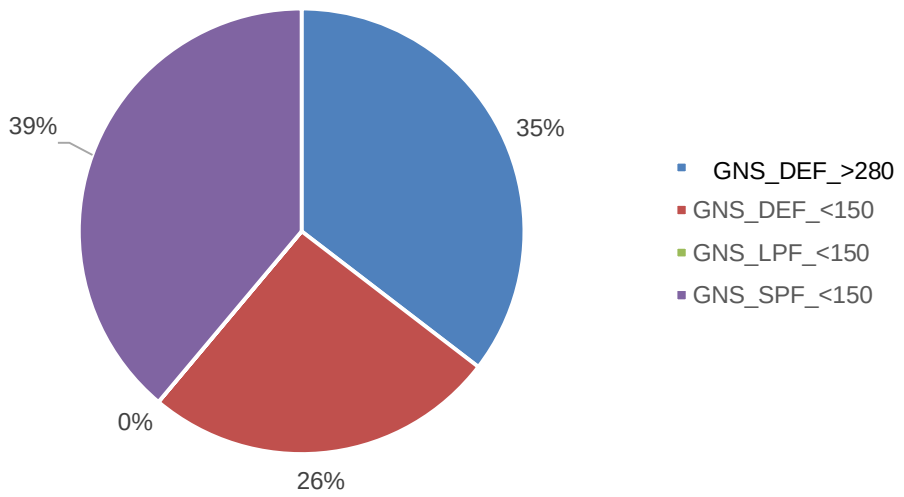


Figure 4.35 Proportion of each gillnet métier (identified in the fishermen's survey) operated in the Black Sea by the Romanian national fleet category 'GNS'.

Figure 4.35 above shows the proportion of each gillnet métier being used in the Romanian fleets identified in the fishermen's survey. All gillnet métiers, apart from those for large pelagic fish appear to be used in relatively equal proportions.

From Bulgaria's EU national statistics, 188 vessels were reported to be using set gillnet métiers (GNS) as their primary gear type in Romania. The fishermen's survey showed that there were, on average 1.8 gillnet métiers being used per vessel. Using the proportions shown in Figure 4.35, it was possible to obtain an estimate of the number of vessels in the national fleet using specific types of gillnet métier found in the fishermen's survey. This is shown in Table 4.30.

4.2.6.1.3. Bulgaria

Fisheries statistics in Bulgaria are reported similarly in Romania where all gillnet métiers are aggregated into one group. The same method was used to extrapolate the number of boats operating each métier.

Table 4.31 The estimated proportion of each gillnet métier (identified in the fishermen's survey) operated by the national Bulgarian fleet category 'GNS' and the estimated number of vessels operating these métiers

Métier	Métier Code	Proportion Based on the Survey	Number of vessels operating each métier
Gillnet Turbot	GNS_DEF_>280	18%	812
Gillnet Mixed Demersal	GNS_DEF_<150	38%	1173
Gillnet Small Pelagic	GNS_SPF_<150	24%	1083
Gillnet Large Pelagic	GNS/GND_LPF_<150	32%	1444

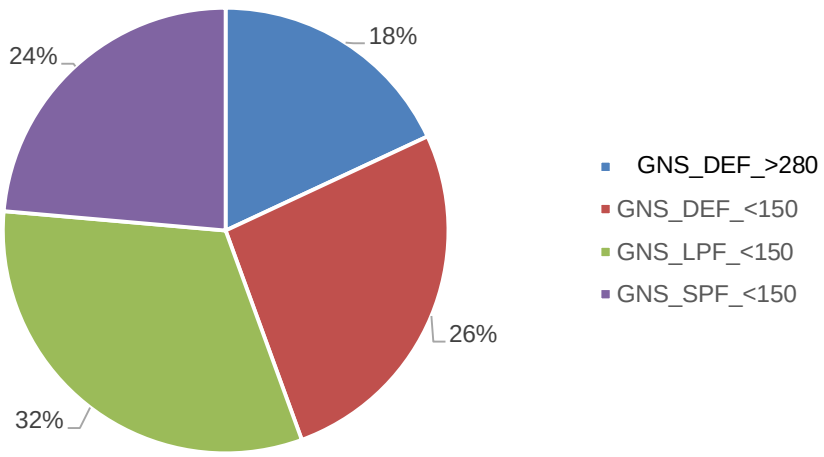


Figure 4.36 Proportion of each gillnet métier (identified in the fishermen's survey) operated in the Black Sea by the Bulgarian national fleet category 'GNS'.

Figure 4.36 above shows the proportion of each gillnet métier being used in the Bulgarian fleets identified in the fishermen's survey. The large pelagics gillnets appear to be the most widely used, followed in relatively equal proportions by the other gillnet métiers.

From Bulgaria's EU national statistics 1805 vessels were reported to be using set gillnet métiers (GNS) as their primary gear type. The fishermen's survey showed that there were on average 2.5 gillnet métiers being used per vessel. Using the proportions shown in Figure 4.36, it was possible to obtain an estimate of the number of vessels in the national fleet using specific types of gillnet métier. This is shown in Table 4.31.

4.2.6.1.4. Ukraine

The total number of gillnets in Ukraine was estimated by the national expert team in absence of published national statistics, and the same method was employed to extrapolate the number of boats each métier was being used in as one of their fishing gears.

Table 4.32 The estimated proportion of each gillnet métier (identified in the fishermen's survey) operated by the national Ukrainian fleet category 'GNS' and the estimated number of vessels operating these métiers.

Métier	Métier Code	Proportion Based on the Survey	Number of vessels operating each métier
Gillnet Turbot	GNS_DEF_>280	47%	543
Gillnet Mixed Demersal	GNS_DEF_<150	41%	474
Gillnet Small Pelagic	GNS_SPF_<150	12%	0
Gillnet Large Pelagic	GNS/GND_LPF_<150	0%	139

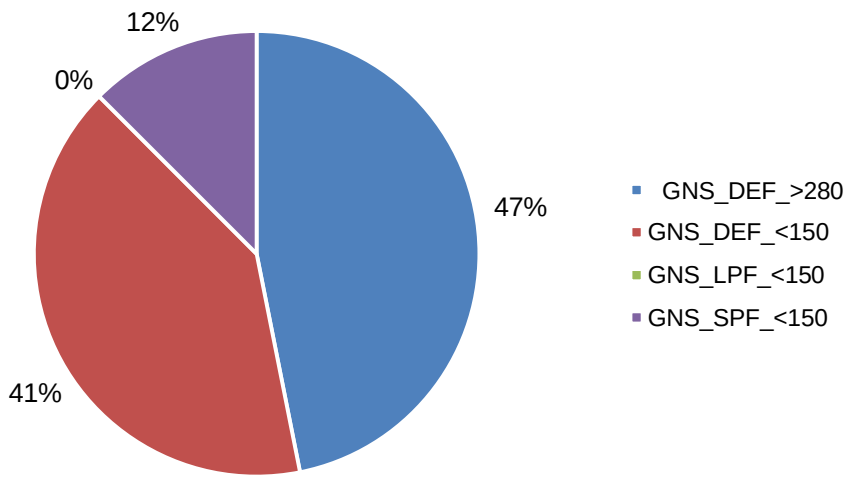


Figure 4.37 Proportion of each gillnet métier (identified in the fishermen's survey) operated in the Black Sea by the Ukrainian national fleet category 'GNS'.

Figure 4.37 above shows the proportion of each gillnet métier being used in the Ukrainian fleets identified in the fishermen's survey. The demersal gillnets of both mesh sizes appear to be the most widely used, followed by those for small pelagics. Gillnets for large pelagics do not appear to be used.

From the national statistics provided by national team members, 722 vessels were reported to be using set gillnet métiers (GNS) in Ukraine. The fishermen's survey showed that there were, on average 1.6 gillnet métiers being used per boat. Using the proportions shown in Figure 4.37, it was possible to obtain an estimate of the number of vessels in the national fleet using specific types of gillnet métier found in the fishermen's survey. This is shown in Table 4.32.

Ukraine is the only country other than Turkey to use purse seines. The fleet is relatively small - 21 vessels. The fishermen's survey identified only two of these boats which where large pelagic purse seiners (PS_LPF_>100). However, it is not possible to extrapolate the number of purse seine métiers from such a small sample.

4.2.6.2. A summary of total fishing capacity and fishing effort in all countries

Table 4.33 Total fishing capacity and fishing effort in all countries

Country	Métier	Number of vessels operating métier (as single or mixed gear)		Estimated average quantity of fishing gear per vessel (meters)	Estimated total quantity of fishing gear nationally (meters)	Estimated average no. of fishing days per year per vessel
		Reported	Estimated			
Turkey	GNS_DEF_>280		1119	11400	12,756,600	61
	GNS_DEF_<150		3148	4900	15,425,200	126
	GNS_DEF_150-280	Reported by Turkish national teams to exist in the Black Sea but not sampled by the fishermen's survey				
	GNS_LPF_<150		2589	650	1,682,850	64
	GNS_SPF_<150		140	650	91,000	41
	PS_LPF_14-60		355	600	213,000	56
	PS_SPF_<14		120	615	73,800	71
	OTM_SPF	470		n/a	n/a	140
	OTB_DEF					
	LLS_DEF	Reported by Turkish national teams to exist in the Black Sea but not sampled by the fishermen's survey				
Bulgaria	GNS_DEF_>280		812	12400	10,068,800	114
	GNS_DEF_<150		1173	2900	3,401,700	127
	GNS_DEF_150-280	Reported by Bulgarian national teams to exist in the Black Sea but not sampled by the fishermen's survey				
	GND_LPF_<150		1444	3200	4,620,800	96
	GNS_SPF_<150		1083	3200	3,465,600	49
	OTM_SPF	88		n/a	n/a	213
	LLS_DEF	65		2000	130,000	0

Romania	GNS_DEF_>280		118	7500	885,000	44
	GNS_DEF_<150		88	1300	114,400	40
	GNS_DEF_150-280	Reported by Romanian national teams to exist in the Black Sea but not sampled by the fishermen's survey				
	GNS_SPF_<150		132	4200	554,400	98
	OTM_SPF	8		n/a	n/a	48
	LLS_DEF	65		2000	130,000	57
Ukraine	GNS_DEF_>280		543	7850	4,262,550	110
	GNS_DEF_<150		474	2200	1,042,800	97
	GNS_DEF_150-280	Reported by Ukrainian national teams to exist in the Black Sea but not sampled by the fishermen's survey				
	GNS_SPF_<150		139	1000	139,000	85
	PS_LPF_14-60		21	600	12,600	108
	PS_SPF_<14					
	OTM_SPF		49	n/a	n/a	154
	OTB_DEF		18	n/a	n/a	140
	LLS_DEF		49	2000	98,000	102

The largest amount of net was reported from Turkish and Bulgarian gillnet fleets, some fleets operating up to 15,000 km of net. The longest time spent fishing annually was reported from Bulgaria and Ukraine in the mid-water otter trawl fisheries, fishing over 200 days a year on average with this metier per vessel. Other fishing segments with over 100 days on average fishing a year per vessel include the Turkish, Bulgarian and Ukrainian gillnet fisheries. In general, Turkish and Bulgarian fishing capacity far exceeds that of other countries. Fishing effort was also analysed spatially to identify fishing hotpots along the coasts of the Black Sea.

4.2.7. Distribution of reported and observed fishing effort

The following section graphically represents the geographical distribution of reported and observed fishing effort by fleet segment (métier). This enables the identification of concentrations of fishing effort of different fisheries in the Black Sea region. Fishing effort in these maps is represented by the amount of a specific gear (e.g. km of net) operated by each country, over the reported fishing depth range of the fishery.

A list of was hotspots were also provided by national teams for identification of specific high concentrations of fishing. Names of fishing hotspots were provided, their coordinates were obtained and subsequently mapped on Google Earth. As only names of ports and bays were provided, the locations of the hotspots are represented by coordinates in water, directly adjacent to the land mass of the named area.

4.2.7.1. Turbot set gillnet fishery (GNS_DEF_>280)

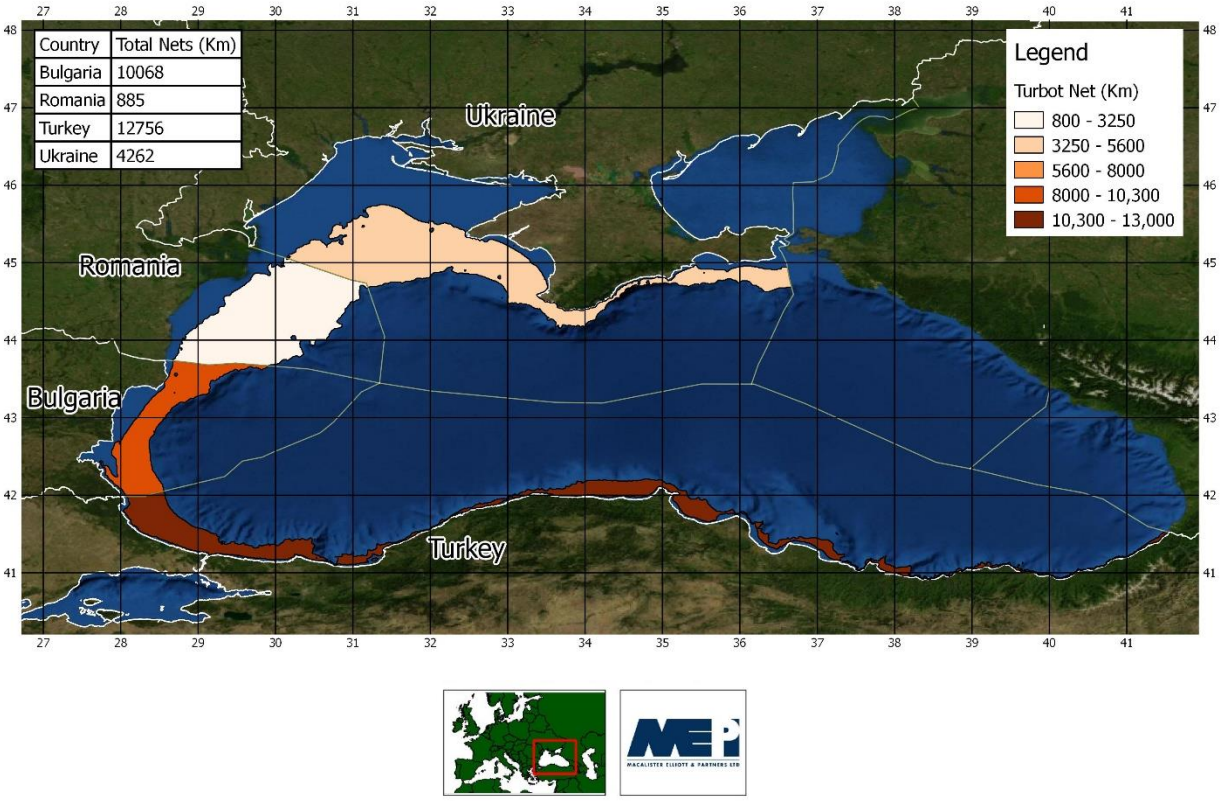


Figure 4.38 Estimated total fishing effort (kilometres of net) and area (km2) of fishing strata (40m-140m) for the set gillnet turbot fishery (GNS_DEF_>280). Image created on Quantum GIS. CRS: WGS 84.

Figure 4.38 shows that the turbot demersal gillnet fishery is limited to the coastal shelf between 40m and 140m. This is the zone where adult turbot tend to aggregate during the spring and summer months to breed[251]. The upper depth limit may fluctuate depending on the specific fishing grounds

[251] *Samsun, N., & Kalaycı, F. (2005). Survival rates of Black Sea Turbot (Scophthalmus maeoticus Pallas, 1811) captured by bottom turbot gillnets in different depths and fishing seasons between 1999 and 2004. Turkish Journal of Fisheries and Aquatic Sciences, 5, 57-62.*

and the lower limit will depend upon the level of the anoxic water layer[252], however for the purpose of this assessment 40m and 140m are the assumed the limits for the fishery.

Fishing effort (or the amount of net operated per kilometre) for turbot was reported to be highest for Turkey, followed by Bulgaria. When considering the availability of continental shelf for fishing activity, Figure 4.38 shows that the Bulgarian fishery had the highest estimated density of nets with effort not evenly spread throughout the available grounds. The higher fishing effort seen in Turkey and Bulgaria are due to larger overall fleet size and markets for turbot, than in Romania and Ukraine. (5113 and 2030 vessels, compared to 194 and 766 vessels, respectively).

Fishing hotspots - fishermen's survey and reports from national teams

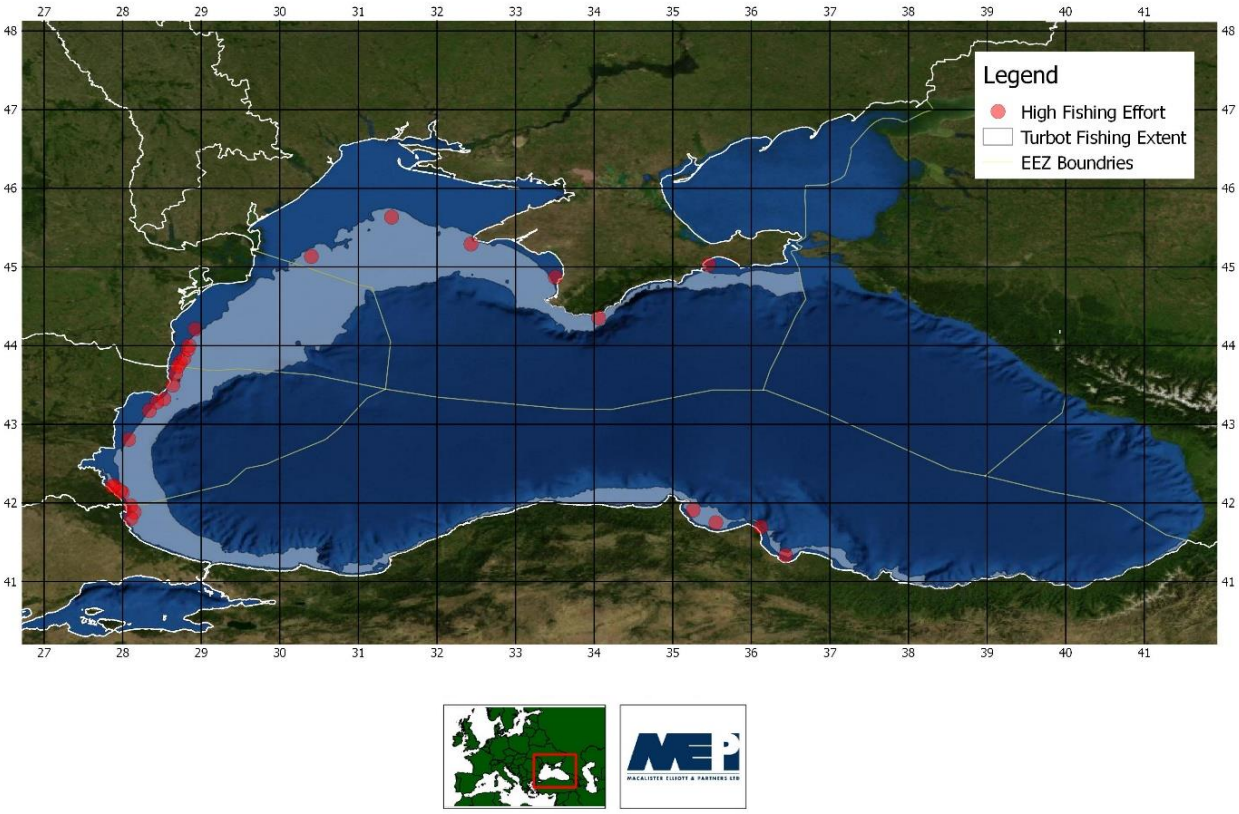


Figure 4.39 Reported turbot gillnet fishing hotspots from national experts. Hotspots based on a rough indication of the region of high fishing effort. Image created on Quantum GIS. CRS: WGS 84.

In terms of fishing hotspots, the national team in Turkey reported that turbot fishing occurred in most regions along the Black Sea coast, particularly in the western sector. This agrees with the results of the fishermen's survey and national teams (see Figure 4.39) where most reports of this gear type were from Sinop in the western region. This area is also reported to be a particular hotspot for cetacean by-catch (see section 6.1.1.2). Bulgarian and Turkish vessels generally claimed they fished within the

[252] *There is very low mixing between the Black Sea surface layer and the deeper waters. That prevents penetration of oxygen to the deeper regions of the Black Sea, there is no oxygen below 200 meters. Marine animals and algae cannot live in the anoxic zone of Black Sea, that water is inhabited by anaerobic bacteria which disintegrate sinking remains of the upper layer marine life. These saprophytic bacteria produce sulphuric hydride (H2S) when recycling sulphur-containing amino-acids (http://blacksea-education.ru/blacksea.shtml).*

12nm limit yet it is regularly reported that Turkish boats operate in Bulgarian, Romanian and even Ukrainian waters. The Bulgarian shelf extends beyond 12nm.

Bulgarian vessels reported to the fishermen's survey that vessels operated from ports in all three coastal regions, spreading their effort all along the coast. This also agrees with reports from national teams (Figure 4.39). Romania has an extensive coastal shelf area yet the fishermen's survey and reports from national teams revealed that much of the fishing effort was concentrated in the south in the Constanta region; the majority of fishing vessels operate from ports in this region.

Ukrainian vessels sampled in the fishermen's survey and national team members reported that fishermen travelled greater distances than other countries; up to 40km into the North West Black Sea, to target turbot (Figure 4.39).

4.2.7.2. Mixed demersal set gillnet fishery (GNS_DEF_<150)

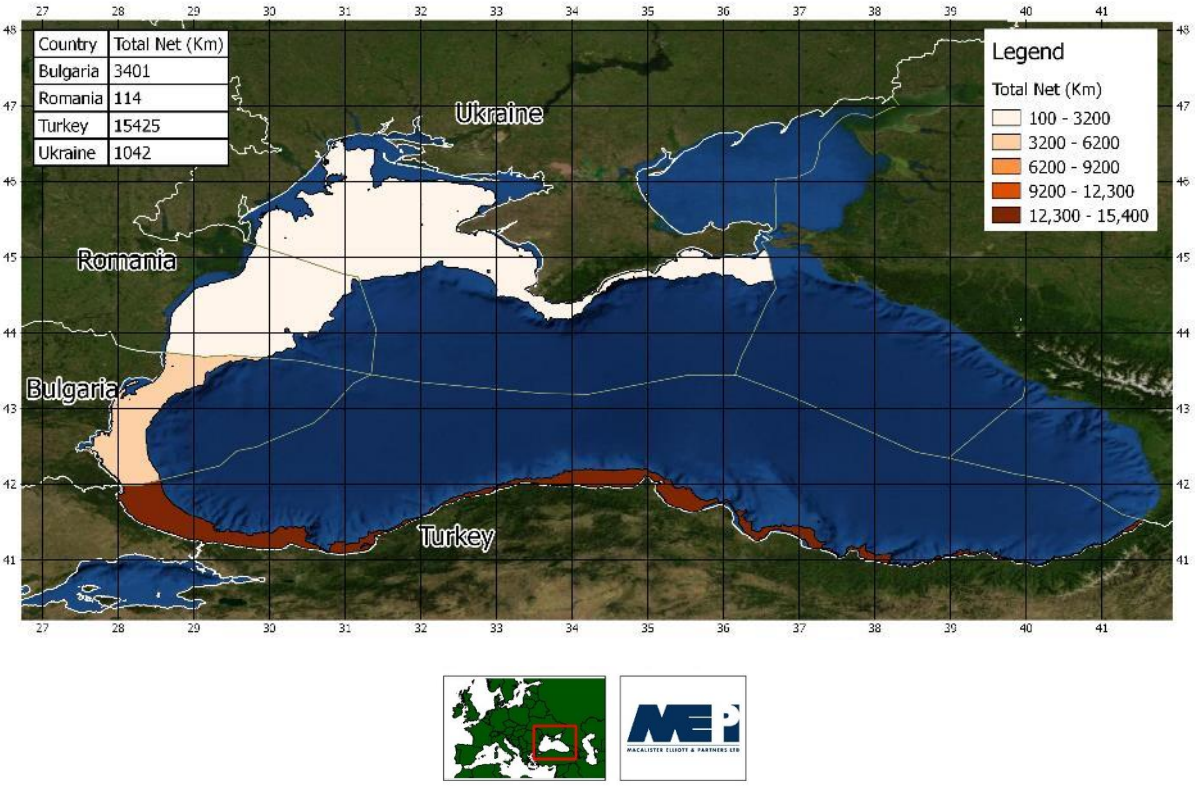


Figure 4.40 Estimated total fishing effort (kilometres of net) and area (km2) of fishing strata (20m-140m) for the mixed demersal set gillnet fishery (GNS_DEF_<150). Image created on Quantum GIS. CRS: WGS 84.

Figure 4.40 shows that mixed demersal gillnet fisheries are limited to the coastal shelf between 20 and 140m. This is similar to the turbot gillnet fishery except that Romanian and Ukrainian mixed demersal gillnets fish a wider area. This is likely due to a greater variety of species being fished (goby, dogfish, whiting and red mullet) than the targeted turbot fishery.

Again, Turkish fishing effort is greatest, concentrated close to shore according to the survey. The majority of vessels that reported using this gear were under 12 meters in length.

Fishing hotspots - fishermen's survey and reports from national teams

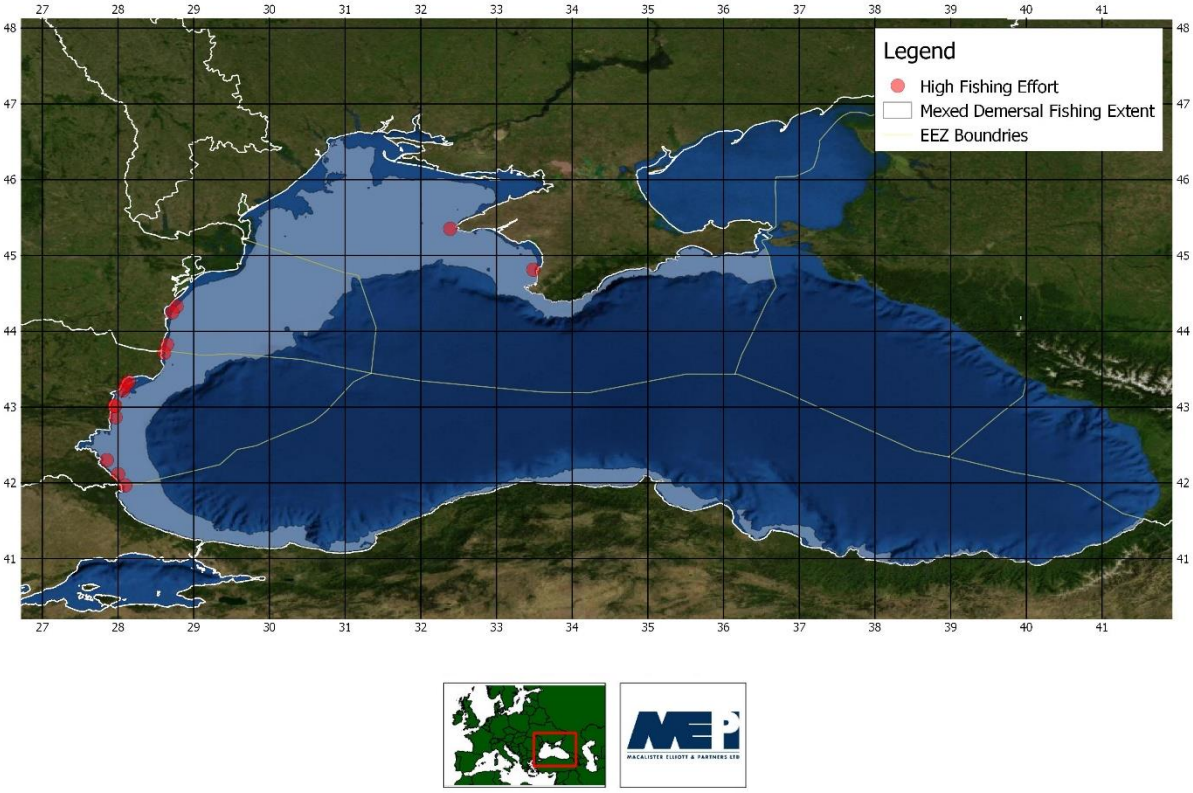


Figure 4.41 Reported mixed demersal gillnet fishing hotspots from national experts. Hotspots based on a rough indication of the region of high fishing effort. Image created on Quantum GIS. CRS: WGS 84.

In terms of fishing hotspots for the mixed demersal gillnet fisheries reports from the fisheries survey indicate that fishing effort is particularly high at ports Sinop and Rize, yet national experts report that fishing hotspots exist at all ports. It must be noted that reports of high by-catch rates are also present in this region (see section 6.1.1.2).

Romanian fishermen reported hotspots may exist in the southern section of Romania's coastline at Saturn, the Vama Veche area, the central sector of the coastline at Cape Tuzla and in the northern sector at Sulina. This generally agrees with reports from the national teams (Figure 4.41). Bulgarian fishermen reported hotspots in the southern sector of the coastline whereas national teams reported hotspots all along the coast. The smaller number of hotpots reported by fishermen is a reflection of the small sample of vessels represented in the fishermen's survey in relation to the full size of the national fleet.

Ukrainian fishermen reported fishing hotspots in the northwest region of the Black Sea and off the coast of southern Crimea. This coincides with reports from the national teams (Figure 4.41) and with reported areas of high cetacean by-catch (see section 6.1.1.2).

4.2.7.4. Pelagic gillnet fishery (GNS/GND_LPF or GNS_SPF_<150)

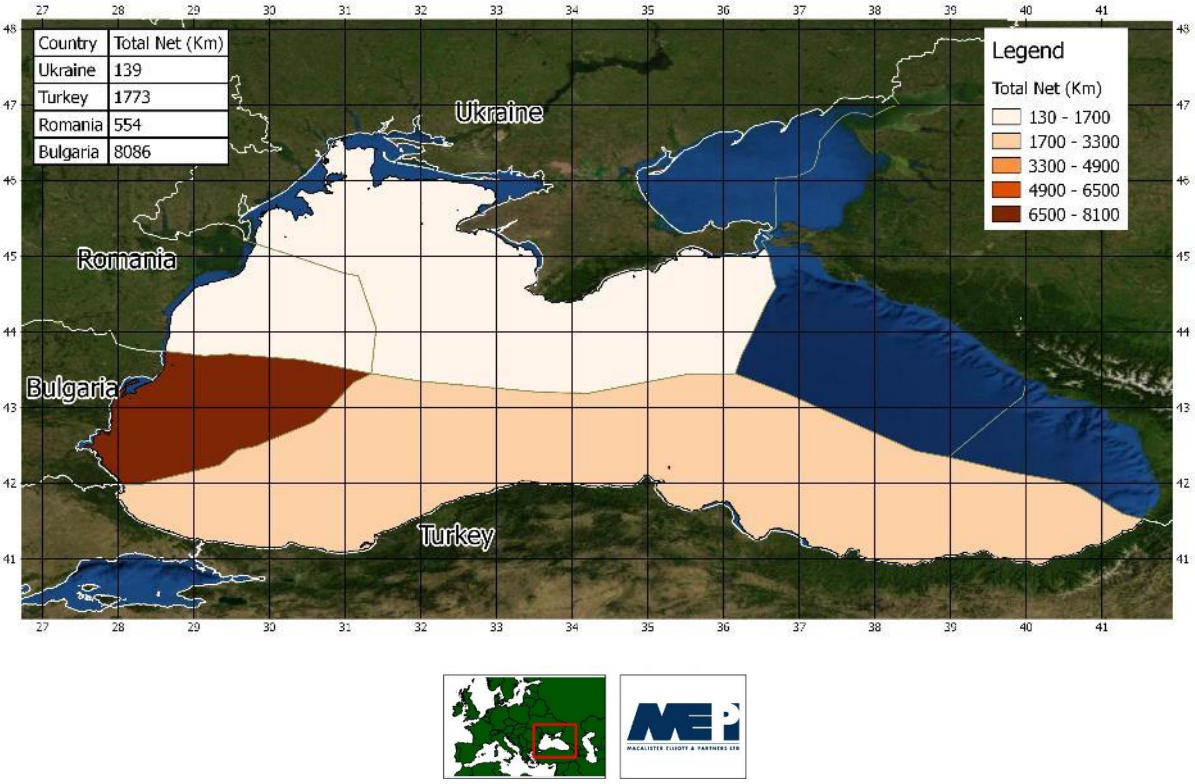


Figure 4.42 Estimated total fishing effort (kilometres of net) and area (km2) of fishing strata (20m-EEZ extent) for the pelagic set gillnet and drift gillnet fisheries (GNS/GND_<150). Image created on Quantum GIS. CRS: WGS 84.

Figure 4.42 Shows that effort in the pelagic gillnet and drift net fisheries highest in Bulgaria, followed by Turkey. Turkey reported to be using purse seine vessels to target the same species, which is why, despite the larger fleet size, Turkey's effort is lower than Bulgaria's here.

Fishing hotspots - fishermen's survey and reports from national teams

Figure 4.42 Shows that the depth range of these fisheries is reported to extend to the area of each country's EEZ but the fishermen's survey reported that this fishery is generally operated by small scale vessels under 12 meters that actually do not range far from harbour (2-3 miles from the coast), concentrating effort close to the shore. An exception is seen in Bulgaria, where the driftnet fishery for Bonito ranges further from the coast. Hotspots were not identified by national teams for this fishery, except in Ukraine, where fishing activity was reported to be high in the mouth of the Dniester estuary.

4.2.7.5. Purse seine fishery (PS_SPF_<14 or PS_LPF_14-60)

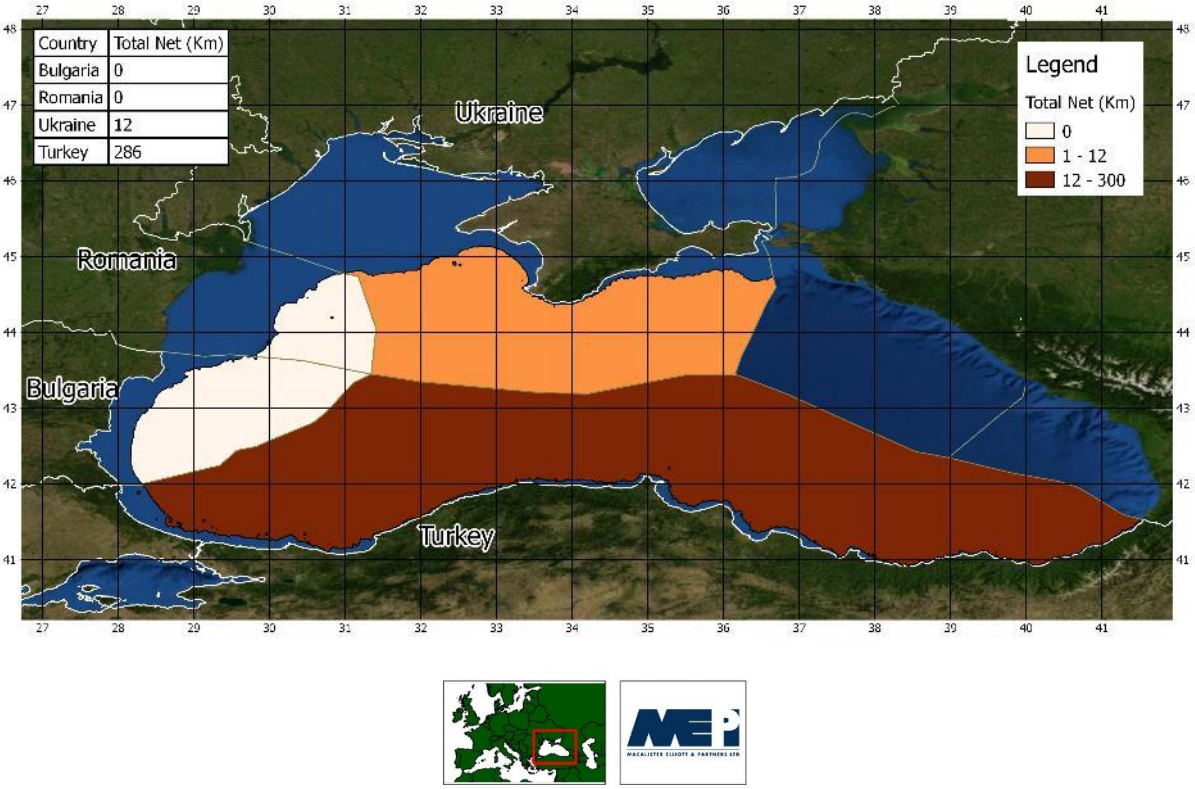


Figure 4.43 Estimated total fishing effort (kilometres of net) and area (km2) of fishing strata (80m-EEZ extent) for the large and small pelagics purse seine fisheries (PS_SPF_<14 and PS_LPF_14-60). Image created on Quantum GIS. CRS: WGS 84.

Purse seines are reportedly not operated in Romania or Bulgaria, and are also not a dominant gear type in Ukraine. Figure 4.43 Shows however, that Turkey has a significant purse seine fleet targeting both small pelagics (such as Black Sea anchovy and sprat) and large pelagic fish such as bonito. These vessels are wide ranging as they are not constrained by the continental shelf so will move seasonally depending on the migration of the target species.

Fishing hotspots - fishermen's survey and reports from national teams

The fishermen's survey reported that Turkish and Ukrainian vessels had no particular hotspots for this fishery yet Turkish national teams reported hotpots at various locations including the east: Trabzon Rize, Giresen and Samsun, central: Zonguldak and the west: Istanbul. Ukrainian national team members reported hotspots for purse seining to be between Cape Takil and Cape Onuk. These data have not been mapped.

4.2.7.6. Trawl fishery (OTM_SPF or OTB_DEF)

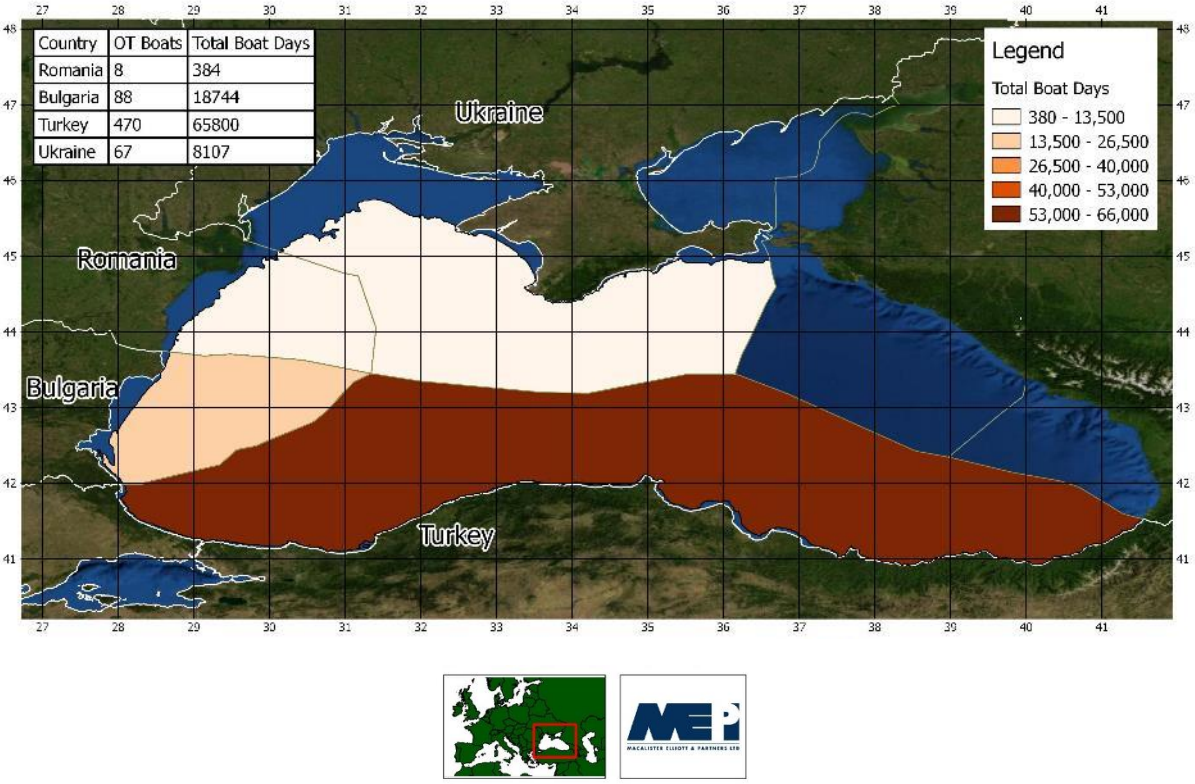


Figure 4.44 Estimated total fishing effort (total boat days) and area (km2) of fishing strata (30m-EEZ extent) for the demersal and mid-water otter trawl fisheries (OTB_DEF and OTM_SPF). Image created on Quantum GIS. CRS: WGS 84.

Figure 4.44 shows that greatest trawl fishing effort is from the Turkish fleet largest trawl fleets are seen in Turkey where bottom otter trawls are primarily operated (although mid-water trawls are used). Bulgaria operate a mix of mid-water and bottom trawls. The trawl fleets in Ukraine and Romania are not as significant in terms of effort.

In the Black Sea the bottom trawling fleet is restricted to operating on suitable grounds over the coastal shelf whereas the mid-water trawlers are able to fish in waters beyond 40m – 60m depth, similar to purse seiners.

Fishing hotspots - fishermen's survey and reports from national teams

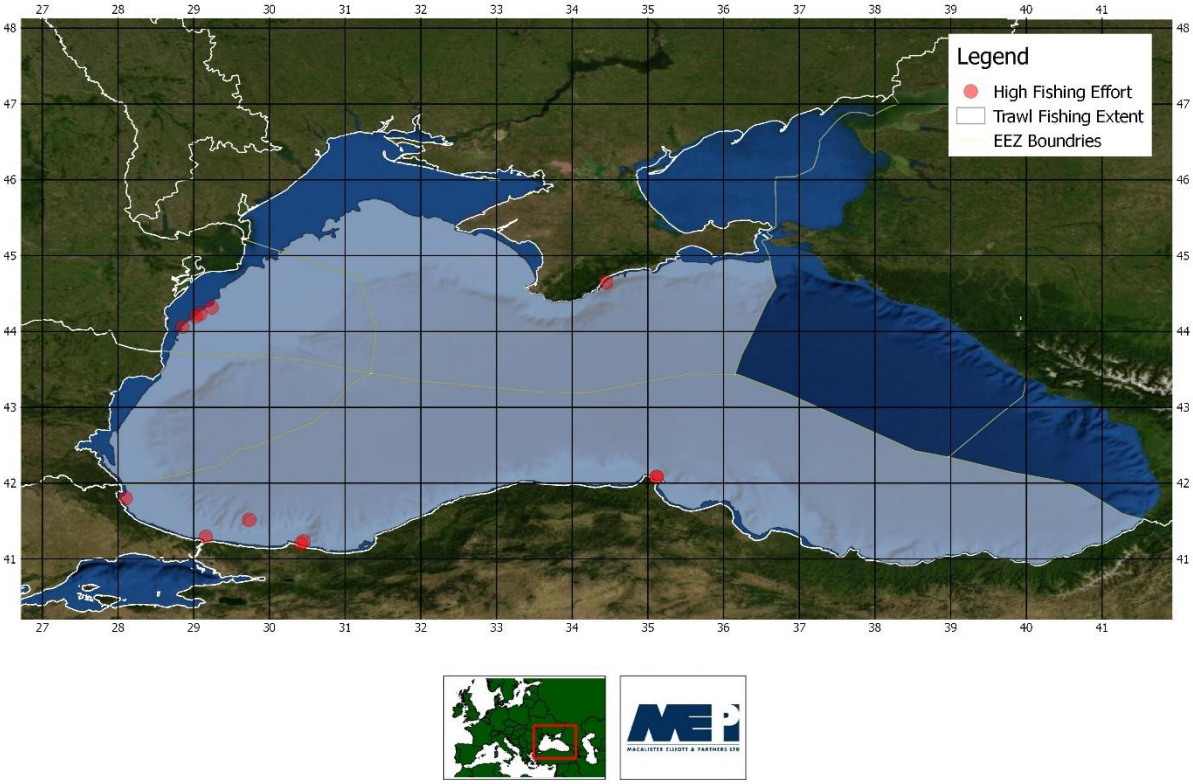


Figure 4.45 Reported trawl fishing hotspots from national experts. Hotspots based on a rough indication of the region of high fishing effort. Image created on Quantum GIS. CRS: WGS 84.

No fishing hotspots were identified in the fishermen's survey although it is likely that the bottom trawlers will concentrate on specific grounds at a local level. This was subsequently revealed by national team members (Figure 4.45).

5. Cetacean abundance and distribution in the Black Sea

5.1. Abundance and distribution of cetaceans determined by project surveys

5.1.1. Introduction

During July 2013, the combined shipboard and aerial line transect survey was conducted to document the distribution and abundance of cetaceans in the western Black Sea including all waters under the jurisdiction of Bulgaria (BG), Romania (RO) and the waters of Ukraine (UA) located to the west of Crimea peninsula. The southern and south-eastern boundaries of the survey area coincided with the maritime border between Bulgaria and Turkey and then across the Ukrainian sea along a straight line towards Cape Khersones in Ukraine. The territorial sea, internal waters and exclusive economic zones (EEZs) of Bulgaria and Romania taken together were considered as a maritime area of the European Union (EU) in the Black Sea.

This survey represents the first dedicated line-transect cetacean survey in the inshore and offshore waters of the western Black Sea. This is the first line-transect cetacean survey in Bulgaria, Romania and in the EU Black Sea as a whole.

The vessel and aircraft followed pre-determined track lines throughout the territorial sea/internal waters and EEZs. Double platform line transect techniques were used to collect distance sampling data. The methodology of surveying was presented in detail in Annex 4. Surveying was conducted when the wind was Beaufort force four or below and the visibility was good. The survey was carried out in “passing mode”: the vessel and aircraft did not approach any cetaceans sighted. All sightings data were recorded on pre-prepared data sheets and entered into a database at the end of a survey day.

The data was treated as a single platform survey by combining the sightings from each observation platform and removing duplicate sightings. The data was processed and analyzed by means of Distance 6.0 **program package**[253].

This section of the report presents the assessment of the distribution, density and absolute abundance of all three Black Sea cetacean species/subspecies, including the Harbour porpoise (*Phocoena phocoena relicta*), the Common dolphin (*Delphinus delphis ponticus*) and the Bottlenose dolphin (*Tursiops truncatus ponticus*). In addition, an estimate was made of the number of fishing buoys installed in the territorial sea/internal waters.

[253] *Thomas, L., Laake, J.L., Rexstad, E., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Burt, M.L., Hedley, S.L., Pollard, J.H., Bishop, J.R.B. and Marques, T.A. 2009. Distance 6.0. Release 2. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK.* http://www.ruwpa.st-and.ac.uk/distance/

5.1.2. Results of the vessel-based survey in the territorial sea and internal waters

A double-platform line-transect vessel-based survey has been carried out over a period of 24 days (8–31 July 2013) covering the entire territorial sea and internal maritime areas of Bulgaria and Romania and, partially, of Ukraine. The survey started from the Bulgarian-Turkish border, then advanced clockwise along the Black Sea coast following a zigzag pattern, and finished at the entrance to Sevastopol Bay in Crimea. The summarized information about the study area, applied observation effort and sighted objects is presented in Table 5.1. A total of 573 sightings of Black Sea cetaceans of all three species and 30 sightings of fishing buoys have been recorded and analysed. The results of Distance analysis of the obtained data are presented in detail in Annex 5.

Table 5.1 Observation effort and number of target objects recorded during the boat survey in the 12-mile-wide inshore zone of the western Black Sea, 8–31 July 2013.

Surveyed area, *km*^{2}		Observation effort			Sighted targets						
					P. p. relicta		*D. d. ponticus*		*T. t. ponticus*		Fishing buoys
		km	hours	min	sightings	animals	sightings	animals	sightings	animals	
BG waters	6987	347.5	31	03	17	24	34	79	48	95	7
RO waters	5827	301.3	25	00	143	204	35	52	30	44	13
UA waters	18967	942.3	79	17	97	150	95	210	74	132	10
EU waters*	12814	648.8	56	03	160	228	69	131	78	139	20
Total area**	31781	1591.1	135	20	257	378	164	341	152	271	30

* BG+RO waters. ** BG+RO+UA waters.

5.1.2.1. Harbour porpoises (P. p. relicta)

Harbour porpoises (257 sightings; 378 animals) have been observed in different parts of the study area including coastal waters of Bulgaria, Romania and Ukraine (Figure 5.1). The distribution of sightings was quite irregular. The most dense clusters of sightings, indicative of porpoise accumulations, were found in the vicinity of the Danube Delta (Romania and Ukraine), in the southern Romanian Black Sea, and south-westwards from Tarkhankut peninsula in Crimea. No evidence of considerable gatherings of Harbour porpoises were detected in the Bulgarian 12-mile-wide coastal area.

Major gaps in *P. p. relicta* occurrence within the study area were indicated in the southern and middle Bulgarian sea (2 or 3 transects without any sighting), in the middle Romanian sea (1 transect) as well as in several localities in the Ukrainian sea including inshore areas off Dnestrovskiy Liman (2 transects), Tendra island (1 transect), in the northern and central parts of Karkinitskiy Gulf (6 transects), and in the waters to the west of Cape Yevpatoriyskiy (1 transect) (Figure 5.1.).

Harbour porpoises have been observed as solitary animals (170 sightings; 66% of the total sightings), groups consisting of two (66; 26% of the total), three (15; 6% of the total) and more (6; 2% of the total). A group is defined as at least two animals within two body lengths of each other. The largest group in a single sighting was composed of eight porpoises. The estimated aggregate values of the group size in different maritime areas are presented in Table 5.2. There is no significant difference between these values. All of them show small group size of porpoises everywhere in the surveyed waters.

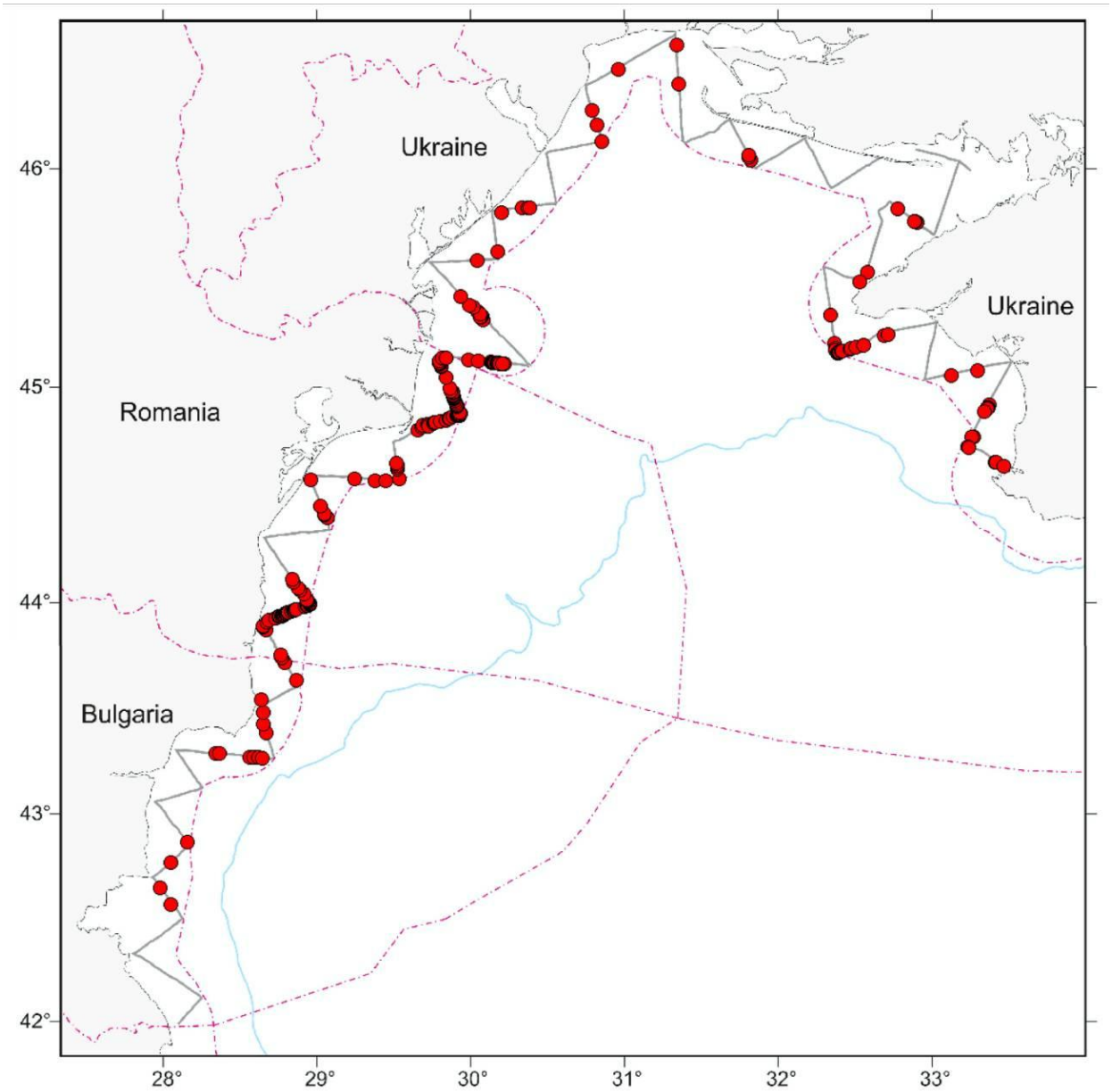


Figure 5.1 Sightings of Harbour porpoises (red spots) during the vessel-based survey in the territorial sea and internal waters of Bulgaria, Romania and Ukraine (July 2013). Here and on further maps each spot symbol represents one sighting; the diameter of symbol does not depend on the recorded group size. The tracks of survey platform are shown as a solid grey line. Solid blue line corresponds to the edge of the continental shelf (depth contour of 200 m*). The dotted lines indicate state borders and borders of EEZs.*

Table 5.2 Group size of Harbour porpoises in the inshore area

Surveyed areas	Expected value of group size		Mean group size	
	E (*S*)	95% CI	*M*	95% CI
BG waters	1.402	1.142 – 1.720	1.412	1.174 – 1.698
RO waters	1.376	1.284 – 1.475	1.427	1.316 – 1.547
UA waters	1.543	1.396 – 1.705	1.546	1.344 – 1.780
EU waters (BG+RO)	1.367	1.282 – 1.458	1.425	1.323 – 1.535
Total area (BG+RO+UA)	1.436	1.360 – 1.517	1.471	1.370 – 1.579

The uncorrected values of Harbour porpoise density and absolute numbers estimated for different parts of the study area are shown in Table 5.3.

Table 5.3 Density and abundance of Harbour porpoises in the inshore area

Surveyed areas	Density of groups, groups/*km²*		Density of animals, indiv./*km²*		Number of animals	
	DS	95% CI	*D*	95% CI	*N*	95% CI
BG waters	0.102	0.040 – 0.263	0.144	0.055 – 0.374	1003	385 – 2611
RO waters	0.876	0.429 – 1.790	1.205	0.589 – 2.468	7023	3431 – 14378
UA waters	0.177	0.094 – 0.334	0.273	0.144 – 0.518	5178	2728 – 9827
EU waters (BG+RO)	0.533	0.269 – 1.055	0.728	0.367 – 1.445	9331	4702 – 18518
Total area (BG+RO+UA)	0.343	0.210 – 0.559	0.492	0.301 – 0.805	15635	9555 – 25583

The densities of *P. p. relicta* groups (*DS*) and individuals (*D*) were significantly more high in Romania than in Bulgaria ($p<0.01$ and $p<0.05$) and Ukraine ($p<0.05$). The absolute abundance (*N*) of porpoises was the lowest in Bulgaria differing from correspondent values in Ukraine and Romania in 5 to 7 times ($p<0.05$).

5.1.2.2. Common dolphins (*D. d. ponticus*)

A total of 164 sightings (341 animals) of Common dolphins were recorded in the 12-mile-wide coastal area of the western Black Sea (Figure 5.2). The sightings were distributed unevenly along the survey tracks. Compact clusters of sightings were recorded in Bulgarian (2 sites), Romanian (2 sites) and in Ukrainian waters (3 sites). The sites of *D. d. ponticus* accumulations were situated opposite Cape Kaliakra and off Shabla–Durankulak area in Bulgaria, opposite Cape Tuzla and Danube Delta in Romania, near Zmeinyi (Serpent) island, Dzharylgach Island and in the middle of Karkinitskiy Gulf in Ukraine.

In contrast, Common dolphins were not seen for the entirety of 3 transects in Bulgaria (opposite Varna and suburbs), 1 transect in Romania (near Constanţa) and 13 transects in Ukraine (at the coasts of Odessa and Kherson provinces and off the western Crimea) (Figure 5. 2).

Common dolphins have been observed as single animals (71 sightings; 43% of total sightings) and groups of animals (93; 57% of total sightings). Most groups consisted of two (52; 32% of total sightings) and three individuals (26; 16% of total sightings). Again, a group is defined as at least two animals within two body lengths of each other. Groups of four to twenty dolphins were recorded on rare occasions (15; 9% of total sightings). The estimated aggregate values of group size are summarized in Table 5.4. According to the expected values of group size, the groups were bigger in Ukraine than in Bulgaria ($p<0.05$), Romania ($p<0.001$) and Black Sea EU waters in whole ($p<0.01$). The mean size of *D. d. ponticus* groups was more significant in Ukraine in comparison with the Romanian value ($p<0.001$).

Table 5.4 Group size of Common dolphins in the inshore area

Surveyed areas	Expected value of group size		Mean group size	
	E (*S*)	95% CI	*M*	95% CI
BG waters	1.621	1.260 – 2.084	2.324	1.422 – 3.800
RO waters	1.450	1.242 – 1.693	1.486	1.264 – 1.747
UA waters	2.104	1.872 – 2.365	2.211	1.961 – 2.493
EU waters (BG+RO)	1.602	1.383 – 1.855	1.899	1.403 – 2.568
Total area (BG+RO+UA)	1.885	1.718 – 2.067	2.079	1.813 – 2.384

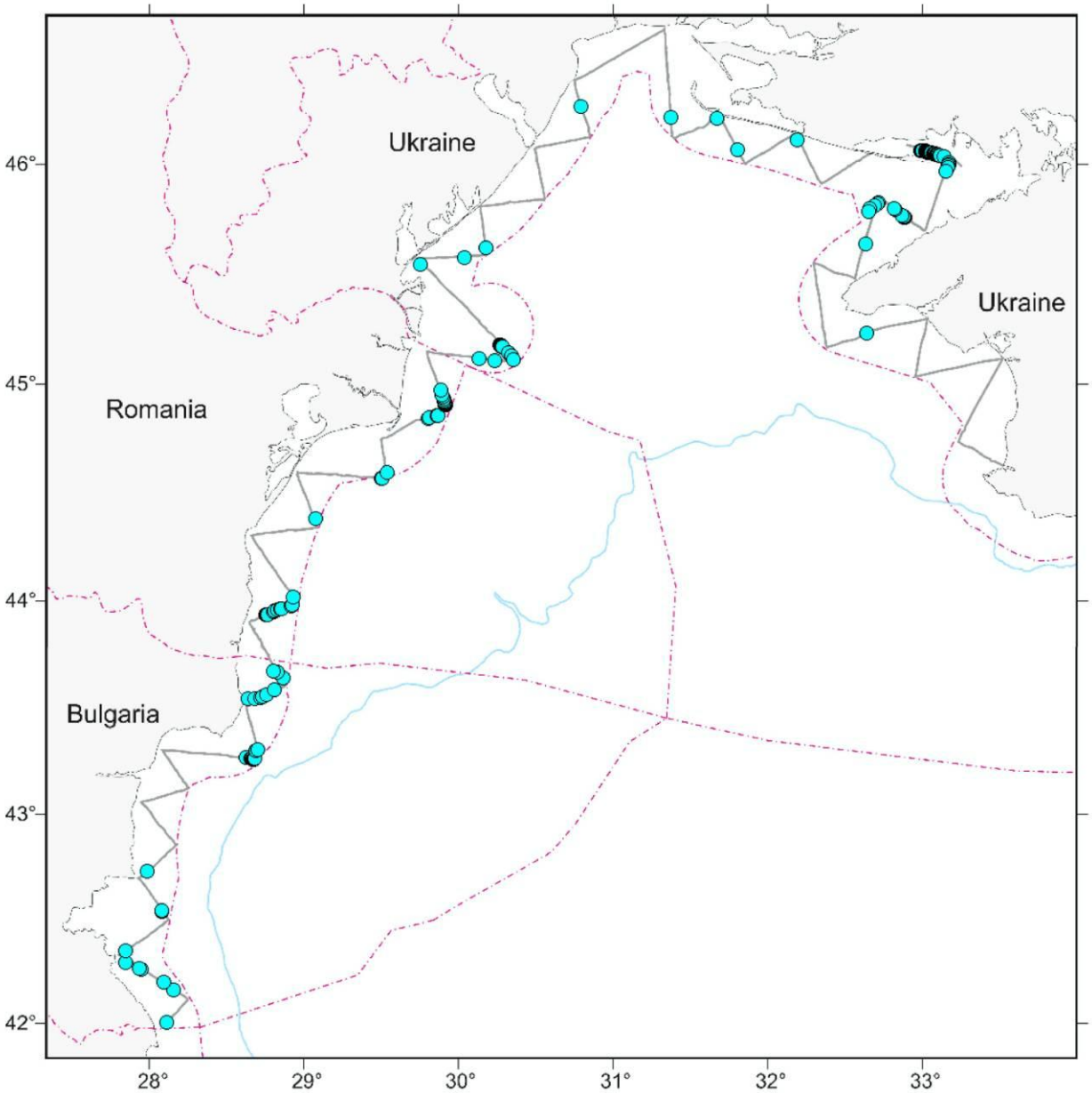


Figure 5.2 Sightings of Common dolphins (blue spots) during the vessel-based survey in the territorial sea and internal waters of Bulgaria, Romania and Ukraine (July 2013).

The uncorrected values of Common dolphin density and absolute abundance estimated for different parts of the study area are shown in Table 5.5. There is no statistically significant difference between these values.

Table 5.5 Density and abundance of Common dolphins in the inshore area

Surveyed areas	Density of groups, groups/km^2		Density of animals, indiv./km^2		Number of animals	
	DS	95% CI	*D*	95% CI	*N*	95% CI
BG waters	0.443	0.227 – 0.866	0.718	0.356 – 1.448	5019	2489 – 10118
RO waters	0.192	0.079 – 0.470	0.279	0.113 – 0.685	1624	660 – 3993
UA waters	0.249	0.090 – 0.684	0.523	0.189 – 1.445	9919	3589 – 27415
EU waters (BG+RO)	0.273	0.157 – 0.476	0.438	0.247 – 0.774	5609	3170 – 9922
Total area (BG+RO+UA)	0.258	0.138 – 0.483	0.486	0.258 – 0.915	15450	8211 – 29073

5.1.2.3. Bottlenose dolphins (*T. t. ponticus*)

Bottlenose dolphins (152 sightings; 271 individuals) were recorded in coastal waters of all three countries involved (Figure 5. 3).

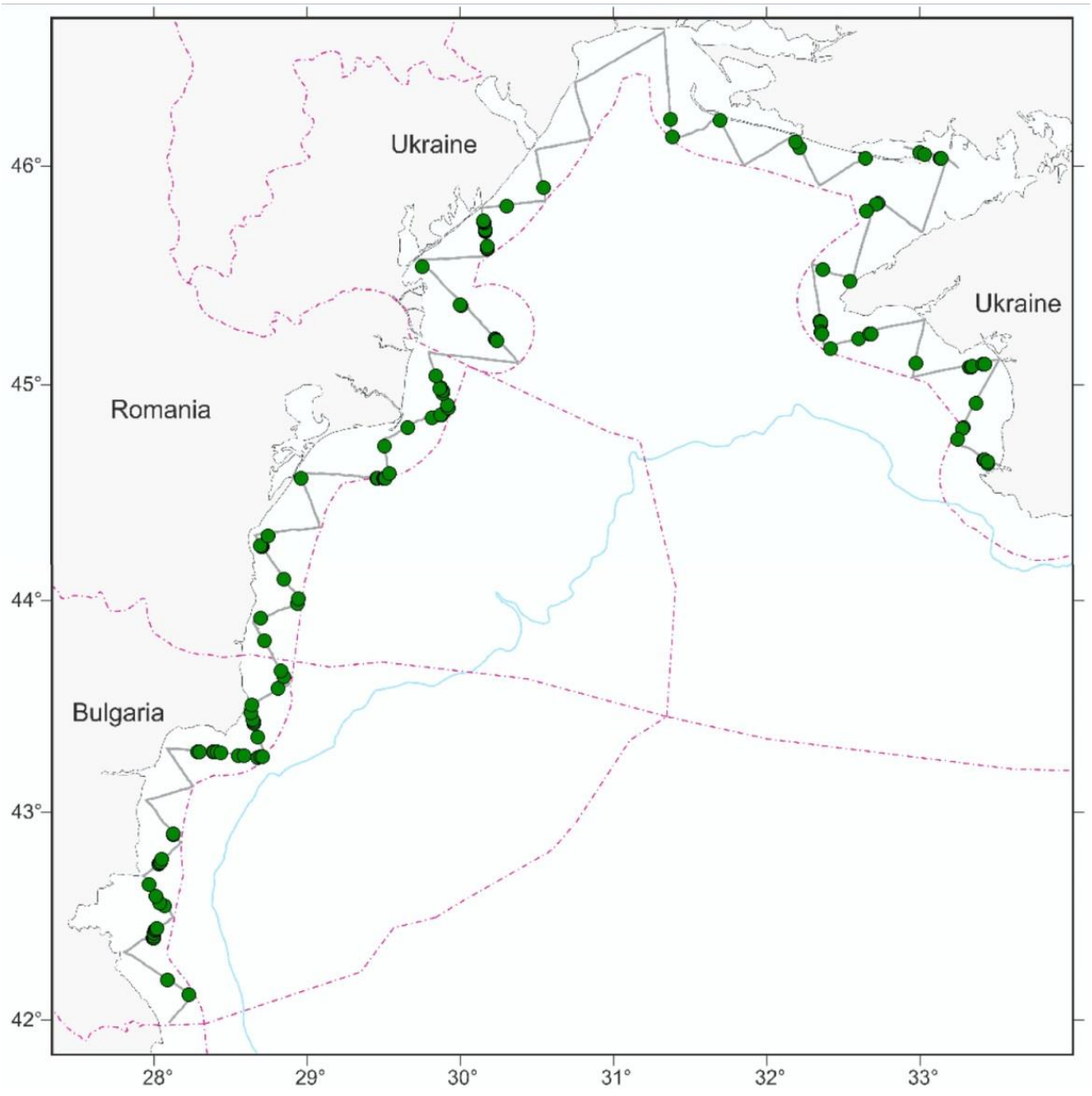


Figure 5.3 Sightings of Bottlenose dolphins (green spots) during the vessel-based survey in the territorial sea and internal waters of Bulgaria, Romania and Ukraine (July 2013).

Notable clusters of sightings of Bottlenose dolphins were recorded opposite Gulf of Burgas (between Cape Maslen and Cape Emine) and near Cape Kaliakra in Bulgaria; opposite Danube Delta in Romania; opposite Danube-to-Dniester interfluve, and nearby Tarkhankut peninsula in Ukraine.

Bottlenose dolphins were not found along 2 transects in Bulgaria (opposite Varna and environs) and 11 transects in Ukraine, including 5 transects off Odessa province, 3 transects off Kherson province and 3 transects off Crimea (Figure 5.3).

Over a half of sightings were represented by solitary animals (89; 59% of total sightings). The recorded groups consisted of two (35; 23% of total sightings), three (18; 12% of total sightings) and more individuals (10; 7% of total sightings), where a group is defined as at least two animals within two body lengths of each other. The biggest group was composed of 12 Bottlenose dolphins. The estimated aggregate values of the group size are shown in Table 5.6.

Table 5.6 Group size of Bottlenose dolphins in the inshore area

Surveyed areas	Expected value of group size		Mean group size	
	E (*S*)	95% CI	*M*	95% CI
BG waters	2.062	1.710 – 2.487	1.979	1.516 – 2.585
RO waters	1.376	1.161 – 1.630	1.467	1.218 – 1.766
UA waters	1.789	1.559 – 2.054	1.784	1.516 – 2.098
EU waters (BG+RO)	1.799	1.577 – 2.052	1.782	1.471 – 2.158
Total area (BG+RO+UA)	1.788	1.629 – 1.963	1.783	1.574 – 2.020

The expected size of *T. t. ponticus* groups was definitely smaller in Romania than in Bulgaria ($p<0.01$) and Ukraine ($p<0.05$). The disparity between the Bulgarian and Ukrainian values is statistically insignificant.

The estimated values of Bottlenose dolphin density and abundance are presented in Table 5.7.

Table 5.7 Density and abundance of Bottlenose dolphins in the inshore area

Surveyed areas	Density of groups, groups/km^2		Density of animals, indiv./km^2		Number of animals	
	DS	95% CI	*D*	95% CI	*N*	95% CI
BG waters	0.337	0.197 – 0.578	0.696	0.396 – 1.221	4861	2769 – 8533
RO waters	0.158	0.098 – 0.255	0.217	0.131 – 0.359	1265	766 – 2089
UA waters	0.192	0.106 – 0.346	0.343	0.188 – 0.628	6515	3563 – 11913
EU waters (BG+RO)	0.280	0.193 – 0.406	0.504	0.341 – 0.745	6456	4366 – 9547
Total area (BG+RO+UA)	0.219	0.155 – 0.309	0.392	0.274 – 0.560	12453	8719 – 17786

According to these estimates, the territorial sea and internal waters in Romania were clearly less abundant in *T. t. ponticus* than in Bulgaria ($p<0.05$) and Ukraine ($p<0.05$). The density of Bottlenose dolphins in Romania was a third of the density estimated for Bulgaria ($p<0.05$).

5.1.2.4. Fishing buoys

The number of sightings recorded in Bulgaria (7 buoys), Romania (13 buoys) and Ukraine (10 buoys) was too small to estimate the density and absolute quantity of fishing buoys in each separate country but it was sufficient to make proper estimates for the study area in whole and for EU waters (Table 5.8.).

Table 5.8 Density and numbers of fishing buoys in the inshore area

Surveyed areas	Density, buoys/km^2		Number of buoys	
	D	95% CI	*N*	95% CI
EU waters (BG+RO)	0.072	0.030 – 0.171	922	388 – 2192
Total area (BG+RO+UA)	0.042	0.022 – 0.081	1333	694 – 2560

5.1.3. Results of the aerial survey in the exclusive economic zones

Double-platform line-transect aerial survey was carried out over a period of seven days (6–12 July 2013) covering the entire EEZs of Bulgaria, Romania and part of the Ukrainian EEZ. The aerial survey platform was a Partenavia P68 equipped with two rows of bubble observation windows. The aircraft moved along 25 parallel track lines 20 *km* apart from one another oriented from northwest to southeast. The summarized information regarding the study area, observation effort and numbers of cetacean sightings is presented in Table 5.9. A total of 512 sightings of Black Sea cetaceans of all three species have been recorded and analysed. The results of Distance analysis are shown in detail in Annex 5.

Table 5.9 Observation effort and number of target objects recorded during the aerial survey in EEZs of the western Black Sea, 6–12 July 2013

Surveyed area, km^2		Observation effort			Sighted targets					
					P. p. relicta		*D. d. ponticus*		*T. t. ponticus*	
		km	hours	min	sightings	animals	sightings	animals	sightings	animals
BG waters	28248	1438.7	8	12	94	127	120	277	42	78
RO waters	23247	1172.0	7	00	11	12	20	59	29	74
UA waters	36520	1834.7	9	30	40	50	104	263	52	90
EU waters*	51495	2610.7	15	12	105	139	140	336	71	152
Total area**	88015	4445.4	24	42	145	189	244	599	123	242

* BG+RO waters. ** BG+RO+UA waters.

5.1.3.1. Harbour porpoises (*P. p. relicta*)

Harbour porpoises (145 sightings; 189 animals) have been recorded in different parts of the study area including offshore waters of Bulgaria, Romania and Ukraine (Figure 5.4).

The densest clusters of *P. p. relicta* sightings were situated in the western and south-western parts of the Bulgarian EEZ. Less dense accumulations of sightings were recorded in the northern and southern parts of the Ukrainian EEZ and there were infrequent sightings of clusters of Harbour porpoises in the Romanian EEZ.

Porpoises have been observed as single animals (119 sightings; 82% of total sightings) and groups consisting of two (19; 13% of total sightings) and more individuals (7; 5% of total sightings). A group is at least two animals within two body lengths of each other. The biggest group was composed of ten animals. The estimated aggregate values of the group size in different maritime areas are presented in Table 5.10.

Table 5.10 Group size of Harbour porpoises in the offshore area

Surveyed areas	Expected value of group size		Mean group size	
	E (*S*)	95% CI	*M*	95% CI
BG waters	1.251	1.146 – 1.366	1.351	1.143 – 1.597
RO waters	1.072	1.000 – 1.268	1.091	1.000 – 1.313
UA waters	1.286	1.143 – 1. 447	1.250	1.064 – 1.468
EU waters (BG+RO)	1.237	1.143 – 1.340	1.324	1.135 – 1.543
Total area (BG+RO+UA)	1.251	1.172 – 1.336	1.303	1.156 – 1.469

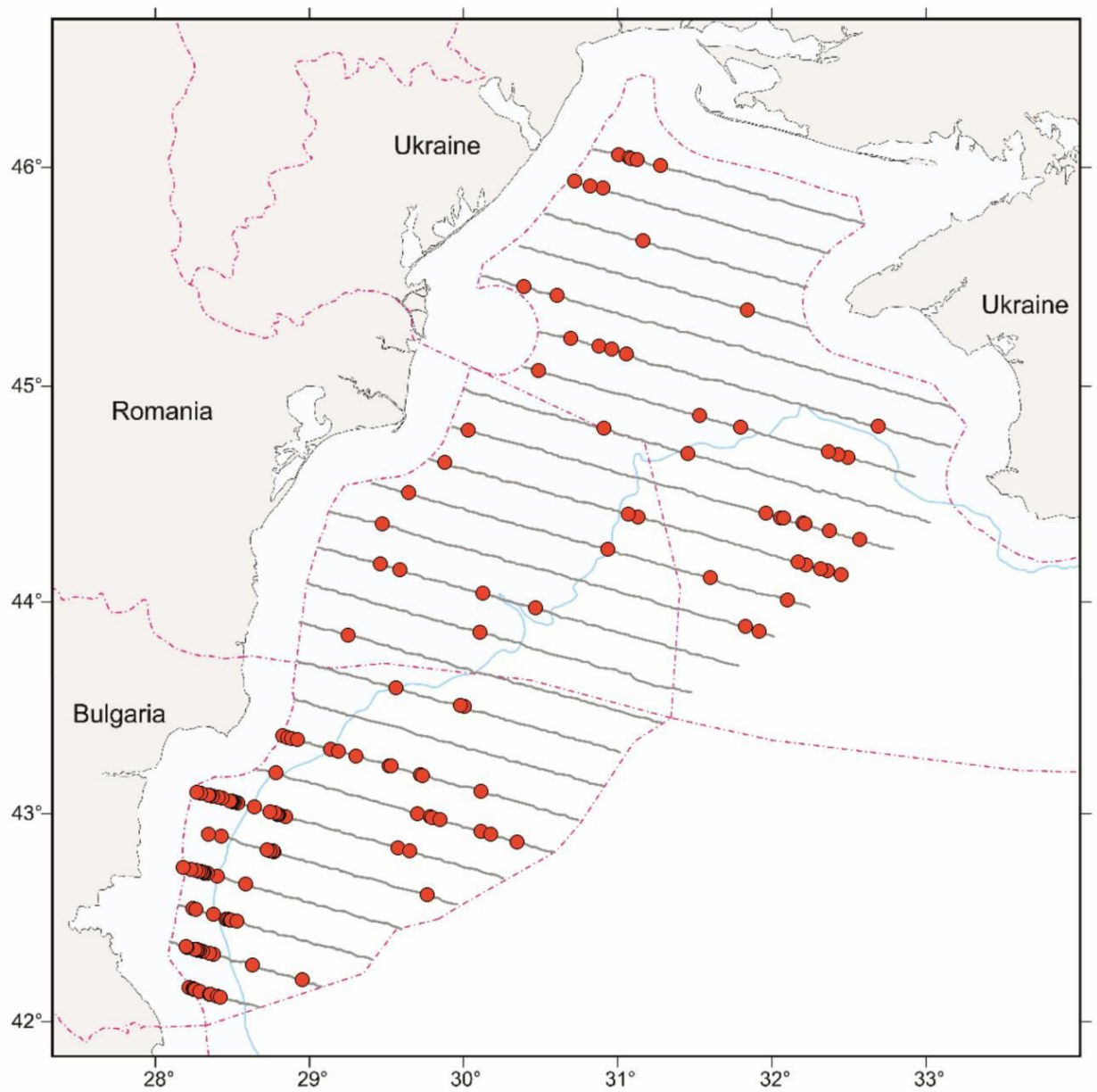


Figure 5.4 Sightings of Harbour porpoises (red spots) during the aerial survey over the EEZs of Bulgaria, Romania and Ukraine (July 2013).

The values of Harbour porpoise density and absolute numbers estimated for different parts of the study area are shown in Table 5.11. The densities of *P. p. relicta* groups and individuals were considerably lesser in the Romanian EEZ than in the Bulgarian ($p<0.01$) and Ukrainian EEZs ($p<0.01$). Correspondingly, the absolute abundance of Harbour porpoises was the lowest in the Romanian EEZ and differed from relevant Ukraine and Bulgaria values in 7-12 times ($p<0.01$).

Table 5.11 Density and abundance of Harbour porpoises in the offshore area

Surveyed areas	Density of groups, groups/km^2		Density of animals, indiv./km^2		Number of animals	
	DS	95% CI	*D*	95% CI	*N*	95% CI
BG waters	0.282	0.145 – 0.546	0.353	0.181 – 0.686	9960	5116 – 19390
RO waters	0.032	0.014 – 0.073	0.034	0.015 – 0.079	799	346 – 1844
UA waters	0.114	0.071 – 0. 182	0.146	0.090 – 0. 237	5342	3303 – 8638
EU waters (BG+RO)	0.170	0.086 – 0.333	0.210	0.106 – 0.414	10800	5468 – 21331
Total area (BG+RO+UA)	0.139	0.081 – 0. 238	0.174	0.101 – 0.299	15307	8903 – 26318

5.1.3.2. Common dolphins (*D. d. ponticus*)

A total of 244 sightings (599 individuals) of Common dolphins have been recorded in the EEZs of Bulgaria, Romania and Ukraine (Figure 5.5.). Almost half of the sightings (120 incidents or 49%; 277 animals) were observed in the Bulgarian EEZ in contrast with the Romanian EEZ which had the least abundant in *D. d. ponticus* sightings (20 incidents or 8%; 59 animals).

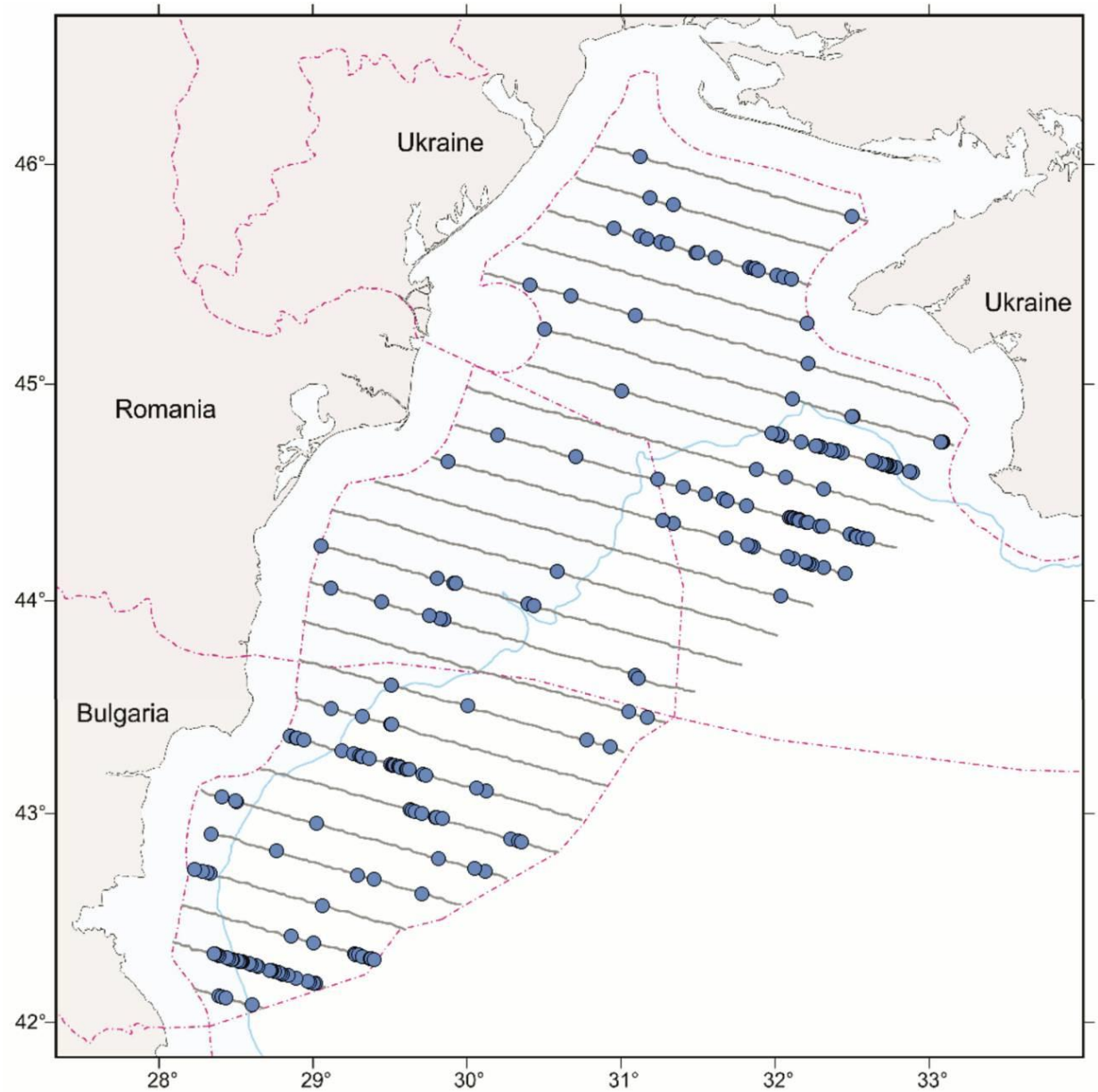


Figure 5.5 Sightings of Common dolphins (blue spots) during the aerial survey over the EEZs of Bulgaria, Romania and Ukraine (July 2013).

The densest clusters of the sightings (accumulations of Common dolphins) were recorded to the east of Cape Maslen and Cape Kaliakra in the Bulgarian EEZ; to the west and southwest of Cape Khersones and to the northwest of Tarkhankut peninsula in the Ukrainian EEZ (Figure 5.5.). During the survey there were no transects devoid of any *D. d. ponticus* sightings.

Common dolphins have been detected as single animals (139 sightings; 57% of total sightings) and groups consisted of two (40; 16% of total sightings), three (26; 11% of total sightings), four to ten (31; 13% of total sightings), and twelve to 28 individuals (8; 3% of total sightings). A group is where at least two animals are within two body lengths of each other and estimated aggregate values of group size are shown in Table 5.12. No statistically significant difference was found amongst the presented values.

Table 5.12 Group size of Common dolphins in the offshore area

Surveyed areas	Expected value of group size		Mean group size	
	E (*S*)	95% CI	*M*	95% CI
BG waters	2.182	1.890 – 2.520	2.308	1.802 – 2.957
RO waters	2.161	1.314 – 3.555	2.950	1.679 – 5.185
UA waters	1.809	1.542 – 2.119	2.529	2.066 – 3.095
EU waters (BG+RO)	2.189	1.905 – 2.516	2.400	1.917 – 3.004
Total area (BG+RO+UA)	2.070	1.864 – 2.298	2.455	2.106 – 2.862

The values of Common dolphin density and absolute abundance estimated for different parts of the study area are shown in Table 13. Following these estimates it could be concluded that the absolute abundance (*N*) of Common dolphins was the lowest in the Romanian EEZ; it differed from relevant Ukrainian and Bulgarian values by 4-5 times ($p<0.05$).

Table 5.13 Density and abundance of Common dolphins in the offshore area

Surveyed areas	Density of groups, groups/km^2		Density of animals, indiv./km^2		Number of animals	
	DS	95% CI	*D*	95% CI	*N*	95% CI
BG waters	0.383	0.178 – 0.822	0.835	0.385 – 1.810	23580	10874 – 51136
RO waters	0.100	0.045 – 0.225	0.217	0.089 – 0.532	5047	2058 – 12376
UA waters	0.278	0.142 – 0.548	0.503	0.253 – 1.003	18381	9228 - 36613
EU waters (BG+RO)	0.251	0.126 – 0.504	0.550	0.272 – 1.114	28344	14007 – 57358
Total area (BG+RO+UA)	0.249	0.152 – 0.407	0.515	0.312 – 0.850	45337	27482 – 74794

5.1.3.3. Bottlenose dolphins (*T. t. ponticus*)

Bottlenose dolphins (123 sightings; 242 individuals) were recorded in different parts of the surveyed EEZs of Bulgaria, Romania and Ukraine (Figure 5.6). The sightings were rather scattered in the study area than concentrated somewhere in the form of clear gatherings. Nevertheless, some clusters of *T. t. ponticus* sightings have been indicated in the southern and central Bulgarian EEZ, in the central and northern Romanian EEZ, and in the northern and southern Ukrainian EEZ. There was only one transect (just in the EEZ of Ukraine) completely free of the sightings.

Sightings were represented by single dolphins (74; 60% of total sightings), pairs (24; 20% of total sightings) and groups of three (11; 9% of total sightings) or more animals (14; 11% of total sightings). A group is defined as two animals within two body lengths of each other. The largest group was composed of 11 individuals. The estimated aggregate values of the group size are presented in Table 14. There is no major difference between group sizes in different areas.

The estimated values of Bottlenose dolphin density and abundance are presented in Table 5.15. (No statistically significant difference here either).

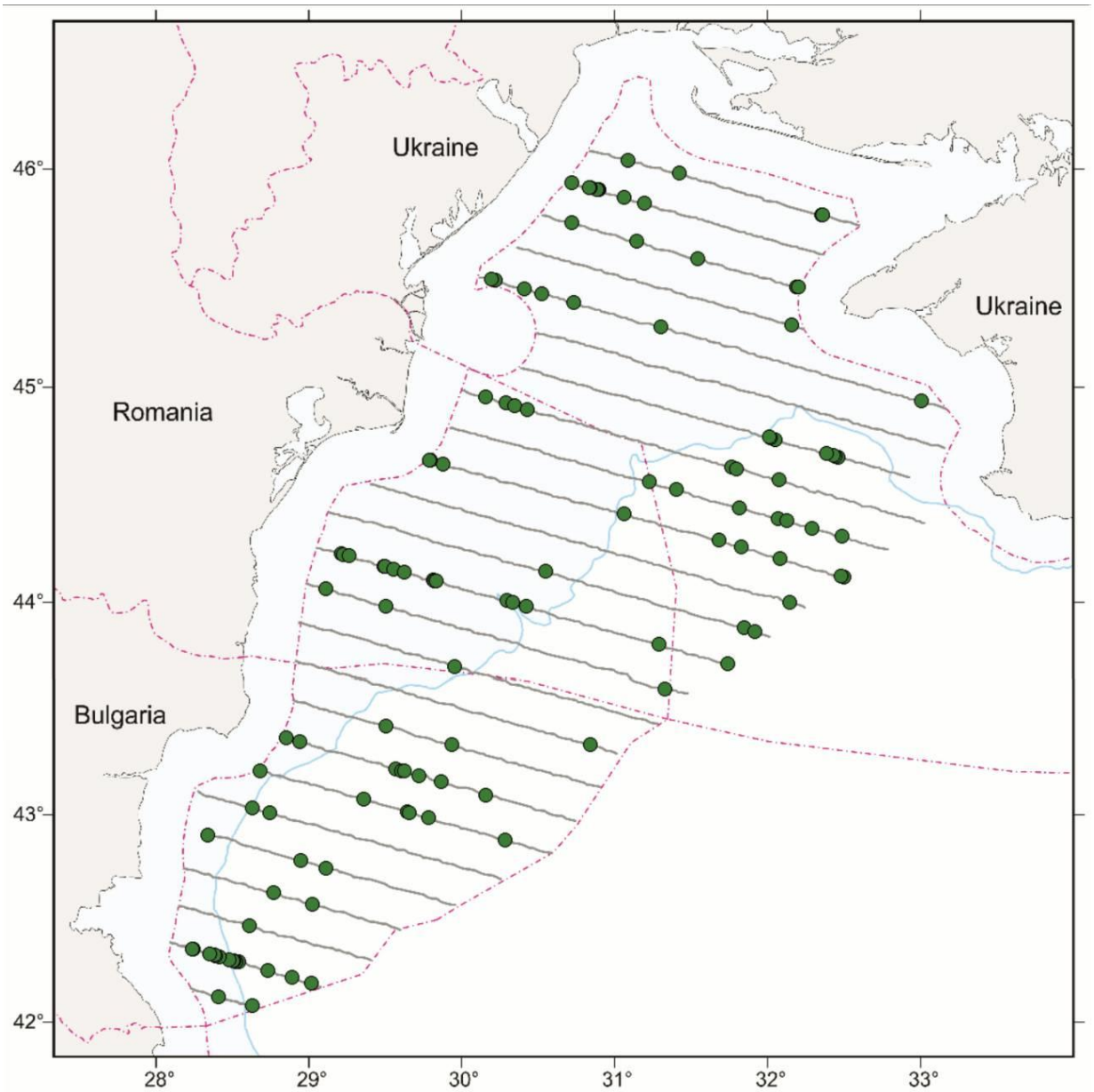


Figure 5.6 Sightings of Bottlenose dolphins (green spots) during the aerial survey over the EEZs of Bulgaria, Romania and Ukraine (July 2013).

Table 5.14 Group size of Bottlenose dolphins in the offshore area

Surveyed areas	Expected value of group size		Mean group size	
	E (*S*)	95% CI	*M*	95% CI
BG waters	2.069	1.689 – 2.534	1.857	1.292 – 2.670
RO waters	2.010	1.442 – 2.803	2.552	1.870 – 3.482
UA waters	1.865	1.591 – 2.186	1.731	1.419 – 2.111
EU waters (BG+RO)	2.028	1.688 – 2.437	2.141	1.688 – 2.716
Total area (BG+RO+UA)	1.943	1.719 – 2.195	1.968	1.667 – 2.323

Table 5.15 Density and abundance of Bottlenose dolphins in the offshore area

Surveyed areas	Density of groups, groups/km^2		Density of animals, indiv./km^2		Number of animals	
	DS	95% CI	*D*	95% CI	*N*	95% CI
BG waters	0.174	0.080 – 0.376	0.360	0.164 – 0.789	10162	4633 – 22289
RO waters	0.147	0.054 – 0.400	0.295	0.106 – 0.824	6863	2459 – 19154
UA waters	0.159	0.099 – 0.256	0.297	0.182 – 0.487	10860	6629 - 17791
EU waters (BG+RO)	0.142	0.080 – 0.253	0.289	0.159 – 0.524	14858	8179 – 26988
Total area (BG+RO+UA)	0.145	0.099 – 0.212	0.282	0.190 – 0.419	24820	16699 – 36892

5.1.4. Combined results of the vessel-based and aerial surveys

The data collected during the vessel-based and aerial surveys were brought together and the consolidated datasets were analysed by means of Distance 6.0[253] in order to obtain integral information about the group size, density and abundance of Black Sea cetaceans in maritime areas under the jurisdiction of Bulgaria, Romania and Ukraine without splitting these areas up into the internal waters/ territorial sea and EEZs. Similar analyses were conducted for the waters of the European Union in the Black Sea (Bulgaria and Romania) and for the entire study area in the western Black Sea (Bulgaria, Romania and Ukraine). More statistical details concerning the results of these analyses are presented in Annex 5.

5.1.4.1. Bulgaria

According to the values shown in Table 5.16, the Common dolphin was the most abundant cetacean species/subspecies in Bulgaria. Its density and absolute number exceeded the density and numbers of the Harbour porpoise and the Bottlenose dolphin in 3.6 ($p<0.05$) and 3.1 ($p<0.05$) times respectively. The density of *D. d. ponticus* groups was considerably more high in comparison with *T. t. ponticus* ($p<0.05$). The expected group size and the mean group size of *D. d. ponticus* were clearly greater in comparison with *P. p. relicta* ($p<0.001$).

Table 5.16 Integral values estimated for cetaceans in the entire Bulgarian Black Sea including the internal waters, territorial sea and EEZ

Parameters	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	35235.0		
Observation effort (total length of transect lines), *km*	1786.3		
Number of observed objects (single or groups of animals)	111	154	90
Estimate of expected value of group size	1.269	2.036	1.928
95% confidence Interval	1.173 – 1.374	1.796 – 2.307	1.683 – 2.209
Mean group size	1.360	2.312	1.922
95% confidence Interval	1.179 – 1.569	1.856 – 2.879	1.549 – 2.386
Estimate of density of groups per 1 km^2	0.191	0.429	0.146
95% confidence Interval	0.124 – 0.294	0.245 – 0.751	0.086 – 0.250
Estimate of density of animals (individuals/km^2)	0.242	0.872	0.282

95% confidence Interval	0.156 – 0.376	0.492 – 1.546	0.163 – 0.489
Estimate of number of animals in surveyed area	8539	30737	9947
95% confidence Interval	5507 – 13240	17348 – 54461	5747 – 17215

5.1.4.2. Romania

There was no significant difference between the estimated values of either cetacean density or cetacean numbers in Romania (Table 5.17) and it is therefore impossible to say that any species/subspecies of cetaceans is more (or less) abundant in this country than either of the two. At the same time, the expected group size of the Harbour porpoise was considerably less than corresponding values of the Common dolphin (p<0.01) and Bottlenose dolphin (p<0.01). In addition, the mean group size of *P. p. relicta* was less than that of *T. t. ponticus* (p<0.01).

Table 5.17 Integral values estimated for cetaceans in the entire Romanian Black Sea including the internal waters, territorial sea and EEZ

Parameters	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	29074.0		
Observation effort (total length of transect lines), *km*	1473.3		
Number of observed objects (single or groups of animals)	154	55	59
Estimate of expected value of group size	1.339	1.881	1.932
95% confidence Interval	1.255 – 1.429	1.548 – 2.285	1.606 – 2.324
Mean group size	1.403	2.018	2.000
95% confidence Interval	1.298 – 1.515	1.480 – 2.752	1.616 – 2.475
Estimate of density of groups per 1 km^2	0.207	0.100	0.114
95% confidence Interval	0.081 – 0.527	0.047 – 0.211	0.062 – 0.211
Estimate of density of animals (individuals/km^2)	0.277	0.187	0.221
95% confidence Interval	0.109 – 0.707	0.087 – 0.403	0.117 – 0.416
Estimate of number of animals in surveyed area	8059	5447	6413
95% confidence Interval	3159 – 20563	2530 – 11731.0	3402 – 12091

5.1.4.3. Ukraine

In the Ukrainian sector of the western Black Sea, Harbour porpoises were considerably less numerous than cetaceans of other two species (Table 5.18). The density and number of *P. p. relicta* were 3.6 and 2.2 times lower than the values for *D. d. ponticus* (p<0.05) and *T. t. ponticus* (p<0.05) respectively.

Table 5.18 Integral values estimated for cetaceans in the western part of the Ukrainian Black Sea including the internal waters, territorial sea and EEZ

Parameters	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	55487.0		

Observation effort (total length of transect lines), *km*	2776.9		
Number of observed objects (single or groups of animals)	137	199	126
Estimate of expected value of group size	1.429	2.123	1.766
95% confidence Interval	1.322 – 1.546	1.921 – 2.347	1.595 – 1.955
Mean group size	1.460	2.377	1.762
95% confidence Interval	1.304 – 1.635	2.100 – 2.690	1.556 – 1.995
Estimate of density of groups per 1 km^2	0.085	0.204	0.154
95% confidence Interval	0.049 – 0.145	0.113– 0.371	0.100 – 0.237
Estimate of density of animals (individuals/km^2)	0.121	0.434	0.272
95% confidence Interval	0.070 – 0.209	0.237 – 0.792	0.175 – 0.422
Estimate of number of animals in surveyed area	6713	24057	15096
95% confidence Interval	3888 – 11591	13163 – 43968	9727 – 23428

The expected group size and the mean group size of Harbour porpoises were significantly less than the values estimated for Common dolphins ($p<0.001$) and Bottlenose dolphins ($p<0.01$ and $p<0.05$) (Table 5.18.). Both parameters of the group size of Common dolphins were also greater in comparison with the values of Bottlenose dolphins ($p<0.05$ and $p<0.001$).

5.1.4.4. Waters of the European Union

No significant difference was found between the values of cetacean density nor cetacean numbers in the EU Black Sea represented by waters under the jurisdiction of Bulgaria and Romania (Table 5.19.). The expected group size and the mean group size of Harbour porpoises were considerably less than equivalent values for Common dolphins ($p<0.001$) and Bottlenose dolphins ($p<0.001$).

Table 5.19 Integral values estimated for cetaceans in the European Union's Black Sea including the internal waters, territorial seas and EEZs of Bulgaria and Romania

Parameters	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	64309.0		
Observation effort (total length of transect lines), *km*	3259.6		
Number of observed objects (single or groups of animals)	265	209	149
Estimate of expected value of group size	1.293	1.964	1.933
95% confidence Interval	1.230 – 1.359	1.770 – 2.179	1.734 – 2.154
Mean group size	1.385	2.234	1.953
95% confidence Interval	1.286 – 1.491	1.863 – 2.681	1.675 – 2.277
Estimate of density of groups per 1 km^2	0.232	0.211	0.169
95% confidence Interval	0.134 – 0.403	0.132 – 0.336	0.114 – 0.251
Estimate of density of animals (individuals/km^2)	0.300	0.414	0.327
95% confidence Interval	0.173 – 0.522	0.257 – 0.665	0.217 – 0.492
Estimate of number of animals in surveyed area	19306	26607	21012
95% confidence Interval	11093 – 33598	16543 – 42793	13953 – 31642

5.1.4.5. Western Black Sea (study area in its entirety)

This section considers a general analysis of the data obtained by means of the combined aerial and boat cetacean surveys implemented in July 2013 in the western Black Sea. This area can be loosely defined as the entire area located to the north of a line coinciding with marine border between Bulgaria and Turkey and then crossing the Ukrainian sea towards Cape Khersones in Crimea (Table 5.20.).

Common dolphins were found to be significantly more numerous than Bottlenose dolphins and Harbour porpoises. The values of density and number of *D. d. ponticus* individuals were 2.3 and 2.0 times higher than the respective values for *T. t. ponticus* ($p<0.01$) and *P. p. relicta* ($p<0.05$).

The distribution of *D. d. ponticus* groups was more dense than that for groups of *T. t. ponticus* ($p<0.01$). The expected group size and the mean group size of Harbour porpoises were clearly less than corresponding values of Common dolphins ($p<0.001$) and Bottlenose dolphins ($p<0.001$). In addition, the mean group size of Common dolphins was more considerable than that of Bottlenose dolphins ($p<0.01$).

Distribution heat map plots of the data from the combined surveys show a clear difference in the distribution of the three species (Figures 5.7, 5.8 and 5.9). The distribution of Common dolphins (*D. d. ponticus*) (Figure 5.7) is sporadic throughout the survey area although it could be argued that groups of individuals are clustered on or near to the edge of the shelf. This would be very much in keeping with the Common dolphin's natural habitat and ecology, they tend to be distributed mainly offshore and visit shallow coastal waters following seasonal aggregations and regular mass migrations of their preferred prey, small pelagic fishes such as Black Sea anchovy (*Engraulis encrasicolus ponticus*) and Black Sea sprat (*Sprattus sprattus phalaericus*)[134,254,255]. Summer concentrations of sprats in the north western, north eastern and central Black Sea attract common dolphins to quite different feeding grounds.

[254] *Tzalkin, V.I. (1940a) The data on biology of the Azov and Black Sea harbour porpoise (Phocaena phocaena relicta Abel). Zoologichesky Zhurnal, 19(1): 160-171 (in Russian).*

[255] *Geptner, V.G., Chapsky, K.K., Arsenyev, V.A., Sokolov, V.E. (1976) Mammals of the Soviet Union. Volume 2, Part 3: Pinnipeds and Toothed Whales. Vysshaya Shkola, Moscow, 718pp (in Russian).,*

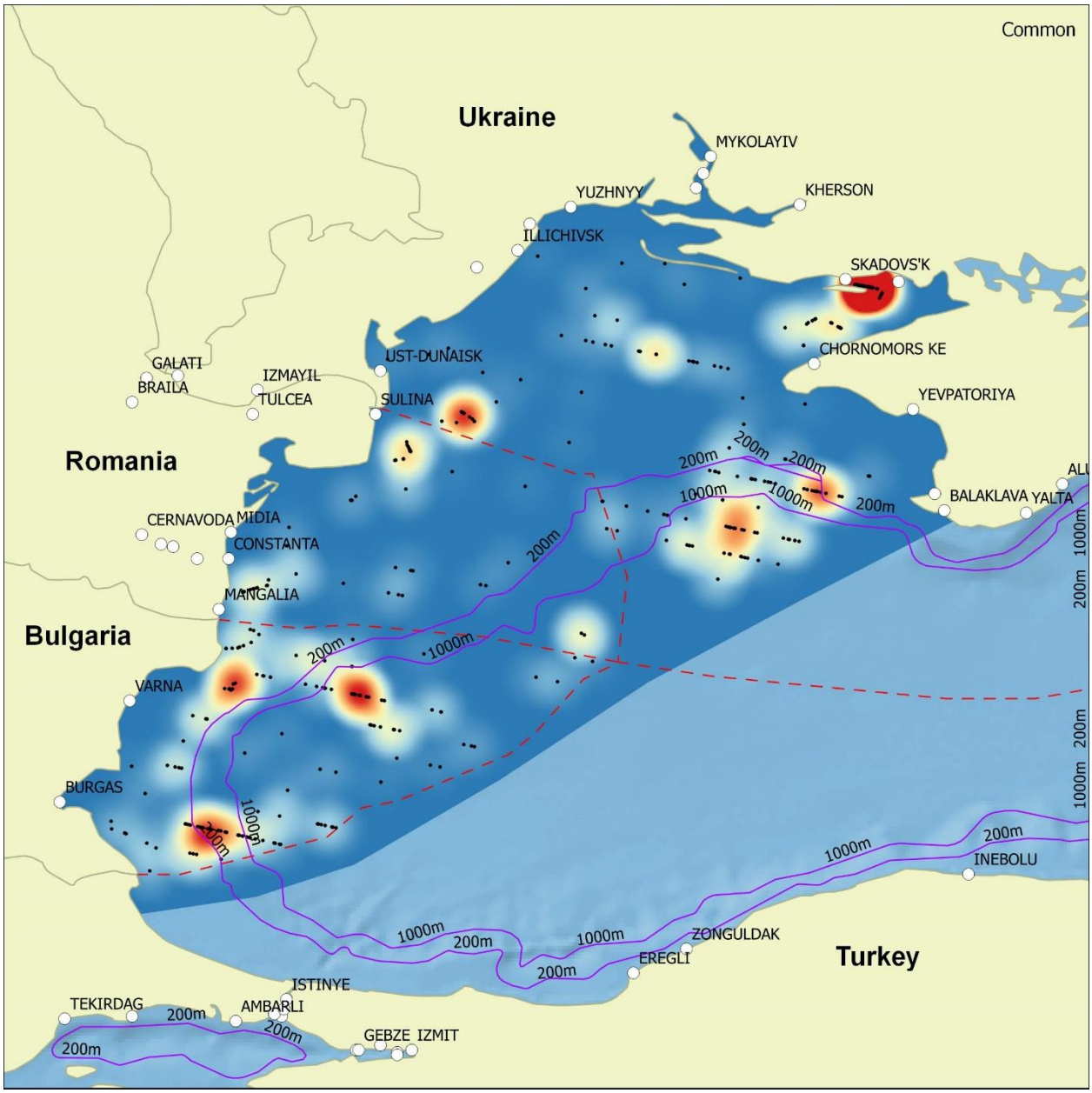


Figure 5.7 'Heat map' indicating abundance of individual Common Dolphins, red showing the highest levels, blue the lowest. The black spots mark actual sightings. This map is based on data from the combined 2013 vessel and aerial surveys.

In contrast, the distribution of Harbour Porpoises (*P. p. relicta)* is 'coastal' in nature (Figure 5.7). Again this is in keeping with the behaviour of the species in general, Harbour Porpoises inhabit mainly shallow waters (0–200 m deep) over the continental shelf around the entire perimeter of the Black Sea, although they also occur quite far offshore in deep water. For instance, in late September - early October 2005, sizeable groups were observed in the central Black Sea, beyond the shelf edge some 38-215 km from the nearest coast in waters 450-2,170 m deep[106]. At least 14 fish species have been recorded in the stomach contents[202,134,203,173,197,157], of which four are considered as the most important prey: Anchovy, Sprat (*Sprattus sprattus phalaericus*), Whiting (*Merlangius merlangus euxinus*) and gobies (*Gobiidae*).

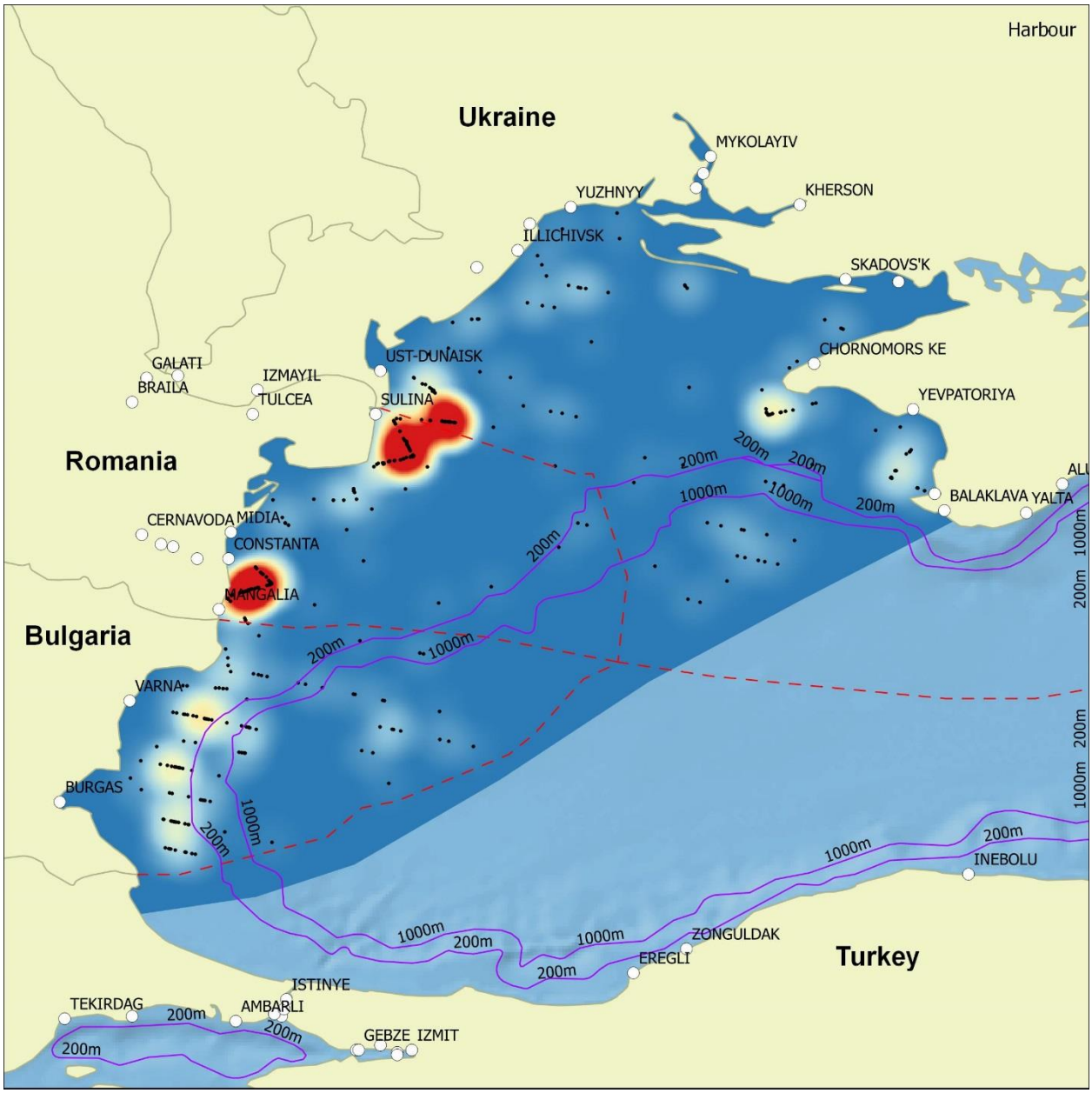


Figure 5.8 'Heat map' indicating abundance of individual Harbour porpoises, red showing the highest levels, blue the lowest. The black spots mark actual sightings. This map is based on data from the combined 2013 vessel and aerial surveys.

The distribution of Bottlenose Dolphins (Figure 5.9) appears to be more even across the survey area although there is a bias towards the inshore coastal areas. Previous observations have shown them to be distributed across the Black Sea shelf, they can however sometimes occur far offshore[256,257]. In the

[256] *Beaubrun, P.C. (1995) Atlas Preliminaire de Distribution des Cetaces de Mediterranee. CIESM & Musee Oceanographique, Monaco, 87pp.*

[257] *Sokolov, V. E., Yaskin, V. A., & Yukhov, V. L. (1997). Distribution and numbers of the Black Sea dolphins surveyed from ships. ZOOLOGICHESKY ZHURNAL, 76(3), 364-370.*

northern Black Sea they form scattered communities of some tens to approximately 150 animals in different places around Crimea, including the Kerch Strait and coastal waters off the western and southern extremities of the peninsula[258,109,157]. Bottlenose Dolphins are primarily piscivorous in the Black Sea, taking both benthic and pelagic fishes, large and small. A total of 16 fish species have been reported as prey off the Crimean and Caucasian coasts[202,134,203,197] including four species of mullet (*Lisa aurata, L. saliens, Mugil cephalus* and *M. so-iuy*).

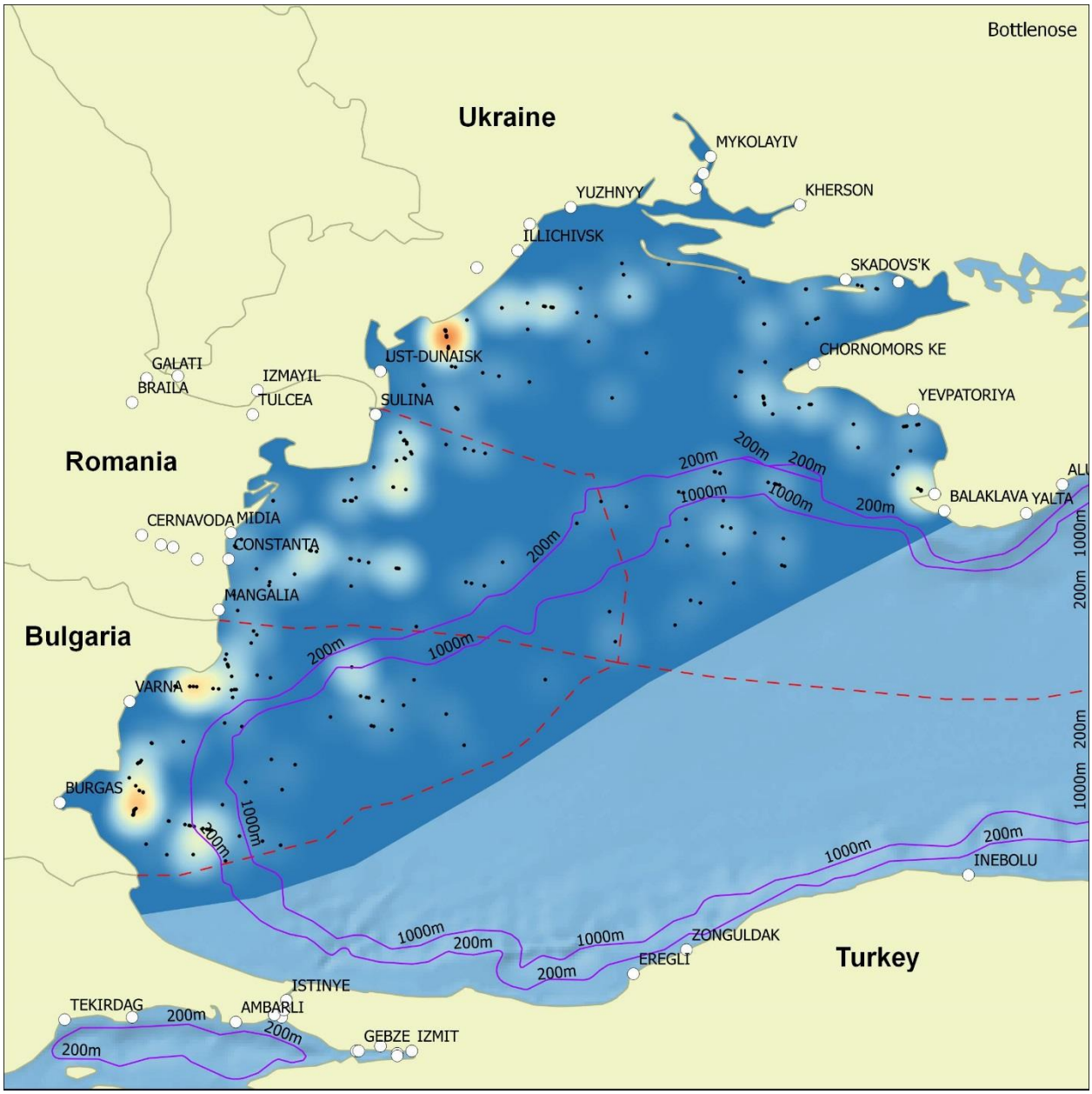


Figure 5.9 'Heat map' indicating abundance of individual Bottlenose Dolphins, red showing the highest levels, blue the lowest. The black spots mark actual sightings. This map is based on data from the combined 2013 vessel and aerial surveys.

[258] *Zatevakhin, I. I., & Bel'kovich, V. M. (1996). The structure of the society of bottlenose dolphins of the Tarkhankut peninsula. In Proceedings of the First International Symposium on the Marine Mammals of the Black Sea (p. 72).*

It must be stressed the heat map plots (Figures 5.7, 5.8 and 5.9) should be viewed with a number of caveats in mind, namely; 1) the source data is derived from two very different survey methodologies, 2) some species of cetaceans (Common dolphins) have a habit of aggregating around vessels whilst others (Harbour porpoises) are notoriously shy possibly skewing the vessel data and 3) the heat maps represent just a snapshot based on a survey at a particular time, had the survey happened a week later for example then all the heat spots could well be somewhere else. We just happened upon some aggregations at that time.

Table 5.20 Integral values estimated for cetaceans in the western part of the Black Sea including the internal waters, territorial seas and EEZs of Bulgaria, Romania and Ukraine

Parameters	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	119796.0		
Observation effort (total length of transect lines), *km*	6036.5		
Number of observed objects (single or groups of animals)	402	408	275
Estimate of expected value of group size	1.335	1.986	1.836
95% confidence Interval	1.280 – 1.392	1.848 – 2.134	1.705 – 1.977
Mean group size	1.410	2.304	1.866
95% confidence Interval	1.326 – 1.501	2.065 – 2.571	1.685 – 2.066
Estimate of density of groups per 1 km^2	0.184	0.254	0.120
95% confidence Interval	0.123 – 0.277	0.175 – 0.369	0.090 – 0.161
Estimate of density of animals (individuals/km^2)	0.246	0.504	0.221
95% confidence Interval	0.163 – 0.370	0.345 – 0.737	0.164 – 0.298
Estimate of number of animals in surveyed area	29465	60400	26462
95% confidence Interval	19568 – 44368	41316 – 88298	19586 – 35751

The 'rounded to thousands' estimates of cetacean abundance in the western Black Sea is listed as follows ($M \pm m$):

- Common dolphins Approx. 60,000 ± 12,000
- Harbour porpoises Approx. 29,000 ± 6,000
- Bottlenose dolphins Approx. 26,000 ± 4,000

5.1.5. Conclusions

1. The status of cetaceans in the Black Sea has been of concern for many decades. In July 2013, the vessel-based and aerial line transect surveys were conducted in the western part of the basin to provide accurate estimates of cetacean density and abundance as a basis for a conservation strategy in this particular maritime area that covers all waters under the jurisdiction of Bulgaria and Romania and partially, in the Ukraine. Shipboard transects covered 1591.1 *km* within an inshore area of 31781 km^2 represented by the 12-mile-wide territorial sea and internal waters. Aerial transects covered 4445.4 *km* within an offshore area of 88015 km^2 represented by the EEZs.

2. All three subspecies of Black Sea cetaceans have been recorded throughout the survey area including inshore and offshore waters. That said, the distribution of sightings was quite irregular

indicating spots where dolphins and porpoises made up sizeable accumulations or occurred as dispersed individuals and small groups.

3. The density of Harbour porpoises and Bottlenose dolphins varied considerably in different survey strata:
   - *P. p. relicta*: from 0.034 indiv./km^2 in the EEZ of Romania (CV = 41.39; 95% CI = 0.015 – 0.079) to 1.205 indiv./km^2 in the territorial sea of the same country (CV = 33.66; 95% CI = 0.589 – 2.468) (p<0.01).
   - *T. t. ponticus*: from 0.217 indiv./km^2 in the territorial sea of Romania (CV = 24.23; 95% CI = 0.131 – 0.359) to 0.696 indiv./km^2 in the territorial sea of Bulgaria (CV = 27.73; 95% CI = 0.396 – 1.221) (p<0.05).

4. The variation of density of Common dolphins, *D. d. ponticus*, in different strata (from 0.217 to 0.835 indiv./km^2) was found to be statistically insignificant.

5. *P. p. relicta* abundance for the entire survey area was estimated as 29465 (CV = 20.77; 95% CI = 19568 – 44368). The estimated number of *D. d. ponticus* was 60400 (CV = 19.25; 95% CI = 41316 – 88298). The estimate for *T. t. ponticus* was 26462 (CV = 15.24; 95% CI = 19586 – 35751).

6. The estimated numbers of cetaceans for the EU Black Sea (maritime areas under the jurisdiction of Bulgaria and Romania taken together) were as follows:
   - *P. p. relicta*: 19306 (CV = 28.02; 95% CI = 11093 – 33598),
   - *D. d. ponticus*: 26607 (CV = 23.89; 95% CI = 16543 – 42793),
   - *T. t. ponticus*: 21012 (CV = 20.56; 95% CI = 13953 – 31642).

7. The estimates of cetacean numbers for waters under the jurisdiction of Bulgaria:
   - *P. p. relicta*: 8539 (CV = 21.51; 95% CI = 5507 – 13240),
   - *D. d. ponticus*: 30737 (CV = 28.55; 95% CI = 17348 – 54461),
   - *T. t. ponticus*: 9947 (CV = 27.15; 95% CI = 5747 – 17215).

8. The estimates of cetacean numbers for waters under the jurisdiction of Romania:
   - *P. p. relicta*: 8059 (CV = 47.24; 95% CI = 3159 – 20563),
   - *D. d. ponticus*: 5447 (CV = 38.76; 95% CI = 2530 – 11731),
   - *T. t. ponticus*: 6413 (CV = 31.75; 95% CI = 3402 – 12091).

9. The estimates of cetacean numbers for waters under the jurisdiction of Ukraine in the western Black Sea:
   - *P. p. relicta*: 6713 (CV = 27.57; 95% CI = 3888 – 11591),
   - *D. d. ponticus*: 24057 (CV = 30.62; 95% CI = 13163 – 43968),
   - *T. t. ponticus*: 15096 (CV = 22.19; 95% CI = 9727 – 23428).

10. The density and number of each cetacean species/subspecies were assessed also separately for inshore and offshore areas represented, respectively, by the territorial sea/internal waters and EEZs of Bulgaria, Romania and, partially, Ukraine. These estimates could be found in Sections 4 of this report and Annex 5.

11. It is necessary to underline that the produced estimates are correct for the period (mid-summer) when the shipboard and aerial surveys were conducted. It could be supposed that this period concurs with annual maximum of the presence of cetaceans in the western-north-western Black Sea. Other seasons coincide with mass migrations of cetaceans to the north (spring) and south (autumn), and with winter accumulation of cetaceans outside the western Black Sea.

5.2. Estimates of total population abundance using historical and project survey data

5.2.1. Introduction

This section is devoted to rough estimates because precise estimates of total population abundance of Black Sea cetaceans seem to be unachievable until the southern borders of geographic range of each of these subspecies become known and a cetacean survey is conducted throughout the entire range.

5.2.1.1. Uncertainty of the range

The range of the Black Sea Harbour porpoise, *Phocoena phocoena relicta* (Figure 5.10A), is more understandable than the range of the two other subspecies. It includes the Black Sea proper, the Azov Sea, the Marmara Sea, the Aegean Sea (or at least its northern part) and the Kerch, Bosphorus and Dardanelles Straits connecting these seas (see Annex 6). In July-August 2013, a dedicated vessel-based line-transect survey provided additional evidence of the presence of Harbour porpoises in the northern Aegean (Thracian Sea) although the small sample size (9 porpoise sightings in total) was not sufficient to enable estimates of the density and abundance[259]. At present it is not clear enough what the southern border of the range of *P. p. relicta* should be defined as. Should it edge the northern Aegean Sea (e.g. like on Figure 5.10A), from where >20 *P. p. relicta* sightings and strandings were reported[259], or also include the southern Aegean, where only one stranded Harbour porpoise has so far been found[104].

The range of the Black Sea Common dolphin, *Delphinus delphis ponticus*, includes the Black Sea but does not include the Sea of Azov and the Kerch Strait (Figure 6.10B), whereas the range of the Black Sea Bottlenose dolphin, *Tursiops truncatus ponticus*, extends to the Black Sea, Kerch Strait and to the southern portion of the Azov Sea (Figure 6.10C). Currently this is our best guess with regards to the geographical distribution of these two subspecies (See Annex 5). At the same time, cetaceans of both species (*Delphinus delphis* and *Tursiops truncates*) are widely observed in the Marmara and Aegean Seas, and their regular occurrence in the Bosphorus and Dardanelles Straits has been noted. Do dolphins of the Turkish Straits System (or of any it's part) belong to the Black Sea subspecies or are they their Mediterranean relatives? Do some Black Sea Common and Bottlenose dolphins use the Aegean Sea as their habitat? It is very difficult to answer these questions currently and given that it is impossible to distinguish visually between the Black Sea and Mediterranean individuals, defining the extent of their respective habitats is nigh on impossible. It is hoped that at some time in the future a systematic genetic study will shed light on the taxonomy and population structure of *Delphinus* and *Tursiops* communities in the area between the Black and Aegean Seas, and, as a result, on the southern boundaries of *D. d. ponticus* and *T. t. ponticus* range.

5.2.1.2. Unfeasibility of the range-wide survey

In July 2013 MacAlister Elliott and Partners Ltd., funded by the European Commission, successfully implemented a combined aerial and shipboard cetacean survey in the western Black Sea. An attempt was made by the ACCOBAMS executive body to allot funds towards an extension of the survey to cover the rest of the Black Sea. However, this proved to be impossible due to a number of difficulties including the time constraints on obtaining permission to conduct research in Russian waters and the difficulty in conducting any sort of a survey in the maritime area off Abkhazia, the sovereignty of which is not recognized by most countries.

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[259] *Ryan, C., Romagosa, M., Boisseau, O., Cucknell, A. C., Frantzis, A., Moscrop, A., & McLanaghan, R. (2013). Cruise report for a visual and acoustic survey for marine mammals of the Aegean Sea and Levantine Sea, eastern Mediterranean conducted from R/V Song of the Whale July to September 2013. Funded by the International Fund for Animal Welfare with contributing funds from Pelagos Cetacean Research Institute.*

In 2014, the situation in the Black Sea region became even more complicated because of geopolitical issues causing instability in Ukraine and the annexation of Crimea by the Russian Federation. Preparing and implementing a basin-wide cetacean survey in such adverse circumstances would have proved unrealistic at best. For these reasons, accurate and precise estimates of total population abundance of the three Black Sea cetacean subspecies from a basin wide scientific survey is not likely to take place any time in the near future.

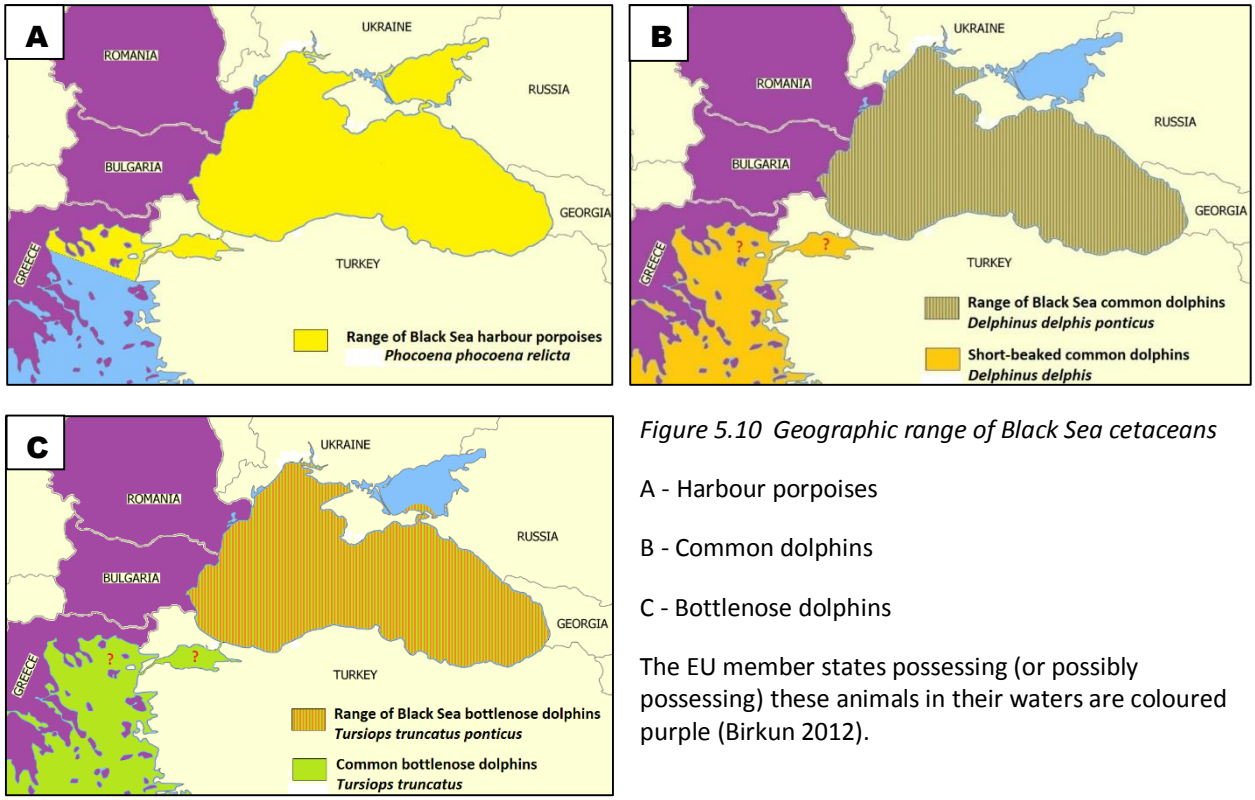

Figure 5.10 Geographic range of Black Sea cetaceans

A - Harbour porpoises

B - Common dolphins

C - Bottlenose dolphins

The EU member states possessing (or possibly possessing) these animals in their waters are coloured purple (Birkun 2012).

5.2.2. Previous estimates of population abundance based on results of line-transect surveys

In the Black Sea and contiguous waters, previous cetacean line-transect surveys were conducted within separate, geographically circumscribed areas during nine-year period between 1997 and 2005. These studies were seasonally and methodologically heterogeneous. Any synthesis of the results was so fraught with risks as to be significantly biased.

Nevertheless, the Mediterranean/Black Sea Cetacean Red List Workshop (Monaco, 5-7 March 2006) found the results of the Black Sea surveys to be suitable enough for preliminary rough assessment of the population abundance of Black Sea dolphins and porpoises[260]. Since 2008, these rough estimates have been included in the checklists of Black Sea cetaceans presented in the IUCN Red List of Threatened Species[261] [262] Birkun and Frantzis 2008).

[260] *Reeves R., Notarbartolo di Sciara G. (compilers and editors). 2006. The status and distribution of cetaceans in the Black Sea and Mediterranean Sea. IUCN Centre for Mediterranean Cooperation, Malaga, Spain. 137 pp.*

[261] *Birkun, A. (2008). The state of cetacean populations. State of the environment of the Black Sea (2001-2006/7). Publications of the Commission on the Protection of the Black Sea Against Pollution (BSC), 3.*

[262] *Birkun Jr., A. A., Frantzis, A. (2008) Phocoena phocoena ssp. relicta. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. Available at http://www.iucnredlist.org/details/17030/0*

5.2.2.1. Harbour porpoises

Line transect surveys have been conducted to estimate Harbour porpoise density and abundance in different (but far from all) parts of the range[107,108,109205,106,105]. In particular, aerial surveys were conducted in the Azov Sea, Kerch Strait (July 2001 and August 2002) and northeastern shelf area of the Black Sea (August 2002); vessel-based surveys were performed in the Kerch Strait (August 2003), the entire 12-mile-wide zone of the Ukrainian and Russian Black Sea (September–October 2003), Georgian territorial sea (January 2005; except waters off Abkhazia), and central part of the Black Sea between the Crimea peninsula, Ukraine, and Sinop province of Turkey (September–October 2005). Those surveys covered the entirety the Azov Sea and Kerch Strait and partially the Black Sea (*ca* 17% of the surface) but they did not cover any part of the Turkish Strait System nor the Aegean Sea. The density and abundance of porpoises could not be determined in some areas (*e.g.*, over the northeastern shelf) because of insufficient number of sightings. In other Black Sea areas the density varied between 0.04 indiv./km^2 (0.02–0.09; 95% CI) in Russia and Ukraine in autumn and 1.54 indiv./km^2 (0.89–2.65; 95% CI) in Georgia in winter.

Results of the surveys suggested that in the beginning of the 21st century total population size of *P. p. relicta* was at least several thousand and possibly in the low tens of thousands[262].

5.2.2.2. Common dolphins

Common dolphins were not sighted during cetacean line transect surveys in the Azov Sea and Kerch Strait[107,108,109205]. However, they were recorded by means of shipboard surveying in the Turkish Straits System including the Sea of Marmara, Bosphorus and Dardanelles[263]. Estimates of *D. delphis* abundance in that area were as follows: 773 individuals (292–2059; 95% CI) in October 1997 and 994 individuals (390–2531; 95% CI) in August 1998[263], although the relationship of local Common dolphins to the Black Sea subspecies, *D. d. ponticus*, still remains unclear (see Introduction to this section of the report).

Line transect surveys have been carried out to estimate Common dolphins density and abundance in a few parts of the Black Sea proper (*ca* 17% of the sea surface was surveyed in total): within the entire Ukrainian and Russian territorial waters in September–October 2003[109]; in the Georgian territorial sea in January 2005[105]; and in the central Black Sea beyond territorial waters of Ukraine and Turkey in September–October 2005[106]. The uncorrected density estimates varied between 0.15 indiv./km^2 (0.05–0.51; 95% CI) in the central Black Sea in autumn and 4.18 indiv./km^2 (2.16–8.11; 95% CI) off the coast of Georgia in winter.

The results obtained for **above mentioned parts of the basin suggested that the overall population size in the early 2000s was at least several tens of thousands, and possibly a hundred thousand or more[261].**

5.2.2.3. Bottlenose dolphins

Line transect aerial and boat surveys have been conducted to ascertain features of distribution and to estimate density and abundance of T. t. ponticus in some parts of the range including ca 17% of the Black Sea surface area. Sightings of Bottlenose dolphins were recorded over the north eastern shelf in August 2002[108]; through out territorial waters of Ukraine and Russia in September–October 2003[205]; in the Kerch Strait in July 2001, August 2002 and August 2003[107,108,109205]; and in the Turkish Straits System in October 1997 and August 1998[263]. The uncorrected density estimates differed within quite tight range of values: from 0.09 indiv./km^2 (0.03–0.22; 95% CI) to 0.15 indiv./km^2 (0.08–0.28; 95% CI).

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[263] *Dede 1999, cited in IWC 2004. Report of the Sub-Committee on Small Cetaceans. J. Cetacean Res. Manage. 6(Suppl.): 315-334.*

Bottlenose dolphins were never sighted during cetacean surveys in the Azov Sea in July 2001 and August 2002[107,108], in the central Black Sea in September–October 2005[106] and in the Georgian Black Sea in January, May, August and November 2005[110 105].

Results of the implemented surveys suggested that in the beginning of the 21st century total population size of *T. t. ponticus* was at least several thousands of animals[261].

5.2.2.3. Preceding estimates of population abundance Conclusion

The aforementioned estimates of total population abundance of Black Sea dolphins and porpoises are very rough and possibly, strongly biased. They were produced by means of expert judgment based more on common sense and speculative inferences than on rigorous calculation. No elements of spatial or ecological modelling were applied to support those estimates.

Beyond doubt, the data collected during preceding line transect surveys (1997-2005) is now out of date and thus, of limited use for generating new estimates. The only data that could be considered of value today are the estimates obtained for the Azov Sea, Kerch Strait and Turkish Straits System, and the value is only derived from the fact that there has been limited or no subsequent data observed for these water bodies.

5.2.3. Novel estimates of population abundance

Habitat preference approach was used as a tool for analysis of the data obtained during dedicated cetacean shipboard and aerial surveys in the western Black Sea (July 2013) and opportunistic ferry-based cetacean survey in the western, central and eastern Black Sea (August-September 2013). The approach exploited some basic geomorphological (profile of the seabed), environmental (level of anoxic waters) and ecological (prey availability) data in order to arrange values of cetacean density and estimate rough abundance of the three subspecies within different spatial strata and in the Black Sea in whole.

This analysis should be considered as a preliminary exploration and the results should be taken with due caution.

5.2.3.1. Spatial stratification of the Black Sea

The Black Sea has a surface area of 413-436 thousand square kilometers and a maximal depth of 2212 or 2245 meters (*e.g.*, Black Sea Commission 2009; Geographic Data Portal 2010; Anonymous 2014). According to our estimates based on the Black Sea Navigation Chart (2008) and **Ozi***Explorer* GPS Mapping Software (version 3.95.4m), the area of the main Black Sea (without its satellite seas and straits) that can be populated by cetaceans comes to 411 571 km^2 in total and consists of 116 807 km^2 of relatively shallow (≤200 *m*) waters over the shelf and 294 764 km^2 of deep waters (>200 *m*) over the continental slope and deep-sea depression (Figure 5.11).

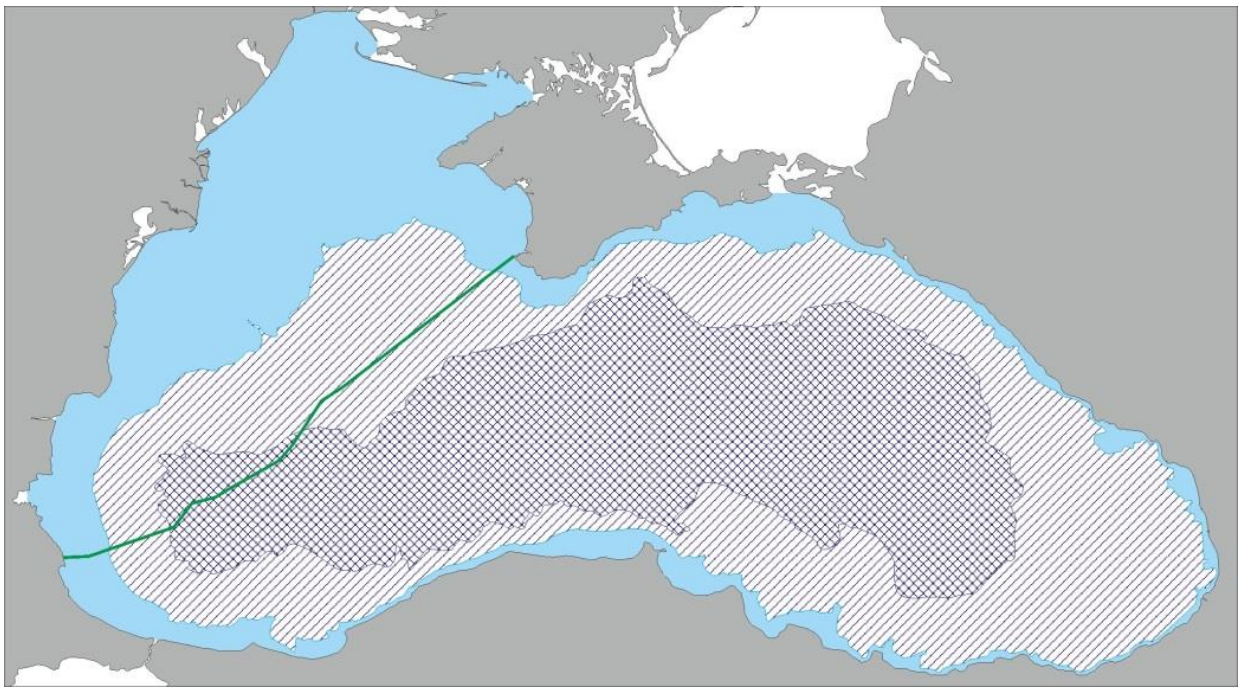


Figure 5.11 Projection of the shelf (≤200 m of depth; solid blue colour), continental slope (>200–2000 m; striped area) and deep-sea depression (>2000 m; checked area) on the surface of the Black Sea. Green polygonal line divides the sea into the western part where dedicated cetacean surveys were conducted in July 2013 and the central and eastern part explored only by opportunistic survey in August-September 2013.

The Black Sea is stratified into the superficial layer of oxygenated waters and the deeper column of anoxic waters saturated by high concentrations (0.2-9.6 *mg/l*) of dissolved hydrogen sulphide

originating from archaic and actual redox processes and probable past geological cataclysms. A transitional interlayer between those strata is relatively stable, it lies at a depth between 100 and 250 *m* with some topographic, seasonal and annual fluctuations. A bathymetric contour of 200 *m* is generally recognized as a conditional boundary between the aerobic and anaerobic zones. Therefore, about 87-90% of the Black Sea water volume forms a "dead" zone unfit for aerobic life and inhabited almost exclusively by specific anaerobic bacteria. Consequently, only the upper 10-13% of the water mass represents appropriate conditions for most marine organisms including cetaceans.

Waters over the shelf represent the aerobic zone; they are suitable for living of both, pelagic and demersal, fish species constituting food resources of dolphins and porpoises. At the same time, waters over the continental slope and deep-sea depression are free from demersal fish at all because of anaerobic conditions near the sea bottom, and only pelagic fish shoals in the upper, oxygenated, layer are prey for cetaceans.

The features of deep-water and shelf strata of the Black Sea suggested different degree of usability of these areas by each of the three cetacean subspecies. This assumption is corroborated by results of the aerial survey presented in the next section.

5.2.3.2. Distribution and density of cetaceans in the shelf and deep-water areas of the western Black Sea

Aerial survey, conducted in the western Black Sea in July 2013, covered evenly the EEZs of Bulgaria, Romania and, partially, Ukraine. The study area (88,015 km^2 in total) consisted of a stratum over the shelf (with a depth of ≤200 *m*) and a stratum over the continental slope and deep-sea depression (with a depth of >200 *m*). The summarized information regarding the estimated areas, applied observation effort, numbers of cetacean sightings in both strata, and results of Distance analysis is presented in Table 5.21. and, in more detail, in Annex 8.

Table 5.21 Results of the aerial survey in the shelf and deep-water strata of the western Black Sea (6–12 July 2013)

Parameters	Shelf area (depth of ≤ 200 *m*)			Deep-water area (depth of > 200 *m*)		
	P. p. relicta	*D. d. ponticus*	*T. t. ponticus*	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	47283.0			40732.0		
Observation effort, *km*	2384.1			2061.4		
Number of sightings	85	78	61	60	166	62
Expected group size	1.288	2.169	2.198	1.208	1.998	1.701
95% CI	1.167 – 1.421	1.775 – 2.651	1.792 – 2.696	1.121 – 1.303	1.765 – 2.262	1.488 – 1.945
Mean group size	1.400	2.692	2.361	1.167	2.343	1.581
95% CI	1.170 – 1.675	2.108 – 3.439	1.880 – 2.964	1.046 – 1.301	1.925 – 2.853	1.257 – 1.988
Density of groups per 1 km^2	0.158	0.171	0.169	0.134	0.359	0.157
95% CI	0.075 – 0.331	0.100 – 0.293	0.096 – 0.300	0.086 – 0.211	0.198 – 0.651	0.097 – 0.253
Density of animals per 1 km^2	0.203	0.371	0.372	0.162	0.717	0.267

95% CI	0.096 – 0.428	0.210 – 0.656	0.204 – 0.680	0.103 – 0.256	0.391 – 1.315	0.163 – 0.437
Number of animals in the area	9590	17535	17602	6610	29217	10859
95% CI	4547 – 20223	9916 – 31007	9642 – 32135	4190 – 10430	15943 – 53544	6620 – 17813

According to the presented results (Table 5.21.), the densities of Harbour porpoises and Bottlenose dolphins tended (p>0.05) to decrease in the deep-water stratum whereas the density of Common dolphins in this area had a tendency (p>0.05) to be higher than in the shelf stratum. There was no statistically significant difference between density values of the three cetacean subspecies over the shelf. At the same time, in the deep sea the density of *D. d. ponticus* individuals was significantly higher than the densities of *P. p. relicta* (p<0.05) and *T. t. ponticus* (p<0.05).

The expected and mean group sizes of Harbour porpoises were much less than of Common dolphins (p<0.001) and Bottlenose dolphins (p<0.001, p<0.01 and p<0.05) in both, shelf and deep-sea, areas. The mean group size of Bottlenose dolphins was significantly less than this value of Common dolphins in the deep-sea area only (p<0.05). The expected and mean values of *T. t. ponticus* group size were found to be greater in the shelf area than in the deep sea (p<0.05).

The above characteristics of the distribution and density of cetaceans within the two strata, having different depth and ecological conditions, supports the assumptions concerning the different extent of usability of the shelf and deep-water areas by the three cetacean species.

In addition, Table 5.22. makes it possible to compare the densities estimated for the offshore shelf and deep-water areas (results of the aerial survey) with the densities estimated for the inshore shelf area within the 12-mile-wide zone of the territorial sea (results of the vessel-based survey conducted from 8–31 July 2013.

Table 5.22 Density of cetaceans in the inshore and offshore areas of the shelf stratum and in the deep-water stratum of the western Black Sea (comparative results of the shipboard and aerial surveys conducted in July 2013)

Surveyed area, platform and observation effort	Density and 95% confidence interval, indiv./km^2 *		
	P. p. relicta	*D. d. ponticus*	*T. t. ponticus*
Inshore shelf area, 31781 km^2, boat, 1591.1 *km*	0.492 (257) 0.301 – 0.805	0.486 (164) 0.258 – 0.915	0.392 (152) 0.274 – 0.560
Offshore shelf area, 47283 km^2, aircraft, 2384.1 *km*	0.203 (85) 0.096 – 0.428	0.371 (78) 0.210 – 0.656	0.372 (61) 0.204 – 0.680
Deep-water area, 40732 km^2, aircraft, 2061.4 *km*	0.162 (60) 0.103 – 0.256	0.717 (166) 0.391 – 1.315	0.267 (62) 0.163 – 0.437

* Number of sightings is shown in brackets.

No significant difference was found between the densities of cetaceans in inshore and offshore shelf areas. The density of Harbour porpoises in the inshore shelf area was clearly higher than in the deep sea (p<0.05).

5.2.3.3. Distribution and density of cetaceans in the deep-water area of the central and eastern Black Sea

Opportunistic line transect vessel-based double platform survey have been conducted aboard the Greifswald ferry (Ukrferry Shipping Company; http://www.ukrferry.com/eng/) in late summer 2013. The ferry traversed the Black Sea between Ilyichevsk (Ukraine) and Poti (Georgia) from 28-31 August and backward (by somewhat different way) from 2-3 September. The objective of the opportunistic survey was to enable comparison of density and distribution data from the western Black Sea with those obtained from the central and eastern Black Sea.

Total observation effort during daytime came to 42 hours and 35 minutes or 884.1 *km* of surveying the sea surface with average speed of 21 *km/h*. Between shelf area (in the western and eastern Black Sea) and deep-water area (in the central and eastern Black Sea) the applied effort was shared as follows: 124.8 *km* and 759.3 *km*, respectively. Geographical locality and length of the surveyed five route sections are shown in Table 5.23.

Table 5.23 Position and length of ferry route sections where the cetacean survey was carried out in August-September 2013

Date	Part of the Black Sea	Stratum	Coordinates of the surveyed route sections				Length of the surveyed route sections, *km*
			starting point		terminal point		
			latitude	longitude	latitude	longitude	
29.08.2013	western	shelf	46°19.0’	30°40.9’	45°37.9’	31°41.3’	109.8
30.08.2013	central	deep-water	44°6.1’	33°46.5	43°23.2’	36°38.3’	247.3
31.08.2013	eastern	deep-water and shelf	42°45.1’	39°14.4’	42°10.1’	41°38.9’	209.3
02.09.2013	eastern	shelf and deep-water	42°9.6’	41°38.7’	42°26.3’	40°40.2’	88.4
03.09.2013	central	deep-water	43°5.3’	38°5.0’	43°45.3’	35°24.4’	229.3

Two primary and two tracker observation platforms were installed on both sides of the upper passenger deck with a height of 20.14 *m* above sea level. Primary and tracker platforms on each side of the ship were *ca* 12 *m* apart. Surveying was conducted by seven trained observers rotating and taking a rest every 30 minutes. All sightings data were recorded on data sheets and entered into a computer database at the end of each survey day. The surveying was conducted when the wind was Beaufort force four or below and the visibility was good. The obtained data was treated as a single platform survey by combining the sightings from primary and tracker observation platforms and removing duplicate sightings. The data were processed and analysed by means of Distance 6.0 **program package (**Thomas *et al*. 2009).

A total of 265 cetacean sightings were included in the dataset after removing duplicates. The results of analysis arranged according to the sea stratum and subspecies are presented in Table 5.24.

Table 5.24 Results of the opportunistic ferry-based survey in the shelf and deep-water strata of the western, central and eastern Black Sea (29 August – 3 September 2013)

Parameters	Shelf area (depth of ≤ 200 *m*)			Deep-water area (depth of > 200 *m*)		
	P. p. relicta	*D. d. ponticus*	*T. t. ponticus*	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Observation effort, *km*	124.8			759.3		
Number of sightings	2	0	0	78	185	0
Expected group size 95% CI	n.a.*	n.a.	n.a.	1.691 1.514 – 1.888	2.056 1.877 – 2.253	n.a.
Mean group size 95% CI	n.a.	n.a.	n.a.	1.615 1.440 – 1.813	2.151 1.930 – 2.399	n.a.
Density of groups per 1 km^2 95% CI	n.a.	n.a.	n.a.	0.123 0.018 – 0.858	0.692 0.406 – 1.177	n.a.
Density of animals per 1 km^2 95% CI	n.a.	n.a.	n.a.	0.208 0.030 – 1.439	1.422 0.845 – 2.394	n.a.

* n.a. = not available.

Harbour porpoises (80 sightings) were encountered mainly in deep-water area of the eastern Black Sea (76 sightings or 95%; Figure 5.12.). In addition, two *P. p. relicta* sightings (2.5%) were recorded over deep waters in the central Black Sea. In the shelf area, there were also two sightings (2.5%) in the western and eastern Black Sea.

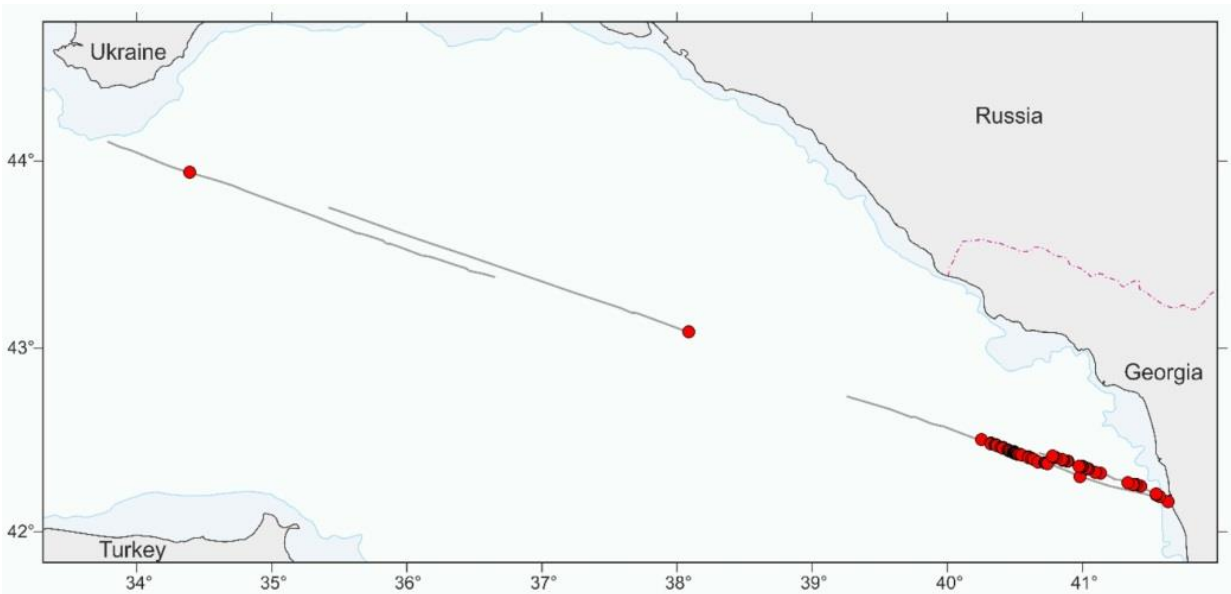


Figure 5.12 Sightings of Harbour porpoises during the ferry-based survey in the central and eastern Black Sea (August–September 2013). One sighting recorded in the western shelf area is not shown on this picture.

Common dolphins (185 sightings; 100%) were found almost everywhere within deep-water stratum in the central and eastern Black Sea (Figure 5.13.). These animals were not sighted in the shelf stratum in either the western or eastern Black Sea.

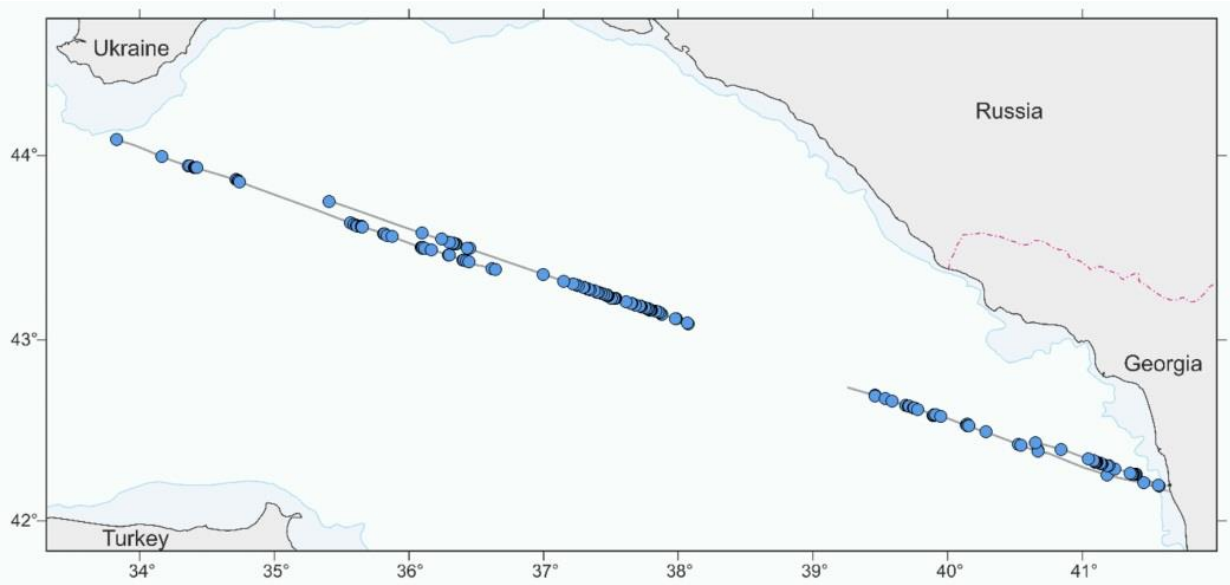


Figure 5.13 Sightings of Common dolphins during the ferry-based survey in the central and eastern Black Sea (August–September 2013).

There were no sightings of live Bottlenose dolphins during the survey at all. One floating carcass belonging to this species has been recorded in the central part of the sea.

The obtained data were sufficient to estimate values of group size and density for Harbour porpoises and Common dolphins in the deep-water stratum (Table 5.13.) but they were too scarce or completely lacking to do so for both species in the shelf stratum. All estimated values were considerably greater for Common dolphins than for Harbour porpoises ($p<0.001$). In particular, the density of *D. d. ponticus* individuals was higher almost in seven times than the density of *P. p. relicta*.

The value of Common dolphins density calculated for deep-water stratum from ferry data (1.422 indiv./km^2) turned out to be twice as much in comparison with similar value obtained from the aerial survey (0.717 indiv./km^2; $p<0.05$). At the same time, there were no statistically significant difference between the densities of Harbour porpoises in both cases (0.208 and 0.162 indiv./km^2, respectively; $p>0.05$).

5.2.3.4. Overall results of systematic and opportunistic surveys and rough estimates of total abundance values

An area of 120 438 km^2 (29.3% of the sea surface that can be used by cetaceans) was explored during two systematic, shipboard and aerial, surveys in the western Black Sea (July 2013) and one opportunistic ferry-based survey in the western, central and eastern Black Sea (August–September 2013). The applied observation effort came to 6920.7 *km* in total (1 *km* per 17.4 km^2). The distribution of surveyed areas and effort between the shelf and deep-water strata is shown in Table 5.25.

The following total abundance values calculated for the Black Sea as whole (basin-wide scale) are <u>very</u> rough estimates and have been extrapolated on the basis of one opportunistic ferry track. The

values could be used a reference point in light of future cetacean abundance estimates for the Black Sea but the estimates presented here should be viewed with extreme caution.

Table 5.25 Areas surveyed and observation effort applied in the shelf and deep-water strata of the Black Sea in summer 2013

Stratum	Black Sea in whole, km^2	Surveyed area		Observation effort	
		km^2	%	*km*	km^2 per 1 *km*
Shelf stratum (depth of ≤ 200 *m*)	116807	79071	67.69	4100.0	19.29
Deep-water stratum (depth of > 200 *m*)	294764	41367	14.03	2820.7	14.67
In total	411571	120438	29.26	6920.7	17.40

A total of 1350 cetacean sightings remained in the datasets for data analysis after removing the duplicates (Table 5.26.). Geographical distribution of the sightings is shown on Figure 5.14.

Table 5.26 Number of cetacean sightings recorded in the shelf and deep-water strata of the Black Sea in summer 2013

Stratum	*P. p. relicta*				*D. d. ponticus*				*T. t. ponticus*			
	boat survey	aerial survey	ferry survey	total	boat survey	aerial survey	ferry survey	total	boat survey	aerial survey	ferry survey	total
Shelf stratum (depth of ≤ 200 *m*)	257	85	2	344	164	78	0	242	152	61	0	213
Deep-water stratum (depth of > 200 *m*)	–	60	78	138	–	166	185	351	–	62	0	62
In total	257	145	80	482	164	244	185	593	152	123	0	275

With regard to the applicability of results of cetacean surveys conducted in summer 2013 for their extrapolation on the entire Black Sea some essential shortcomings of the methodology should be taken into consideration:

- More than two thirds of the sea surface were not covered by the surveys including 32% of the shelf stratum and 86% of the deep-water stratum;
- Survey tracks were distributed uniformly in the western Black Sea only; the rest of the sea was surveyed very unevenly, along a few sections of ferry route traversing the sea from the northwest to the southeast and backwards;

- There was a month-long break between surveys in the western and central/eastern Black Sea –during this period the distribution of cetaceans might have changed considerably.

The above mentioned methodological problems look non-recoverable at the stage of data treatment and analysis. Therefore, further estimations should be treated with great caution.

In order to produce rough estimates of the population abundance of cetaceans in the Black Sea, it was assumed that the data obtained during the three surveys in 2013 might be combined in six datasets arranged in strata (shelf area and deep-water area) and subspecies (*P. p. relicta*, *D. d. ponticus* and *T. t. ponticus*) and then analysed by means of Distance 6.0[264] to estimate integral values of the density of animals. Afterwards, values of the population abundance were calculated by summing up the results of multiplication of the densities and areas estimated for the shelf and deep-water strata. Intermediate and final results of the analysis are presented in Tables 5.27. and 5.28. and in Annex 5.

Table 5.27 Rough estimates of integral values of the density and number of cetaceans in the entire shelf and deep-water strata of the Black Sea

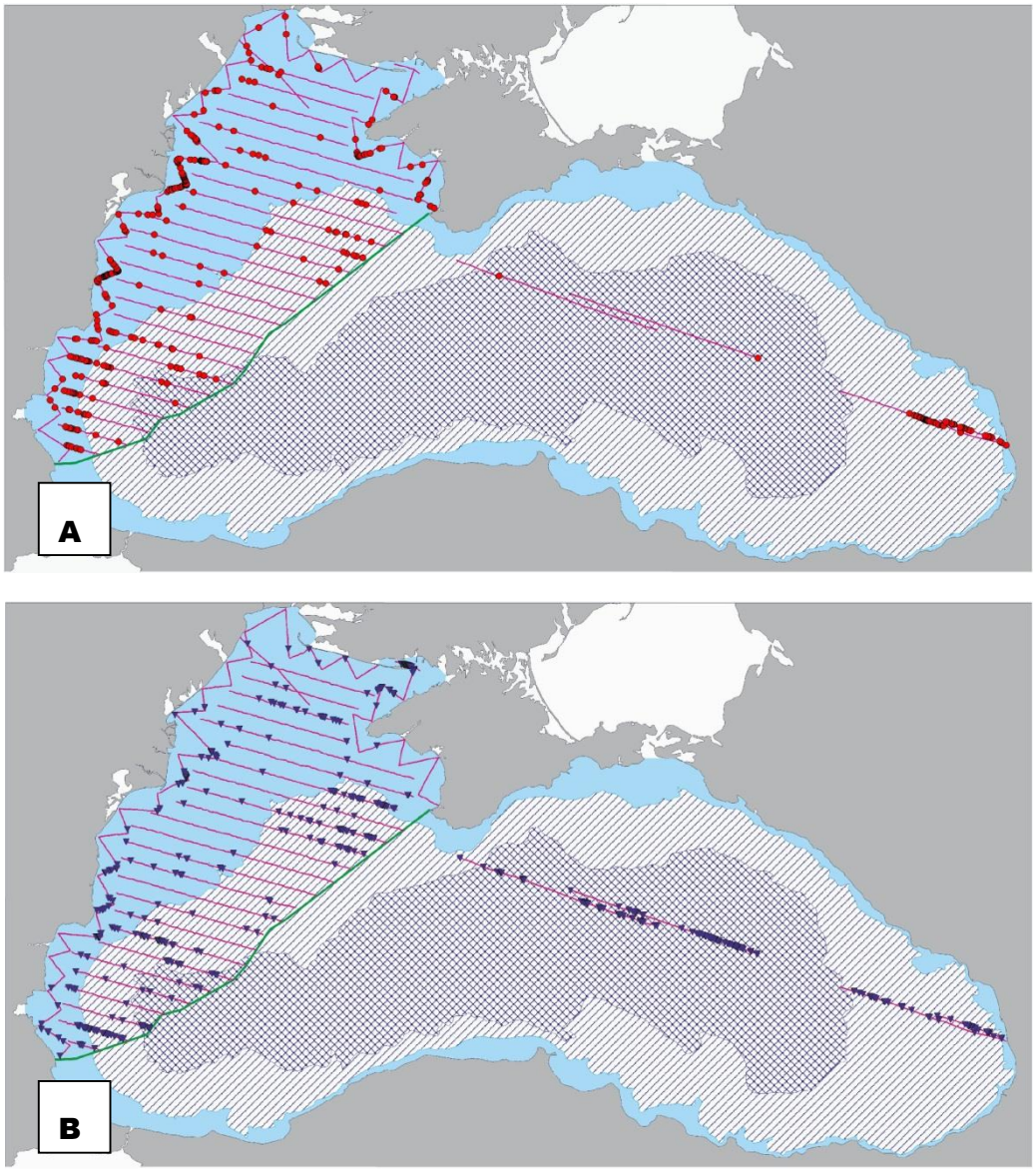
Parameters	Shelf stratum (depth of ≤ 200 *m*)			Deep-water stratum (depth of > 200 *m*)		
	P. p. relicta	*D. d. ponticus*	*T. t. ponticus*	*P. p. relicta*	*D. d. ponticus*	*T. t. ponticus*
Area, km^2	116807			294764		
Observation effort, *km*	4100.0			2820.7		
Number of sightings	344	242	213	138	351	62
Density of animals per 1 km^2	0.303	0.329	0.254	0.099	0.864	0.195
95% CI	0.191–0.481	0.201–0.539	0.179–0.361	0.048–0.205	0.552–1.352	0.110–0.346
Number of animals	35393	38430	29669	29182	254676	57479
95% CI	22310–56184	23478–62959	20908–42167	14149–60427	162710–398521	32424–101988

Table 5.28 Numbers of cetaceans roughly estimated for the entire Black Sea (apart from contiguous waters)

	P. p. relicta	*D. d. ponticus*	*T. t. ponticus*
Uncorrected rough estimates of absolute number	64575	293106	87148
Max and *min* limits based on 95% CI	36459 – 116611	186188 – 461480	53332 – 144155
Rough estimates rounded to thousands	**65000**	**293000**	**87000**
Max and *min* limits	36000 – 117000	186000 – 461000	53000 – 144000

[264] *Marques, T. A., Thomas, L., Ward, J., DiMarzio, N., & Tyack, P. L. (2009). Estimating cetacean population density using fixed passive acoustic sensors: an example with Blainville's beaked whales. The Journal of the Acoustical Society of America, 125(4), 1982-1994.*

The numbers calculated for the Black Sea as whole are very rough estimates and have been extrapolated on the basis of one opportunistic ferry track. The values should not be used in accurate estimations of cetacean abundance.



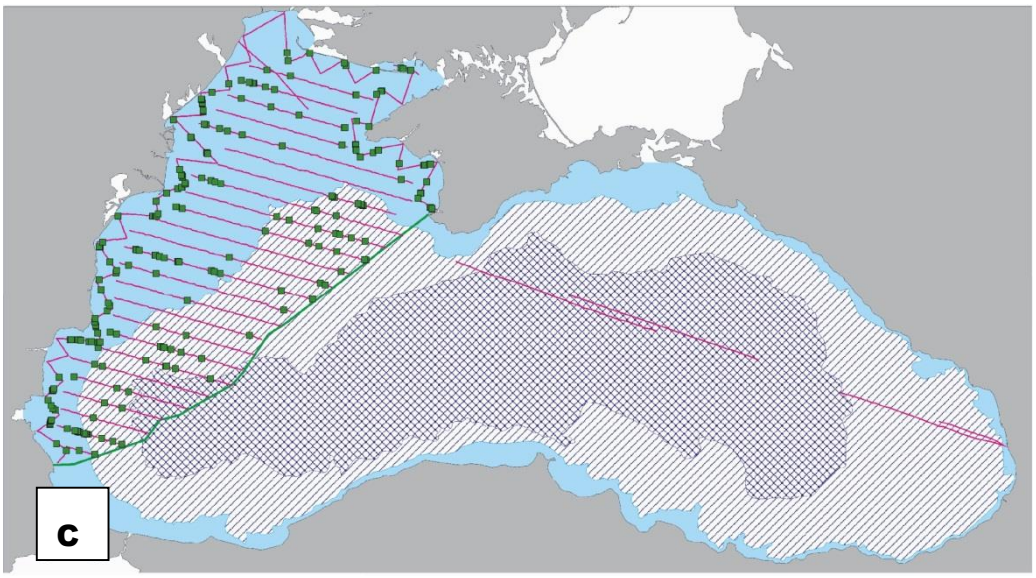


Figure 5.14 Distribution of sightings of Harbour porpoises (A), Common dolphins (B) and Bottlenose dolphins (C) recorded within the shelf (solid blue zone) and deep-water (hatched zones) strata during systematic boat and aerial surveys in the western Black Sea (July 2013) and opportunistic ferry-based survey in the western, central and eastern Black Sea (August–September 2013). Survey tracks are shown with red lines.

5.2.4. Conclusions

1. It is necessary to stress that this analysis used a compilation of data, collected from different surveys (including dedicated shipboard and aerial surveys, and opportunistic ferry-based survey) with very heterogeneous coverage of different areas of the Black Sea, and with one-month interval between surveying the western part and the rest of the basin. There are large areas in the central and eastern Black Sea where there are little or no data. Therefore, this analysis should be considered as a preliminary exploration and the results should be taken with considerable caution. The results need to be validated when a proper systematic survey is performed in the entire Black Sea.

2. According to Distance analysis of the combined data collected in summer 2013 during the three surveys, the density of Harbour porpoises and Common dolphins varied considerably in different Black Sea strata:

   - *P. p. relicta*: from 0.303 indiv./km^2 in the shelf stratum with a depth of ≤200 *m* (CV = 23.59; 95% CI = 0.191–0.481) to 0.099 indiv./km^2 in the deep-water stratum with a depth of >200 *m* (CV = 36.15; 95% CI = 0.048–0.205) (decrease of density in three times; $p<0.05$), and
   - *D. d. ponticus*: from 0.329 indiv./km^2 in the shelf stratum (CV = 25.18; 95% CI = 0.201–0.539) to 0.864 indiv./km^2 in the deep-water stratum (CV = 22.00; 95% CI = 0.552–1.352) (increase of density in 2.6 times; $p<0.01$).

3. The variation of density of Bottlenose dolphins, *T. t. ponticus*, in different strata (from 0.254 to 0.195 indiv./km^2 in the shelf and deep-water strata, respectively) was found to be statistically insignificant.

4. *P. p. relicta* abundance for the entire Black Sea (except neighbouring water bodies) was estimated as 64575 (95% CI = 36459–116611). The estimated number of *D. d. ponticus* was 293106 (95% CI = 186188–461480). The estimate for *T. t. ponticus* was 87148 (95% CI = 53332–144155).

5. Total population abundance of *P. p. relicta* could be roughly estimated between 40 000 and 120 000 taking into consideration several thousands of the animals inhabiting the Azov Sea, the Turkish Straits System and the Aegean Sea. Total population abundance of Black Sea dolphins may be considered between 186 000 and 461 000 (*D. d. ponticus*), and 53 000 and 144 000 (*T. t. ponticus*) until the southern boundaries of the range are ascertained for these two subspecies.

6. Adverse fisheries impacts on cetaceans populations in the Black Sea: current estimates

6.1 Estimation of by-catch rates by fisheries in the Black Sea

Information on by-catch rates of cetaceans comes from three sources. The first are anecdotal records that are summarised in section 3. Such records, while providing an indication of the fishing gears and species most likely to interact, are of little use in providing quantitative estimates of cetacean by-catch. For that purpose we must rely on more rigorously collected data. Two data sets are available at present.

1. The first set of quantitative data are those that have been collected and compiled for section 3 which are presented as a spreadsheet in Annex 9.

2. The second data set is that collected by the fishermen's survey described above in Section 4.2. In this task we have used these two data sets to provide quantitative estimates of cetacean by-catch rates (section 6.1.2.2.). Each of the two data sets is briefly described, and summary statistics are presented.

6.1.1. Data set one: by-catch rates from on-board observer schemes

It is generally accepted that by far the most reliable and useful way to estimate cetacean by-catch is through the use of independent monitoring using on-board observers, or more recently, fishery independent video surveillance and recording of fishing operations[265]. A limited amount of such monitoring has been achieved in Turkey, Romania, Bulgaria and the Ukraine, with different levels of coverage and slightly different aims in each case. An overview is provided in section 3 and is summarised here:

In the Ukraine monthly on-board observations were made by independent observers within a series of projects between 2006 and 2009. Observations were made within Ukrainian territorial waters in the Black Sea, covering an area of about 4000 km^2 in total, close to the western (Evpatoria), southern (Sevastopol) and south-eastern (Feodosia) coasts of the Crimean Peninsula. The survey therefore covered about 1% of the Black Sea surface area (total 436,400 km^2). A total of 84 net hauls was observed, but the soak duration of those nets, and the number of trips associated with them, is not available. All observed hauls were of gillnets, targeting either dogfish or turbot

In Bulgaria 10 days of fishing effort were observed in April-June 2010 an April-July 2011. This was part of a small-scale on-board observer scheme under which ten day-trips were made on a single vessel fishing with gillnets for turbot close to Varna. Twenty hauls were observed.

In Romania, sampling has been more opportunistic, and while there are quite a number of anecdotal accounts of by-caught animals (Annex 9), there were only five observed trips that are considered independent and non-anecdotal. These represent five trips made by fishery enforcement vessels or research vessels to inspect nets at sea. Five hauls were observed in 2002 (1 trip), 2010 (3 trips) and 2011 (1 trip). The target species was turbot in each case, and the nets were gillnets.

[265] *ICES 2010: NAMMCO/ICES Report of the Joint Workshop on observation schemes for by-catch of mammals and birds (WKOSBOMB) International Council for the Exploration of the Seas, Copenhagen 40pp.*

Samples in Turkey are from two sources. Ten trips were made in 2006 from the port of Sinop (Central Black Sea coast) with four hauls observed in each trip, two of which were equipped with pingers and two without. The control hauls (without pingers) represent a sample of by-catch levels in this time and area, and amount to 20 observed hauls. The target species was again turbot and the nets were gillnets. There have been fifteen other trips reported on from western Turkish ports, but only nine of these may be considered fully independently observed, as six included reports made by fishermen of hauls only when cetaceans were caught. In these cases the target species was turbot and the nets were trammel nets.

A summary of the number of observed hauls, reported number of cetaceans and by-catch rates per haul is given in Table 6.1

Table 6.1 Summary of number of observations and their by-catch rates by sampling base port

Country	Base Port	Hauls observed	Porpoises	Porpoises per haul	Bottlenose dolphins	Bottlenose dolphins per haul
Bulgaria	Varna	24	19	0.79	2	0.083
Romania	Constanta	5	52	10.40	0	0.000
Turkey	Karaburun	14	24	1.71	1	0.071
Turkey	R.Feneri	4	3	0.75	0	0.000
Turkey	Sinop	20	92	4.60	0	0.000
Ukraine	Mirnyi	84	517	6.15	5	0.060

A striking aspect of these data – from four countries – is the relatively high rate of cetacean by-catch, and specifically of harbour porpoise by-catch. The values for 'porpoises per haul' in Table 6.1 are much greater than those observed in many other studies of by-catch of this species. In the North Sea for example, where porpoise densities are relatively high (0.125-0.598 in different survey blocks – Hammond *et al* 2013)[266], a summary of fishery observations in 58 different gillnet fishery strata and years resulted in estimates of porpoise by-catch rate per day at sea – ranging from 0 to a maximum of 2.77 animals per day, with a mean of 0.139 animals per day at sea (ICES 2014[267]). Typically about four hauls per day might be expected so that a typical by-catch per haul for the North Sea among different gillnet fisheries would be around 0.034 animals per haul with an observed maximum of 0.69 (assuming four hauls per day at sea). All of the above estimates in Table 6.1 exceed the maximum rate seen in the North Sea, usually by an order of magnitude.

These observations need some explanation. There are several possible reasons why observed by-catch rates might be relatively high in the Black Sea. The most obvious is that the samples may have been taken from a biased sample of vessels, specifically those with high by-catch rates. Although this issue is not discussed in the published account of the sampling at Sinop in Turkey (Gönener and Bilgin,

[266] *Hammond, P.S., et al. 2013. Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management, Biological Conservation, 164: 107-122. http://dx.doi.org/10.1016/j.biocon.2013.04.010.*

[267] *ICES 2014. Report of the Working Group on By-catch of Protected Species (WGBYC), 4-7 february 2014, Copenhagen. ICES CM 2014/ACOM:28*

2009[268]) it would seem plausible that an area of known high by-catch rate would have been chosen in order to test a mitigation device (in this case a pinger) in order to maximise power to detect a difference. Certainly the by-catch rates reported in Gönener and Bilgin (2009) are higher than those reported in western Turkish waters. Most of the Romanian samples were collected from survey boats inspecting nets that may have been illegally set – and these might also therefore represent a biased sample of fishing nets. However, the observations from Bulgaria and the Ukraine were intended to be representative of the fleets concerned and it is much harder to propose any obvious bias in these samples.

The possibility that the observed high by-catch rates might be due to higher porpoise densities in the Black Sea than elsewhere can be discounted based on the results from the sightings survey reported in the present project, which suggest densities of around 0.3 porpoise per km^2, which is quite in line with average densities for the North Sea, and where the highest reported density for a single survey block was 0.598 animals per Km^2. This is not to say, however, that observations were not wittingly or unwittingly directed at areas with exceptionally high local porpoise densities.

A third potential issue is that the by-catch rate reported here is in terms of the number of animals *per observed haul*. Most of the observed hauls were set for turbot, while some (Ukrainian) samples were of dogfish nets. The length of the nets and the duration of time they had been fishing may have varied considerably, and may be greater in either respect (length or duration) than equivalent nets observed in other areas such as the North Sea. To try to address this one can also consider the catch per unit of net length (km) or the by-catch per unit of effort (km of netting x days soak time). Unfortunately not all the relevant data are available to generate such estimates for the entire data set, as net length and soak times are missing for some countries.

It should be stressed that despite the seemingly consistent high by-catch rates observed in four countries, sampling at the Black Sea level has still so far been limited both in terms of the geographical extent and absolute number of hauls observed, and in no way can the observations made so far be seen as an adequate sample with which to obtain a regional overview of the scale of cetacean by-catch in the Black Sea. Most sampling has been focused at the time of year – late spring and early summer- when interview sampling suggests by-catch rates may be highest.

Bootstrap resampling[269] has been used to estimate the mean by-catch rates and the associated 95% upper and lower confidence limits for porpoises and bottlenose dolphins from the sampling programmes available to us at present. This is shown in Table 6.2 below.

[268] *Gönener, S. and S. Bilgin 2009. The effect of pingers on harbour porpoise, Phocoena phocoena by-catch and fishing effort in the turbot gill net fishery in the Turkish Black Sea coast. Turkish Journal of Fisheries and Aquatic Sciences 9(2):151-157.*

[269] *See http://en.wikipedia.org/wiki/Bootstrapping_%28statistics%29*

Table 6.2 A summary of observed by-catch rates with bootstrapped confidence limits

Harbour Porpoises

BCPUEffort*	**Mean**	**LCL**	**UCL**
Overall	0.228	0.147	0.324
Ukraine	NA	NA	NA
Bulgaria	NA	NA	NA
Romania	0.161	0.146	0.177
Turkey	0.239	0.152	0.341

*Net km.days of effort

BCPULength*	Mean	LCL	UCL
Overall	1.388463	0.8825323	2.0011921
Ukraine	1.249	0.893	1.658
Bulgaria	NA	NA	NA
Romania	3.346639	2.994358	3.681424
Turkey	2.324	1.541	3.229

*Km of net hauled

BCPHaul	Mean	LCL	UCL
Overall	4.667	2.917	6.883
Ukraine	6.165	4.050	8.683
Bulgaria	0.790	0.583	1.000
Romania	10.434	7.500	13.717
Turkey	3.123	2.283	4.083

Bottlenose Dolphins

BCPUEffort*	**Mean**	**LCL**	**UCL**	
Overall	0.000	0.000	0.001	
Ukraine	NA	NA	NA	*Ukraine no soak time*
Bulgaria	NA	NA	NA	*Bulgaria no net length*
Romania	0.000	0.000	0.000	
Turkey	0.000	0.000	0.001	

*Net km.days of effort

BCPULength*	Mean	LCL	UCL	
Overall	0.00633	0.00000	0.01543	
Ukraine	0.00729	0.00000	0.01682	
Bulgaria	NA	NA	NA	*Bulgaria no net length*
Romania	0.00000	0.00000	0.00000	
Turkey	0.00484	0.00000	0.01235	

*Km of net hauled

BCPHaul	Mean	LCL	UCL
Overall	0.0532	0.0000	0.1333
Ukraine	0.0598	0.0000	0.1500
Bulgaria	0.0843	0.0167	0.1667
Romania	0.0000	0.0000	0.0000
Turkey	0.0263	0.0000	0.0667

BCPTrip	Mean	LCL	UCL
Overall	2.7320	2.1167	3.4167
Ukraine	NA	NA	NA
Bulgaria	1.9006	1.5167	2.3000
Romania	4.2481	3.8333	4.6833
Turkey	3.0025	2.2167	3.8833

BCPTrip	Mean	LCL	UCL	
Overall	0.1306	0.0500	0.2167	
Ukraine	NA	NA	NA	*Ukraine no trip details*
Bulgaria	0.1993	0.1000	0.3000	
Romania	0.0000	0.0000	0.0000	
Turkey	0.1116	0.0333	0.2000	

The calculations in Table 6.2 have been done at the trip level – that is animals per trip (where possible), at the haul level (animals per haul) and in terms of animals per km of net (BCPUL) and animals per km.day (BCPUE) of netting. If we make the tenuous assumption that each of the four national data sets provides unbiased estimates of the underlying overall by-catch rate in the Black Sea it would be appropriate to pool the estimates. Bootstrapped estimates of by-catch rates with confidence limits for each of the four countries separately have been calculated. Thus we have a series of possible by-catch rates which could be applied to fleet effort to obtain total by-catch estimates for these two species.

In terms of by-catch per haul, the overall mean for all samples (assuming no underlying difference between countries) is 4.67 porpoises per haul (CL 2.9-6.9), and 0.05 bottlenose dolphins (0-0.015). Such statistics belie the fact that there are likely to be differences in net length and soak times between different areas and therefore conceal potentially different underlying rates per unit effort.

By-catch per net.km hour is available for two countries of the four countries; by-catch per unit net length is available for three of the four countries. In both of these cases, by-catch rates are more consistent – less variable – between countries than the by-catch per haul statistic, supporting the common sense notion that net length and/or soak time are important in determining by-catch rate.

These rates might be tentatively applied to fishing effort data, always bearing in mind the potential biases, to provide some preliminary impression of the scale of the issue. This is addressed further below.

6.1.1.1. By-catch rates by fishery, age and sex

Data from the on board observer programmes described here provide little detail on by-catch by fishery, age or sex class. Most observations were made with respect to turbot nets, though in the Ukraine, 37 of 84 observed hauls were targeted at dogfish (*Squalus acanthias*). There was no significant difference in the observed per haul by-catch rate between the two net types.

In terms of sex, females dominated the by-catch in each of the four country samples (all animals included, not just those collected in systematic on-board observations) with an overall ratio of 60% female and 40% male among those where the sex was identified. 362 of the 875 sampled animals (41%) were not given a sex category. There therefore appears to be a sex bias in the selection of the turbot/dogfish nets observed here.

Age data are not available for the sample of animals addressed here, but length frequency data do not suggest any obvious or strong bias towards younger animals (Figure 6.1). There are insufficient data to attempt to estimate by-catch rates by age class. Goldin (2004[270]) found that the mean lengths of physical maturity (age ~8 years) for male and female porpoises were 122 and 133cm respectively. 45% (181) of measured animals exceeded 122cm in length.

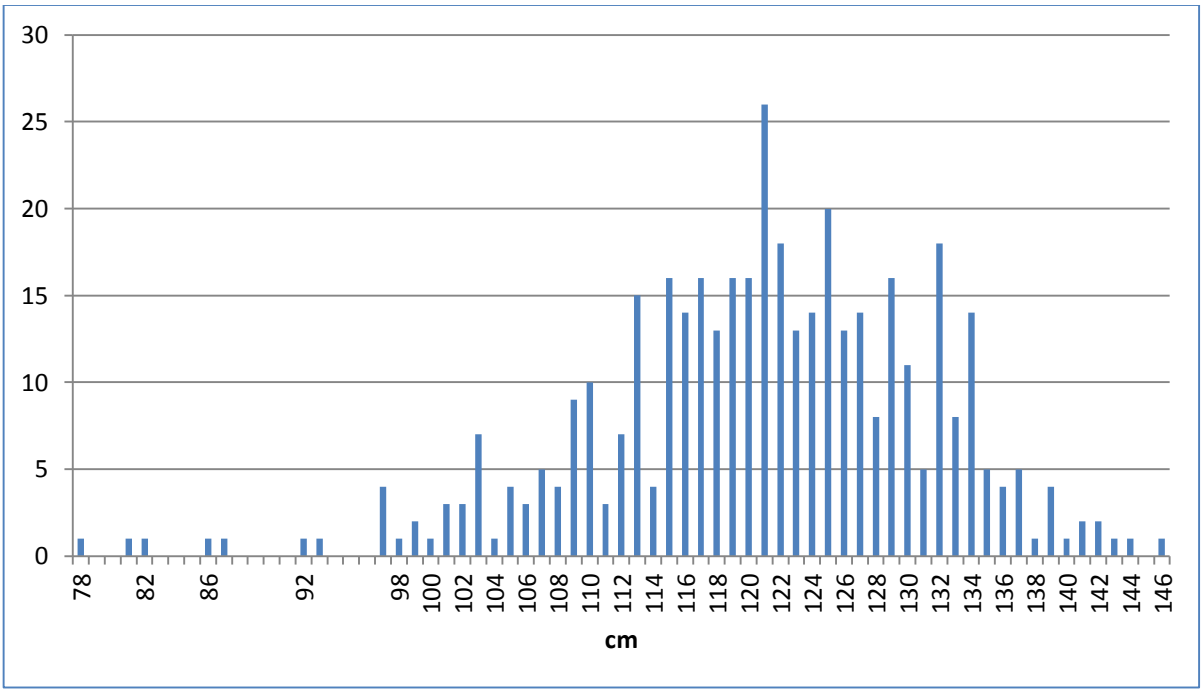


Figure 6.1 Porpoise Length frequency distribution of 402 measured animals recovered from nets.

[270] *Gol'din, P.E. 2004. Growth and body size of the harbour porpoise, Phocoena phocoena (cetacea, phocoenidae), in the Sea of Azov and the Black Sea. Vestnik zoologii, 38(4): 59–73*

6.1.1.2. Areas of high observed by-catch: spatial trends

The exact locations of observed cetacean by-catches referred to in Table 6.6 are not all recorded. Nevertheless those that are, together with additional records from hauls that are not included in the above table because they were not collected systematically, are shown in Figure 6.2. Samples are from a wide area, but are clustered in a few locales. Porpoise by-catch is widespread, bottlenose dolphin by-catch is more restricted, to Ukrainian and Bulgarian waters, and common dolphin by-catch is only recorded three times, in the eastern Black Sea (details available in Annex 9).

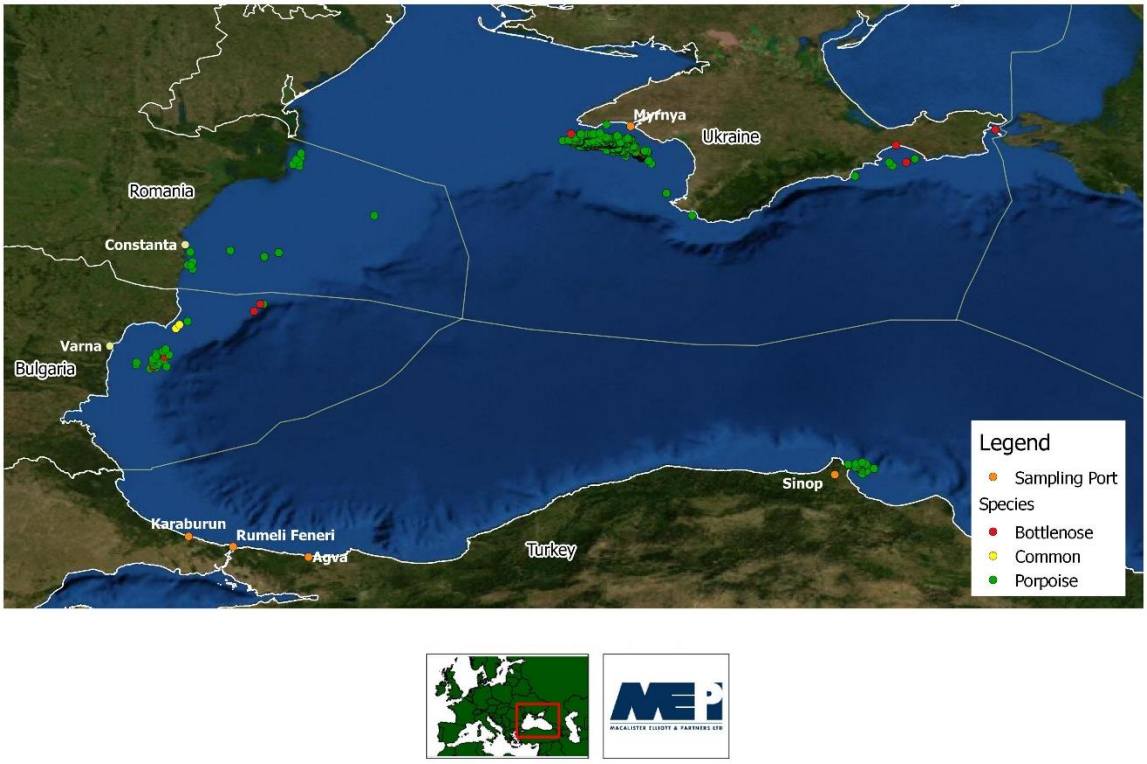


Figure 6.2 Locations of recorded by-catch events (observed and those from hauls) of all species, where fishing net location was recorded. Image created on Quantum GIS. CRS: WGS 84.

While this map demonstrates that sampling has been carried out over a wide area, it does not help a great deal to identify areas of highest by-catch rates. To this end, by-catch rates (number of animals per haul) have been aggregated by tenths of a degree of latitude and of longitude, and are plotted for harbour porpoises and for bottlenose dolphins in Figures 6.2 and 6.3 respectively, while the corresponding numbers are given in Table 6.2.

Because some of the observed by-catch events had no reported corresponding locations (Romania and western Turkey) by-catch rates have been aggregated for these two regions and have been plotted on adjacent land areas.

Table 6.3 By-catch per haul by species aggregated to cells of 6 minutes of latitude and longitude.

Country	Latitude	Longitude	Porpoises	Bottlenose	Hauls	Porpoises per haul	Bottlenose per haul
Bulgaria	42.9	28.1	2	0	3	0.67	0
Bulgaria	42.9	28.3	6	1	5	1.2	0.2
Bulgaria	42.9	28.4	1	0	2	0.5	0
Bulgaria	43	28.1	0	0	2	0	0
Bulgaria	43	28.3	5	0	3	1.67	0
Bulgaria	43	28.4	2	1	7	0.29	0.14
Bulgaria	43.1	28.3	3	0	2	1.5	0
Turkey	41.9	35.2	9	0	6	1.5	0
Turkey	41.9	35.3	5	0	2	2.5	0
Turkey	42	35.1	42	0	12	3.5	0
Turkey	42	35.2	38	0	20	1.9	0
Ukraine	44.9	33.1	3	0	4	0.75	0
Ukraine	45	32.9	128	1	10	12.8	0.1
Ukraine	45.1	32.5	34	0	7	4.86	0
Ukraine	45.1	32.6	166	2	27	6.15	0.07
Ukraine	45.1	32.7	78	1	13	6	0.08
Ukraine	45.1	32.8	92	1	16	5.75	0.06
Ukraine	45.2	32.5	2	0	3	0.67	0
Ukraine	45.2	32.7	14	0	4	3.5	0
Romania	*44.2*	*28.3*	*52*	*0*	*5*	*10.4*	*0*
Turkey	*41.1*	*28.2*	*40*	*1*	*25*	*1.6*	*0.04*

(Last two rows relate to data without lat-long positions – attributed to adjacent coastal land for comparative purposes)

Displayed in this way – it would appear that by-catch 'hot spots' might be associated with certain cells off the coast of western Crimean Peninsula and off Romania (also identified in by-catch data previously to this study). However, it must be remembered that these rates take no account of the lengths of the nets involved, nor of the soak times. If these two factors were included a rather different picture may emerge.

More importantly, these maps show just how few cells have been sampled in the Black Sea as a whole, such that the identification of any putative hot spots from observer data is premature. The information for bottlenose dolphins shown in Figure 6.3 is even more rudimentary and does even less to help identify hot spots. We can conclude that at this point there are insufficient data to identify specific locales with especially high rates of by-catch per unit effort. Indeed there is no *a priori* reason why these should exist.

Nevertheless, these observed by-catch rates (particularly those of porpoises) have been reported in the same areas as high observed abundances in our survey (See Section 5, Figure 5.8 - 'Heat map' indicating abundance of individual Harbour porpoises). The overlap between various fisheries (See section 4.2.7) and aggregations of cetaceans in areas such as the Crimean peninsula is clearly a cause for concern.

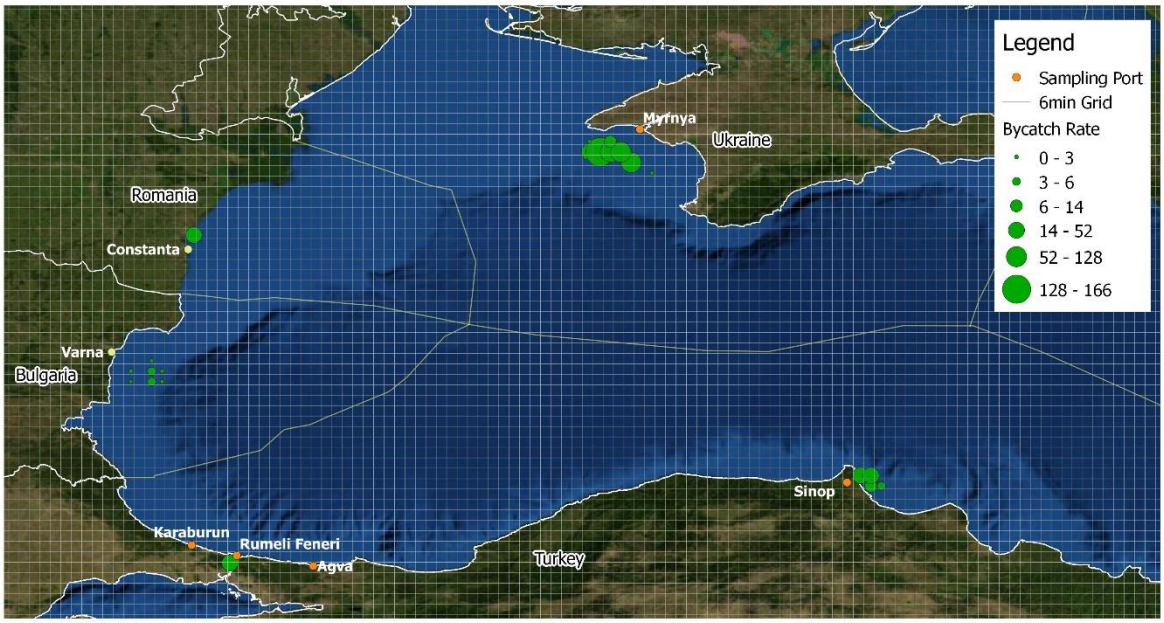


Figure 6.3 Locations of recorded harbour porpoise by-catch events (per haul), broken down to 6 minute cells. By-catch rates = no. of animals per haul. Image created on Quantum GIS. CRS: WGS 84.

Figure 6.4 Locations of recorded bottlenose dolphin by-catch events (per haul), broken down to 6 minute cells. By-catch rates = no. of animals per haul. Image created on Quantum GIS. CRS: WGS 84.

6.1.2. Data set two: by-catch estimates from fishermen's survey

It is widely accepted that the most reliable estimates of cetacean by-catch rates are to be obtained from independent on-board monitoring, either using observers or electronic monitoring using video recordings[265]. However, as has been shown above, often such data are lacking or are too difficult or expensive to obtain. In such cases interview data can provide some insights into the nature and possible scale of cetacean by-catch, provided they are treated with care.

Results from the fishermen's survey conducted under section 4 above. Here we summarise and investigate further results relating specifically to by-catch.

The owners, crew members or skippers of 440 individual vessels were interviewed during the present study, and information relating to 1075 different boat / métier combinations was obtained. Each vessel therefore used on average 2.45 different types of fishing gear. The polyvalent nature of the fleets being surveyed makes it very hard to disentangle the likely amounts of fishing effort deployed by any one gear type in any of the four countries, but these data collected under the present project do enable some attempts to be made, probably for the first time.

In this section we examine which gear types were reported to have any cetacean by-catch, and then by focusing mainly on the turbot gillnet fishery, we attempt to generate rough estimates of by-catch rates by fleet segment (country and size class) for polyvalent vessels.

6.1.2.1. What fishing gear catches cetaceans?

It is widely thought that the most dangerous gear in the Black Sea as far as cetaceans are concerned are turbot gillnets. The results of this study do suggest that this gear type is most frequently listed as having cetacean by-catch. In Table 6.4 we list a summary of the response to the interview question

'are cetacean ever caught in this fishing gear'. As board gear types, only lift nets and hand lines were attributed with a zero score, but some gear types were only reported to catch cetaceans in some countries. Thus mid-water trawls were reported to take cetaceans in the Ukraine, but not in Bulgaria. There were no reports of cetacean by-catch in pound nets in Bulgaria, but some incidents were reported in both Turkey and Ukraine. Some of these results may be anomalous. In the case of the 'burilo' sprat trawl and pound nets in Turkey, for example, sample sizes of 1 or 2 limit the usefulness of the results, but suggest that cetacean by-catch is at least possible in almost any gear.

Among the gillnet métiers, we have separated turbot gillnets from all the rest in table B9.4. About three quarters of respondents in Bulgaria and Ukraine said that cetacean by-catch occurs in turbot nets, while this rose to 95% among Turkish fishermen, whereas only 33% of Romanian respondents agreed. For other gillnets the responses suggest a lower incidence, with 12-33% of respondents noting cetacean by-catch in other types of gillnet.

Among other gears, purse seines, pound nets and mid-water trawls (Ukraine) all warrant further investigation.

Table 6.4 Reported occurrence of by-catch in different gear types by country

Métier Level 4 Descriptor	Country	No of respondents	NO	YES	% Yes
Boat_lift_net	Ukraine	3	3	0	0%
Bottom_otter-trawl	Turkey	10	10	0	0%
Burilo	Ukraine	1	0	1	**100%**
Hand_Lines	Bulgaria	1	1	0	0%
Midwater_otter_trawl	Bulgaria	11	11	0	0%
Midwater_otter_trawl	Ukraine	14	5	9	**64%**
Pound_Net	Bulgaria	16	16		0%
Pound_Net	Turkey	2	0	2	**100%**
Pound_Net	Ukraine	9	5	4	**44%**
Purse_seine	Turkey	144	121	23	16%
Purse_seine	Ukraine	4	2	2	**50%**
Set_Gillnets	Bulgaria	17	15	2	12%
Set_Gillnets	Romania	10	7	3	**30%**
Set_Gillnets	Turkey	194	146	48	**25%**
Set_Gillnets	Ukraine	18	12	6	**33%**
Set_Gillnets-Turbot	Bulgaria	16	4	12	**75%**
Set_Gillnets-Turbot	Romania	84	56	28	**33%**
Set_Gillnets-Turbot	Turkey	58	3	55	**95%**
Set_Gillnets-Turbot	Ukraine	37	9	28	**76%**

These results confirm the significance of turbot nets as a potential threat to cetaceans in the Black Sea, but do little to indicate the rate at which cetaceans are taken.

6.1.2.2. By-catch estimates by species, gear type and geographical region

Interview surveys data can be used to generate some estimate of possible by-catch rate, as long as one assumes that responses are not biased. Biases may arise if people wish to exaggerate the rate at which cetaceans are caught – possibly either through the 'interviewer bias effect' where interviewer responses lead interviewees to tailor their answers to 'please' – or if there is some perceived potential economic gain from exaggerating. More plausibly in this situation, responses may be biased low either because interviewees perceive by-catch of cetaceans as a negative aspect of their livelihood ('response bias'), or because such events are not recorded or remembered well by the interviewee ("recall bias") and are therefore genuinely underestimated.

In an attempt to address recall bias and response bias – we asked interviewees not only how often cetaceans were caught in particular gears, but also when they could remember the last such event. On the perhaps tenuous assumption that both recall and response bias are less likely to apply to this latter question, we aimed to compare the two answers. If we expect that the questions were posed on average mid-way between by-catch events (or- in other words – that a by-catch event is as likely last month as next month) then the time elapsed since the last event will equal the expected time to the next event – and if multiplied by two will result in the expected time between events – or the inverse of the by-catch rate.

We therefore compared the stated by-catch rate with the rate implied by the time elapsed since the most recent by-catch event ('implied rate'). With a relatively large sample size, any systematic bias should be revealed by a disagreement between the two measures. The two measures are plotted in Figure 6.5. No overall bias is evident, though the data appear to be bimodal, with some stated rates underestimated when compared with implied rates and another group where stated rates appear to be higher than implied rates. There was no obvious reason for these differences- as countries and gear types were represented in each group. The absolute differences between implied and stated rates are not great, and we therefore tentatively conclude that the stated rates may not be too badly biased, though this says nothing about their precision.

One problem with the interview data is that respondents did not always distinguish between cetacean species in response to this question. They were asked to name species, but some replied 'all species' while others gave two or three species names. There are concerns that not all fishermen can identify all three species accurately, and in Ukraine some fishermen are known to confuse harbour porpoises with common dolphins (Birkun pers. obs.). For the following exercise we have selected all those records where harbour porpoises were explicitly mentioned in the answer. Of 132 records where porpoises were mentioned, in 40 cases the responses referred to both dolphins and porpoises, whereas in 92 cases just porpoises were mentioned. By including all records where porpoises were mentioned we may therefore have included some dolphins in the following analysis.

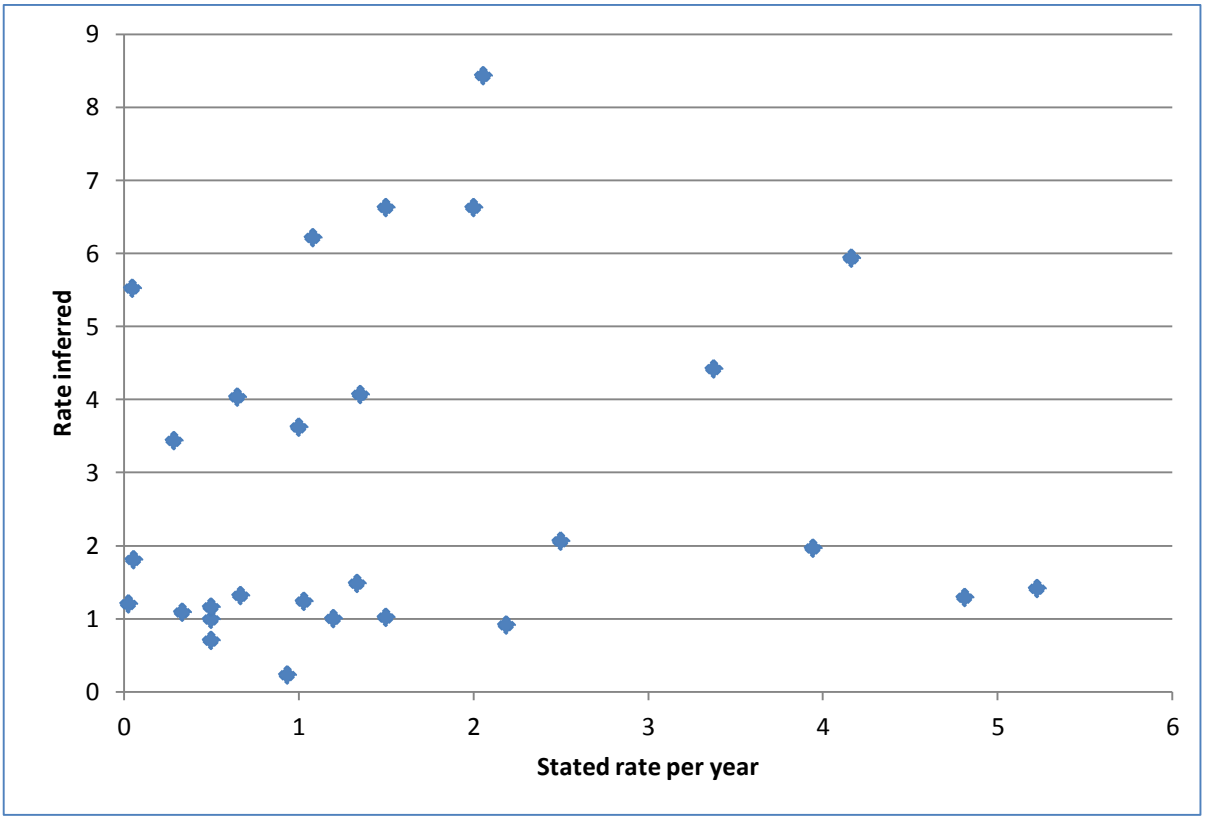


Figure 6.5 comparison of stated by-catch rate with rate inferred from date of most frequently reported event.

Stated by-catch rates (animals caught per year) are congruent with the results of the preceding question, asking whether or not by-catches occur, in that the highest rates were reported for turbot nets, as were the highest numbers reporting by-catch occurrence.

Results are presented in Table 6.5 and 6.6, by gear type (EU métier classification 4-6) alone first, and then by métier and by geographical region. In each table the number of questionnaire responses by gear type and/or area is given, along with the number of boats the answers refer to – as some responses were recorded on behalf of two or more vessels.

6.1.2.2.1. Porpoise by-catch rates

Table 6.5 Stated porpoise by-catch rates (per boat per year) by gear type

Gear Description	No of records	Represented no of boats	Total by-catches reported per year	Mean annual porpoise by-catch	Standard deviation of by-catch rate
Pound nets	20	30	0	0.00	0.00
Set gillnets	35	85	24	0.69	1.71
Set gillnets demersal	59	65	171	2.90	3.03
Set gillnets turbot	156	294	642	4.12	3.99
Set gillnets pelagics	2	2	0	0.00	0.00
Hand lines	2	4	0	0.00	0.00
Lift nets	2	12	0	0.00	0.00
Midwater trawls	10	22	2	0.20	0.42
Purse seine	41	41	48	1.17	2.25
Purse seine small pelagics	4	4	0	0.00	0.00

Table 6.6 Stated porpoise by-catch rates (per boat per year) by gear type and region

Métier	Country	Region	No of records	Represented no of boats	Total by-catches reported per year	Mean annual Porpoise by-catch	St Dev of By-catch Rate
Bulgaria	North	Pound nets	6	6	0	0.000	0.000
Bulgaria	South	Pound nets	10	10	0	0.000	0.000
Ukraine	Crimea	Pound nets	4	14	0	0.000	0.000
Bulgaria	Central	Gillnets unspec	2	2	0	0.000	0.000
Bulgaria	North	Gillnets unspec	8	36	0	0.000	0.000
Bulgaria	South	Gillnets unspec	8	16	0	0.000	0.000
Bulgaria	South, Central	Gillnets unspec	2	4	0	0.000	0.000
TURKEY	RIZE	Gillnets unspec	9	9	24	2.667	2.537
Ukraine	Crimea	Gillnets unspec	4	16	0	0.000	0.000
Ukraine	Odessa	Gillnets unspec	2	2	0	0.000	0.000
Bulgaria	South	GN demersal	4	10	0	0.000	0.000
Turkey	Sinop	GN demersal	27	27	121	4.481	2.789
Turkey	Sinop	GN demersal	26	26	48	1.846	2.767

Ukraine	Zaporojsky	GN demersal	2	2	2	1.000	0.000
Bulgaria	Central	GN turbot	2	2	0	0.000	0.000
Bulgaria	North	GN turbot	8	28	23	2.875	3.079
Bulgaria	North & Central	GN turbot	2	2	4	2.000	0.000
Bulgaria	South	GN turbot	12	22	38	3.167	2.791
Romania	GSA 29	GN turbot	56	166	208	3.714	1.676
Turkey	Sinop	GN turbot	52	52	301	5.788	4.939
Ukraine	Crimea	GN turbot	16	14	63	3.938	6.285
Ukraine	Odessa	GN turbot	6	6	3	0.500	0.775
Ukraine	Zaporojsky	GN turbot	2	2	2	1.000	0.000
Turkey	Sinop	GN pelagic	2	2	0	0.000	0.000
Bulgaria	South, Central	Handlines	2	4	0	0.000	0.000
Ukraine	Crimea	Lift net	2	12	0	0.000	0.000
Bulgaria	North	Midwater trawl	2	2	0	0.000	0.000
Bulgaria	South	Midwater trawl	4	16	0	0.000	0.000
Ukraine	Crimea	Midwater trawl	2	2	2	1.000	0.000
Ukraine	Odessa	Midwater trawl	2	2	0	0.000	0.000
Turkey	Rize	Purse seine	35	35	45	1.286	2.408
Turkey	Sinop	Purse seine	2	2	0	0.000	0.000
Ukraine	Crimea	Purse seine	2	2	3	1.500	0.000
Ukraine	Zaporojsky	Purse seine	2	2	0	0.000	0.000
Turkey	Rize	PS - small pelagics	2	2	0	0.000	0.000
Ukraine	Zaporojsky	PS - small pelagics	2	2	0	0.000	0.000

These tables confirm the importance of turbot gillnets as having stated by-catch rates that are higher than other gear types. Porpoises were not reported as by-catch in pound nets, hand lines or lift nets. They were reported caught in most gillnets, but not those set for small pelagic fish (small meshed), thought the sample was very small there. Porpoise by-catch in mid-water trawls and purse seines was reported very infrequently, and only in Ukraine – where they might have been confused with common dolphins.

Stated by-catch rates of porpoises in gillnets were generally highest in turbot net fisheries and were nearly 1.5x higher in turbot nets than in other gillnets. Regionally they were highest in Sinop on the central Turkish Black Sea coast. They were most variable in Crimea, where up to 20 animals per year were reported by two respondents, but where many reported none or one. This may suggest some spatial pattern in the by-catch rates, where very high rates were observed in one area of the Crimea in a dedicated observer programme (See 6.1 above).

6.1.2.2.2. Dolphin by-catch rates

Table 6.7 Stated dolphin by-catch rates (per boat per year) by gear type

Gear type	No of records	Represented no of boats	Total by-catches reported per year	Mean annual dolphin by-catch	St Dev of By-catch Rate
	9	18	0	0.00	0.00
Pound nets	27	42	7	0.26	0.58
Set gillnets	44	80	62.5	1.42	3.45
Set gillnets demersal	89	99	134	1.51	2.71
Set gillnets - turbot	179	345	295.5	1.65	4.07
GN- large pelagics	120	120	0	0.00	0.00
GN-small pelagics	60	60	0	0.00	0.00
Lift nets	4	19	0	0.00	0.00
Midwater trawls	29	46	18	0.62	0.80
Purse Seine	93	93	65.5	0.70	1.77
P-S- large pelagics	41	41	0	0.00	0.00
P-S- small pelagics	23	23	0	0.00	0.00

Stated by-catch rates of dolphins (both species combined) are given in Table 6.7. Species are combined because in the many cases where dolphins were mentioned as being by-caught, both species were listed (46 combined records vs 42 and 42 instances where species were identified individually), possibly because of uncertainty in identification. In 31 instances respondents mentioned all three cetacean species, so again we may be including some records or porpoises among the 'dolphin' records in this analysis.

Table 6.8 Stated by-catch rates of dolphins (per boat per year) by gear type and region

Country	Region	Métier	No of records	Represented no of boats	Total by-catches reported per year	Mean annual dolphin by-catch	StDev of By-catch Rate
Bulgaria	North	Pound nets	6	6	0	0.00	0.00
Bulgaria	South	Pound nets	10	10	0	0.00	0.00
Turkey	Rumelifeneri	Pound nets	3	3	5	1.67	0.29
Ukraine	Crimea	Pound nets	6	21	0	0.00	0.00
Ukraine	Odessa	Pound nets	2	2	2	1.00	0.00
Bulgaria	Central	Gill Nets	2	2	0	0.00	0.00
Bulgaria	North	Gill Nets	6	22	0	0.00	0.00
Bulgaria	South	Gill Nets	6	8	0	0.00	0.00
Turkey	Rize	Gill Nets	13	13	33	2.54	2.63
Turkey	Sinop	Gill Nets	4	4	0	0.00	0.00
Ukraine	Crimea	Gill Nets	6	24	0	0.00	0.00
Ukraine	Odessa	Gill Nets	7	7	29.5	4.21	7.18
Bulgaria	South	GN - demersal	4	14	0	0.00	0.00
Turkey	Rize	GN - demersal	25	25	111	4.44	2.96
Turkey	Sinop	GN - demersal	60	60	23	0.38	1.52
Bulgaria	Central	GN-turbot	2	2	0	0.00	0.00
Bulgaria	North	GN-turbot	2	2	0	0.00	0.00
Bulgaria	North & Central	GN-turbot	2	2	12	6.00	0.00
Bulgaria	South	GN-turbot	6	10	16	2.67	2.07
Romania		GN-turbot	83	247	0	0.00	0.00
Romania		GN-turbot	1	2	0	0.00	
Turkey	Sinop	GN-turbot	46	46	185	4.02	5.56
Ukraine	Crimea	GN-turbot	24	21	67.5	2.81	6.39
Ukraine	Odessa	GN-turbot	13	13	15	1.15	1.55
Turkey	Rumelifeneri	GN- large pelagics	116	116	0	0.00	0.00
Turkey	Sinop	GN- large pelagics	4	4	0	0.00	0.00
Turkey	Rumelifeneri	GN – small pelagics	58	58	0	0.00	0.00

Turkey	Sinop	GN – small pelagics	2	2	0	0.00	0.00
Ukraine	Crimea	Lift net	4	19	0	0.00	0.00
Bulgaria	North	Midwater trawl	8	16	0	0.00	0.00
Bulgaria	South	Midwater trawl	8	20	0	0.00	0.00
Ukraine		Midwater trawl	3		4	1.33	0.58
Ukraine	Crimea	Midwater trawl	7	7	10	1.43	0.35
Ukraine	Odessa	Midwater trawl	3	3	4	1.33	1.15
Turkey	Rize	Purse seine	44	44	59.5	1.35	2.40
Turkey	Sinop	Purse seine	47	47	4	0.09	0.35
Ukraine	Crimea	Purse seine	2	2	2	1.00	0.00
Turkey	Rumelifeneri	PS large pel	36	36	0	0.00	0.00
Turkey	Sinop	PS large pel	5	5	0	0.00	0.00
Turkey	Rize	PS small pel	2	2	0	0.00	0.00
Turkey	Rumelifeneri	PS small pel	18	18	0	0.00	0.00
Turkey	Sinop	PS small pel	3	3	0	0.00	0.00

Stated by-catch rates of dolphins, as expected from existing data, are generally lower than those for porpoises, but there are differences in the gear types involved. Dolphin by-catches in midwater trawls were mentioned frequently in Ukraine, (but not Bulgaria), and were also mentioned in two purse seine fisheries. Dolphin by-catches were mentioned in turbot gillnet fisheries in Turkey, Ukraine and Bulgaria but not in Romania, but also in other gillnets in Turkey and Ukraine. The fact that some of these by-catch records may have included references to porpoises should be borne in mind. Finally dolphin by-catches are also mentioned in relation to pound nets.

These rates are difficult to interpret or use with confidence, both because of possible inherent biases in the methodology (which we have tried to look for but could not identify) which means that at best they are likely to be very crude estimates, but also because of uncertainties in species identifications. Nevertheless, if we treat them with caution they can be used to look for the likely scale of by-catch by species group and by gear type in the surveyed area. To this end, we have applied them in the following section to fishing effort summaries generated in B8 to provide some idea of likely or possible by-catch totals.

6.2 Estimated by-catch limits

Before trying to address the likely scale of by-catch in the Black Sea, it is useful to have some perspective on what the by-catch limits might be, based on the abundance estimates conducted provided in Section 5.

6.2.1. Calculating by-catch limits

The definition of what constitutes a 'sustainable' take limit has occupied the discussions and thoughts of many scientists over many years. The concept of a sustainable (or unsustainable) level of mortality or removal needs to be considered within the context of management goals or societal expectations. Usually with commercially harvested species, the general idea is to remove the organisms at a rate that is the same as or just below the maximum rate of natural productivity. For many fish species maximum net population growth occurs at around or just above ½ of the unexploited biomass or carrying capacity. This means that in order to continue to catch the highest possible level of fish, the biomass of the resource should be about half what it would be with no human interference. For marine mammals (where density dependent changes in growth rates are not linear with respect to population size), the rate of maximum net productivity is normally achieved when the population is at 50-70% of carrying capacity. Furthermore, when conservation rather than harvesting is the goal, management goals are usually to maintain the population size at *or above* the level of maximum net productivity (MNPL).

In the USA, the Marine Mammal Protection Act requires the management authorities to maintain marine mammal stocks at their optimum sustainable population (OSP) size. The OSP is defined as "a population level between carrying capacity and the population size at maximum net productivity" (Federal Register, 21 December 1976, 41 FR 55536). In the USA the MNPL is taken to be 60% of the carrying capacity in numbers of animals. To achieve this target with a degree of certainty, the US employs an approach that uses the Potential Biological Removal (PBR), which is defined as "the maximum number of animals, not including natural mortalities that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population". Wade (1998) considered how to achieve this goal of attaining OSP size with 95% probability after 100 years. His work is now used routinely in the USA, where the mortality limit is defined by the PBR which in turn is defined as:

$$PBR = N_{min} \cdot \tfrac{1}{2} R_{max} \cdot F_r$$

Where N_{min} is the lower 20th percentile of the estimate of the population size, R_{max} is the maximum theoretical or estimated net productivity rate of the stock at a small population size and F_R is a recovery factor set between 0.1 and 1. "F_R can be seen as both an additional factor to hasten the recovery of depleted populations and as a "safety" factor to account for additional uncertainties other than the precision of the abundance estimate. In statistical terms, using N_{MIN} addresses uncertainty due to imprecision which can be estimated. F_R on the other hand, can be used to address potential biases caused by our ignorance of some important factors, such as stock boundaries" (Wade 1998). Wade implemented a series of bias trials to investigate the consequences of possible biases in the mortality and abundance estimates and concluded that unless one can be confident that no bias exists and that stock structure is correctly identified, an Fr value of 0.5 should be used as default. The value of N_{min} – the lower 20th percentile of the abundance estimate can be calculated as

$$N_{min} = \frac{\widehat{N}}{\exp(z\sqrt{\ln(1 + CV(N)^2)})}$$

Where $\widehat{N}$ is the point estimate of abundance, and z is the standard normal variate which equals 0.842 for the 20th percentile. CV(N) is the coefficient of variation of the abundance estimate and is an indicator of the precision of the estimate.

In other countries other approaches have been put forward. Countries that are signatories to the Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) have agreed on a more simple definition of a mortality limit which is set at 1.7% of the best estimate of abundance. This number was initially derived to meet the ASCOBANS interim

objective of maintaining cetacean populations at or above 80% of their carrying capacity. A joint International Whaling Commission (IWC) / ASCOBANS workshop in 1999 (Anon 2000[271]) reported that: "using a basic population model for harbour porpoises and assuming no uncertainty in any parameters, the maximum annual by-catch that achieves the ASCOBANS interim objective over an infinite time horizon is 1.7% of the population size in that year". If uncertainty were to be taken into account then a figure of less than 1.7% would be needed to achieve the objective. This figure of 1.7% of the best estimate of abundance has been widely cited and used within a European context, and was adopted by ASCOBANS at its 3rd Meeting of Parties in 2000 as an interim definition of unacceptable levels of removal for all small cetaceans in the ASCOBANS area.

Other 'rules of thumb' have also been proposed. The Scientific Committee of the International Whaling Commission agreed in 1995 that it would be "a matter of concern" if annual by-catches were to exceed half of the estimated maximum annual growth rate of any small cetacean population. For porpoises and other small cetaceans the maximum annual rate of increase is generally thought to be 4% at most, leading to 'concerns' if by-catches were to exceed 2% of the population size. The Committee also agreed that "a figure of 1% of estimated abundance represented a reasonable and precautionary level beyond which to be concerned about the sustainability of [by-catch]" (Anon 1996[272]).

Other figures might be derived if other conservation objectives were defined. Such objectives might be more conservative – aiming to keep the numbers of animals closer to the carrying capacity than 60% or 80%, but could also include less conservative goals, such as maintaining the population above some lower value in relation to carrying capacity. In the absence of any clearly stated management goal for the Black Sea or for the European Union, we will proceed using the four mortality or by-catch limits described above: 1%, 2% and 1.7% of the best estimate of abundance, and the PBR, which has the added benefit of taking account of some of the uncertainty involved in these calculations.

6.2.2. Black Sea estimates by-catch limits

Table 6.9 gives the abundance estimates for the Western Black Sea for each of the three cetacean species surveyed, their associated CVs, and the four mortality limits these estimates imply.

Estimates were also calculated for the Black Sea as whole (412, 000km^2) but as these rough estimates have been extrapolated on the basis of one opportunistic ferry track, the results have not been included. As an example however, from these extrapolations, if 65,000 harbour porpoise are assumed to exist in the Black Sea, then the 1% IWC limit would be 650 animals per year. There are no CVs associated with any of the estimates obtained for the entire Black Sea and a PBR calculation is therefore not feasible.

[271] *Anonymous 2000. Annex O. report of the IWC-ASCOBANS Working Group on Harbour Porpoises. Journal of Cetacean Research and Management 2 (Suppl.) p297-305.*

[272] *Anonymous, 1996. Report of the Scientific Committee. Forty Sixth Report of the International Whaling Commission. Cambridge. p89.*

Table 6.9 By-catch take limits for the three small cetacean species in the Black Sea

Western Black Sea 'Distance Survey' Estimates – 120,000 km^2			
Species	**Harbour porpoise**	**Bottlenose dolphin**	**Common dolphin**
Abundance estimate	29465	26462	60400
Coefficient of Variation	0.211	0.196	0.154
PBR based limit	247	225	513
1% Limit (IWC)	295	265	604
1.7% Limit (ASCOBANS)	501	450	1027
2% Limit (IWC)	589	529	1208

The PBR calculation is the most conservative, as it takes into account uncertainty and addresses a management goal that is to be achieved with a specified level of certainty. More relaxed assumptions underpinning the other methods lead to larger by-catch limits.

We can now ask several possible questions about current by-catch levels.

With good information we might ask what the current by-catch levels are and whether or not they exceed one or more of these limits, and with what probability.

With less good information (i.e. a lack of representative observer coverage of the fleets concerned) we can at least ask either: does it seem likely that by-catch totals could exceed these limits? Or conversely: does it seem feasible that current by-catch levels are below any of these limits?

6.3. By-catch totals for the Black Sea

From preceding sections we can make some estimate of the likely total by-catch of cetaceans by combining estimates by-catch rates (numbers per unit of effort) with estimates of total fishing effort. An initial problem is to find a common effort metric that is available in both data sets.

Among the trips that were specifically observed to monitor by-catch we have generated estimates of by-catch rate by (1) observed trip, (2) observed haul, (3) net length and (4) by fishing effort (length x soak time). By-catch rates estimates are not available for all of these metrics for all countries, and are most comprehensive for estimates of by-catch *per haul*.

Among the observed trips, porpoise by-catch rates ranged from 1.9 to 4.2 porpoises per trip, from 0.8 to 10.4 porpoises per haul, 1.2 to 3.3 porpoises per km of net hauled and 0.16 to 0.24 animals per net km day fished.

Rather different and much lower estimates of by-catch rates are derived from the interview surveys, where the overall mean stated by-catch rates for the turbot fishery (highest stated rates) are around 4 animals per year per boat. In these cases we have numbers of animals *per boat per year*, and would need to use the interview data to further estimate the number of trips by métier per year, the number of hauls per trip, mean lengths of net used per haul and the total amounts of effort per boat per years.

Effort for the fleets has been discussed above. We have tabulated 5 estimates of fishing effort for the turbot fishery, and using further results from the interview surveys. Effort is given in terms of (1) the

number boats operating; (2) the number of trips per year (see footnote[273]); (3) the number of hauls per year (as number of strings of nets reported in the survey x the number of trips); (4) the amount of hauled km of netting (number of hauls x mean length of nets hauled by country) per year and (5) the fished km.days (hauled km x the average soak time by country as reported in the surveys). We have tabulated the average of each of these four parameters for each of the four countries based on the interview survey results relating just to boats using turbot nets. Because these statistics are generated by the survey data they are likely to be very imprecise. There is no easy way to estimate the error in such statistics, but misunderstandings in the interviews can easily lead to large cascading errors as total effort figures are generated by multiplying up net numbers, mean net lengths, days fished etc., so that biases are easily introduced.

We can then apply both the *observed by-catch rates* (Section 6.1.1, Table 6.2) and the *stated by-catch rates* per boat per year from the fishermen's survey to these estimates of total fishing effort and total numbers of turbot net boats by country. Note that we cannot easily generate estimates of by-catch per unit effort from the survey data, and there would be little point in so doing.

6.3.1. By-catch totals for the turbot fishery

Table 6.10 Estimated vessel numbers, fishing effort, stated by-catch rates and possible by-catch totals from the fishermen's survey for the turbot gillnet fishery (GNS_DEF_>280) alone.

Country	No of boats	No of trips	No of hauls	Km of net hauled	Km.days of effort	Stated porpoise by-catch per boat / year	Stated dolphin by-catch per boat / year	Potential Porpoise by-catch per year	Potential Dolphin by-catch per year
Ukraine	543	16,154	96,926	760,865	3,660,110	2.83	2.23	1539	1211
Romania	118	2,931	12,777	95,824	716,058	2.71	0.00	320	0
Bulgaria	812	8,088	76,263	945,662	13,398,754	3.71	2.33	3016	1895
Turkey	1119	7,553	26,856	306,158	3,348,608	5.79	4.02	6477	4500
Totals	2592	34,726	212,821	2,108,510	21,123,528	-	-	11351	7606

It should be immediately clear by comparing the *observed by-catch rates* for turbot nets in Table 6.2 with the estimates of effort from the fishermen's survey shown above that the results of the two sets of surveys are not compatible with what we know about cetacean abundance from the sightings surveys conducted during this project.

Observed by-catch rates of porpoises by country ranged from 1.9 to 4.2 animals *per trip*; even using the lowest observed value of 1.9 animals per trip suggests an annual take of 66,000 animals in the

[273] *Some adjustments were needed to interpret the original data: the number of trips per year was estimated from the soak time, the number of trips reported per month and the number of months fished for each vessel. Mean soak time was around 10 days – so if the stated soaktime in days multiplied by the number of stated trips per month exceeded 30, it was assumed the number of trips per month was 30 divided by the soak time – e.g. a soaktime of 10 days implies a maximum of three trips per month. Where more reasonable numbers of days fished per month were given, these were used to estimate number of trips per month.*

Black Sea overall, greater than the estimated population size. If the estimates of by-catch rates per haul, per km of net or per km.day of effort are used, then minimum porpoise by-catch totals would be in the hundreds of thousands or millions per year, two or three orders of magnitude greater than conceivable. Clearly these observed by-catch rates cannot be representative of the real situation, and there must be some unexplained bias in the observations.

By-catch rates derived from the fishermen's survey also suggest some very high by-catch levels overall. Our estimates of the numbers of boats involved in the turbot fishery alone (around 2600 in the Black Sea in total) coupled with the stated by-catch per boat per year from the 440 vessels interviewed, suggests a total of over 11,000 porpoises and over 7,000 dolphins caught per year in this fishery alone. Both these total may be over-estimates because of the difficulty in species identification noted above.

6.3.2. By-catch totals for other métiers reported in the fishermen's survey

Certain other fisheries may be responsible for similar porpoise by-catch totals per year. In Table 6.11 we have summarised the mean stated by-catch rate per boat by métier and country (stratum) for each métier where a positive by-catch rate was recorded. There are 5 such strata that include other gillnets, purse seiners and a mid-water trawl fishery.

Table 6.11 Indicative by-catch totals for other gears where by-catch was reported

Other métiers:	Country	No. of vessels	Porpoises	Dolphins	Porpoises	Dolphins
GNS_DEF_<150	Ukraine	474	0.25	2.27	119	1076
GNS_DEF_<150	Turkey	3148	3.11	1.62	9799	5104
PS_SPF_<14/14-60	Ukraine	21	1.15	1.00	24	21
PS_SPF_<14/14-60	Turkey	395	2.71	0.56	1070	220
OTM_SPF	Ukraine	49	0.50	1.38	25	68
TOTALS					11037	6489

Again our estimates of fleet size and the stated by-catch rates suggest that over 11,000 porpoises are taken annually in Turkey and the Ukraine mainly by other types of gillnets and by purse seiners.

The experts in the Turkish national team suspect that by-catch rates estimated for Turkish GNS and PS are too high. Improving the confidence in the estimates would require quantitative data through independent observation of fisheries where by-catch is a realistic occurrence.

These very crude estimates suggest that the total number of porpoises taken per year may be in excess of 20,000 (this may include some dolphins) and the total number of dolphins taken per year may be around 14,000 animals. These totals of course do not address any potential by-catches in Russia or Georgia.

Ideally we would use bootstrap by-catch rates from the survey data to generate estimates with Confidence Limits, but in the present context this would imply a totally spurious level of certainty in these estimates, which are crude, imprecise and probably biased. They are intended as 'ballpark estimates', but they also address a more general question which is whether existing data suggest that cetacean by-catch rates *are likely to exceed* conservation limits as described in section 6.2.1 above. Clearly they do.

6.4. Significance of estimated by-catch totals

Section 6.3 provides an overview of how cetacean by-catch limits have been calculated for other sea areas, and with differing conservation objectives. Conservation objectives remain undefined in the Black Sea as a whole, but if we take the existing metrics, then the least conservative goals are that by-catch should not exceed 1300 porpoises per year, 1740 bottlenose dolphins or 5860 common dolphins. Based on the available data it would be very difficult to not to conclude that porpoise by-catch rates are an order of magnitude greater than this threshold. Totals for dolphins may not exceed their limits to quite the same degree, depending on the species breakdown among the reported by-catches. Bottlenose dolphins appear (from the observed fishery hauls) to be more frequently caught than common dolphins, which is consistent with their more coastal distribution compared with common dolphins. It is possible therefore that among a crudely estimated 14,000 dolphins taken as by-catch, the majority may be bottlenose dolphins, and their total is therefore likely to exceed the 1740 limit by several-fold.

The reliability of these estimates can well be brought into question. In most circumstances it is recognised that on board observer schemes are required to obtain robust estimates of by-catch rates. Such observer schemes however, must sample the fleets in a representative manner, and it is clear from the very limited observations that have been made so far in the Black Sea that reported observations must have been very far from representative of overall fishing activity. This does not detract from the fact that the observations in each of the four countries concerned did yield some alarmingly high by-catch rates.

Interview surveys are usually regarded as a 'stop-gap' measure to provide an initial overview of likely by-catch rates. This survey has served that function; but whereas we might have expected self-reported rates to be biased low, the stated rates suggest total by-catches that are very much higher than the conservation limits we have elaborated.

There are several issues to consider with regard to our estimates from the interview surveys and their implications for cetacean conservation in the Black Sea.

The survey results may be biased high, but we can see no obvious reason why this might be the case. There were no extreme outliers among the stated by-catch rates that might have biased the overall totals, and the implied by-catch rates derived from asking the date of the most recent capture were roughly consistent with the stated rates.

A more significant problem may relate to our estimates of the numbers of boats operating in the Black Sea. We used official statistics to provide estimates of the total number of boats of certain categories, but these may over-represent the totals. Even so, when one considers the reported scale of illegal fishing for turbot in the Black Sea, a figure of close to 2,600 boats does not seem unreasonable, whereas a figure of 260 boats which would reduce the estimated by-catch to 1100 animals, more consistent with the conservation limit, does seem unreasonably low.

It is hard therefore not to conclude that the by-catch of porpoises in the Black Sea must be well in excess of the conservation limits that we have elaborated.

The limits are based principally on the abundance estimates and on assumptions about the potential rate of population increase of these animals. The abundance estimates – though very crude for the Black Sea as a whole – are consistent with expectations of animal density from other areas, in areas where these species are reasonable abundant rather than in areas where they have been depleted.

The fact that the fisheries that we have described have been in existence in the Black Sea for decades leads one to question the degree of vulnerability of the populations concerned. Prior to the cessation of commercial hunting in the Black Sea in 1983 (see Section 3) hundreds of thousands if not millions

of cetaceans had been removed from the Black Sea during the 20th century. Figures provided in Section 3 indicate that removals for all three species combined totalled 22,080 per year for Bulgaria between 1947 and 1961, 250 per year in Romania between 1955 and 1963, 44,500 for the Soviet Union between 1931 and 1957 and 67,254 per year for Turkey between 1953 and 1982. It is assumed that the population of porpoises in particular which formed the bulk of the commercial harvest in Turkey, were likely depleted by this level of removal. The extent to which ongoing unintentional 'harvests' of over 20,000 porpoises per year may now be impeding recovery, or may have enabled recovery, is therefore a moot question.

The results of these surveys are of concern in that it is clear that large numbers of cetaceans seem to be subject to incidental capture in several fisheries, but predominantly in the gillnet fishery for turbot. But the results are hard to reconcile with the estimates of population sizes and with our preconceptions of possible conservation limits.

Further work is needed in three areas:

1) On understanding the population dynamics and distributional ecology of these animals in the Black Sea to better understand their conservation needs and resilience.
2) More reliable estimates of by-catch rates through properly designed and representative by-catch monitoring programmes throughout the basin.
3) Better information on the fleet structure and fishing effort by all the fleets operating in the Black Sea, but particularly the small scale fisheries that are using gillnets and especially those fishing legally and illegally for turbot.

The last of these three points is probably the most urgent, as arguably this is the sources of most of the uncertainty over the current levels of by-catch.

6.5. Illegal, unreported and unregulated fishing and its adverse impacts on cetaceans in the Black Sea

6.5.1. Introduction

IUU is defined as Illegal Unregulated and Unreported reported fishing activity. Illegal fishing takes place where vessels operate in violation of the laws governing that fishery, unregulated fishing generally refers to fishing by vessels with no nationality, or vessels flying the flag of a country that is not party to the regional organisation governing that fishing area or species, and unreported fishing is fishing that has been unreported or misreported to the relevant national authority or regional organisation, in contravention of applicable laws and regulations.

The driver behind illegal, unreported and unregulated (IUU) fishing is clear, there is a strong economic incentive. Many species of fish, particularly those that have been over exploited, are in short supply, and are therefore of high value. IUU activity may give a high rate of return in fisheries which are not adequately regulated, or where enforcement is insufficient to prove a deterrent. An example of particular relevance in the context of this project are the Black Sea turbot (*Scophthalmus maeoticus*) fisheries, harvested by bottom set gillnets and bottom trawls. Other prime target species of IUU in the Black Sea are anchovy in the eastern Black Sea and sturgeon in the western Black Sea274.

The issue of IUU has a close bearing upon the issue of cetacean by-catch as reported estimates of fishing effort and associated by-catch rates will inevitably be underestimated. 'Ghost fishing' - where illegal nets have been abandoned (due to fishermen fleeing from coast guard sightings) and have sunk

to the seabed or have been washed ashore, are also a great risk to cetaceans. IUU also has several socio-economic and environmental ramifications. Legal fishermen experience unfair competition, a loss of income and tax revenue, and the Black Sea environment becomes less diverse through the loss of major fish stocks and of top predators through by-catch.

This section summaries the estimated extent of IUU in Romania, Bulgaria, Turkey and Ukraine and examines possible solutions to reducing the problem.

6.5.2. Estimated extent of IUU in Black Sea countries

In this study, in an attempt to quantify one aspect of IUU in the Black Sea, an acoustic search for gill-nets set for turbot by means of conventional echo depth-sounder was conducted. These areas coincided with known fishing grounds used for the turbot fishery. However, limited turbot nets were discovered during the period of sampling and this was attributed to sampling in the wrong season.

This study has revealed however that the turbot closed season (15th April to the 15th June every year) is not enforced. From the fishermen's survey almost all fishing vessels reported to fish in May, and some also in March and June, strongly suggesting that illegal activity is prevalent in all fishing fleets. The closed season for turbot falls exactly at the time of spawning and the fish are the easiest to catch at this time.

As IUU activities are by definition, unreported, the level of this activity is difficult to quantify and there is heavy reliance upon expert opinion. The 'Joint GFCM-BSC Workshop on IUU Fishing in the Black Sea' has provided much of the information presented in this section[274] and relates to the main threat to cetacean by-catch – the turbot fisheries.

6.5.2.1. Bulgaria

In Bulgaria, only 7 instances of IUU were reported between 1997 and 2008 for turbot but the number is likely to be much higher considering IUU fishing practice seems to continue all year round in Bulgarian waters. In 2012, it was estimated that 3300 kg of turbot and 20684 kg of other species were illegally caught. Estimated revenues of these IUU products come to 287 808 Bulgarian levs, or 147 154 Euros274.

6.5.2.2. Romania

9 instances of IUU were reported in Romania between 2007 and 2011, mostly from Turkish-flagged vessels. The main target species of these illegal fisheries is turbot, in spring and autumn, in the Romanian EEZ at 45-80m depths, close to the EEZ borders of Ukraine and Turkey274 .

6.5.2.3. Turkey

As Turkey makes up almost 90% of number of fishing vessels in the Black Sea, its illegal fishery is by far the greatest threat to cetaceans. It was reported that due to sturgeon and turbot fishing about

[274] *Ozturk, B (2013). Joint GFCM-BSC Workshop on IUU Fishing in the Black Sea. The nature and extent of the illegal, unreported and unregulated (IUU) fishing in the Black Sea. Available: http://151.1.154.86/GfcmWebSite/GFCM-BSC/2013/IUU%20BackgroundPaper-rev.pdf [Accessed 04.11.2014].*

2000-3000 dolphins (mostly harbour porpoises) are entangled in nets in the Turkish part of the Black Sea every year[275].

At a GFCM workshop, representatives from each country gave their view of IUU in their waters and frequent reference was made to Turkish fishing vessels. It is estimated that Turkish fishermen under report up to 40% of their catch, although there is no official monitoring to verify this estimation[274]. In 2012, 7287 violations were detected, 823 tons of product seized, 134 licenses revoked and over 4,400,000 Euros in fines were paid. The high value and increasing demand for turbot has been a driver for Turkish fishermen to poach in other countries' EEZs[274]. Between 1992 and 2012, 59 cases of IUU beyond the Turkish EEZ have been reported[274].

In the territorial waters, most of the IUU fishing activities are observed both in open and closed fishing seasons (as highlighted by the fishermen's survey), with the most common IUU fishing activities being a violation of minimum catch size and usage of illegal fishing gear in the summer months[274].

6.5.2.4. Ukraine

Between 1992 and 2012, 20 IUU cases were reported, all from Turkish vessels. Illegal activity is common in the northwestern part of the Black Sea and around the Kerch Strait, for bottom set turbot gillnet fisheries in the spring. In 2005, it was estimated that 800 tons of turbot were caught illegally; this is 7 times higher than the official landing totals for the country[274].

6.5.3. Future approaches

Currently several regulations are in place relating to IUU in the Black Sea. In Turkey, fisheries law 1380 regulates the fishery and in 2012, 134 boats had their licenses withdrawn due to violations[274]. In Bulgaria and Romania, the EU's control regulation 1224/2009, IUU regulation 1005/2008 and Fishing Authorization Regulation 1006/2008 are relevant. Ukraine has legal measures in place with penalties of fines, and confiscation of boat, gear and catch. All riparian countries are members of the Black Sea Commission. Turkey Romania and Bulgaria are members of the GFCM. Bulgaria, Romania and Ukraine are parties to ACCOBAMS with Turkey expected to join soon[274].

Despite these regulations IUU appears to remain prevalent in the Black Sea and several options have been proposed to combat the problem[274]:

- Zero tolerance policy to IUU
- If discovered illegally fishing, a life-long annulment of fishing licence and confiscation of vessel might be introduced
- Reinforced MCS for the control of the fishing fleet including through VMS whilst at the same time noting that measures need to include small scale and artisanal fisheries.
- Fishery observer programs need to be implemented
- Improved market control and traceability is required. Any deterrent system to fight IUU fishing would have to ensure that controls are in place from net to plate.
- A database of IUU fishing in the region should be set up
- VMS for all riparian countries should be mandatory
- There should be cooperative efforts to standardise fisheries data

[275] *Öztürk, B. 1998. Black Sea Biological Diversity, Turkey. Black Sea Environmental Series Vol. 9, UN Publication, New York.*

- A network of marine protected areas with particular relevance to turbot fishing grounds and cetacean habitats should be established
- The promotion and financing of turbot production by aquaculture should be considered to take pressure off the depleted stocks – the main driver of IUU in the Black Sea.

7. A strategy for improving cetacean conservation in the Black Sea

7.1. Existing conservation strategies for cetacean in the black Sea

Conservation of cetaceans in The Black Sea has previously been considered under ACCOBAMS and the Black Sea Commission. Indeed Dr. Alexei Birkun has previously drafted 'A Conservation Plan for Black Sea Cetaceans' under the auspices of ACCOBAMS and the Black Sea Commission[276]. Additionally a 'Protocol for data collection on by-catch and depredation in the ACCOBAMS Region' was also developed under ACCOBAMS by Dr. Simon Northridge (University of St Andrews, UK), in cooperation with Dr. Caterina Fortuna (ISPRA, Italy)304.

One of the ACCOBAMS conservation plans, from 2006, is summarised below:[276]

Actions	Activities (sub-actions)
1 Broadening the ACCOBAMS scope	**(a)** promotion of accession of the Russian Federation and Turkey to ACCOBAMS
2 Proper conservation status of cetacean populations	**(a)** proper listing Black Sea cetaceans in the IUCN Red List of Threatened Animals **(b)** providing correct references to the IUCN status of Black Sea cetaceans in relevant international instruments
3 Cetacean conservation approach in fishery regulations	**(a)** adopting the Black Sea legally binding document for fisheries and conservation of marine living resources
4 Improvement and harmonization of national legislation	**(a)** improvement of national legislation in respect of international requirements on the conservation of cetaceans
6 Strategy for reducing cetacean bycatches	**(a)** establishment of a regional bycatch network URG **(b)** estimation of bycatch levels and temporal and geographical distribution of bycatches **(c)** evaluation of sustainable bycatch levels for each cetacean species **(d)** investigation of effects causing by mitigation measures includig pingers and acoustically reflective nets **(f)** developing management objectives for reducing bycatches in the Black Sea region
8 Elimination of live capture of Black Sea cetaceans	**(a)** improvement of control assigned to eliminate live capture of cetaceans **(b)** preparation and adoption of national legal acts banning any intentonal capture of Black Sea cetaceans
11 Network of existing protected areas eligible for cetaceans	**(a)** assessment of existing protected areas with regard to their relevance to cetacean conservation **(b)** developing the regional network of eligible protected areas URG **(c)** preparation of the network's cetaceans-oriented strategy, action plan and guidelines **(d)** protected areas involved in the network should restrain human activities potentially harmful for cetaceans
12 Special marine protected areas for cetacean conservation	**(a)** developing management plans and creating *ad hoc* marine protection areas in the defined localities
13 Basic cetacean surveys	**(a)** carrying out region-wide survey and assessment of cetacean abundance, distribution and hot spots URG **(b)** carrying out cetacean survey in the Turkish Straits System
15 Regional cetacean stranding network	**(a)** developing the existing national CSNs with their functional fusion into the basin-wide network URG **(b)** developing a Black Sea regional database of cetacean strandings **(c)** establishing cetacean tissue bank(s) accumulating samples from stranded and bycaught cetaceans **(d)** multidisciplinary study of samples collected from stranded and bycaught animals
18 Measures for responding to emergency situations	**(a)** assessment of emergency situations demanding special response (e.g. rescue-and-release operations) **(b)** developing guidelines on how to respond to emergency situations affecting Black Sea cetaceans **(c)** developing regional strategy (contingency plan) and national teams for responding to emergency situations

Figure 7.1 Conservation Plan for Black Sea Cetaceans: Actions and activities of high priority URG – activities addressed as a matter of urgency (Istanbul Round Table, May 2006)[276].

These priorities still stand, and while progress has been made in addressing some of them, the present study highlights the need for development of a strategy for reducing cetacean by-catches as the single most important overarching action. Several of the other actions listed in Table 8.1 can in fact be seen as parts of such a strategy. The focus of our work here is therefore to develop the outline of a

[276] *Birkun A., Jr., Cañadas A., Donovan G., Holcer D., Lauriano G., Notarbartolo di Sciara G., Panigada S., Radu G., and van Klaveren M.-C. 2006. Conservation Plan for Black Sea Cetaceans. ACCOBAMS, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area. 50 pp. http://www.disciara.org/documents/Birkun_etal_2006.pdf*

conservation strategy that addresses the issue of cetacean by-catch. While we do not exclude the importance of some of the other related actions, we would prefer to see these as augmenting a strategy to address cetacean by-catch which is clearly the most significant concern in the region.

To develop such a strategy we consider below potential mitigation measures as well as other aspects of management required for a successful by-catch reduction action plan.

7.2. Global review of methods to mitigate cetacean by-catch in fisheries

Any mitigation measures proposed for the Black Sea will likely rely on existing methods for reducing or preventing cetacean by-catch in different fisheries. A summarised review of these methods, including their advantages and disadvantages, is presented below in Table 7.1. Considering the approaches presented in Table 7.1, the key objective is to reduce cetacean by-catch (the conservation perspective) without decreasing profitability and practicability for fishermen (the social and economic perspective). Naturally, there is no single approach that will achieve this and any successful adoption of measures in the fisheries concerned will likely rely on strategies that consider effort limitation, technical change and additional measures.

As a crude example, effort limitations (1) and technical innovations (2) alone all involve various restrictions on fishery practice, which are likely to cause the greatest reductions in profitability and total catch for fishermen. These measures also suffer the potential problem of 'unintended consequences', whereby limitations in one area or aspect of the fishery could result in an increased effort in others, causing further by-catch problems. This is where additional measures (3) might be incorporated as they are designed to work with existing gear types and levels of fishing effort without impacting fish catches. Typically this involves changing the details of how the gear is used, or making some technical innovation in the fishing gear. This may provide more of an incentive to fishermen to adopt newly proposed measures, providing the costs of installation and maintenance are not too high.

Table 7.2 Summary of potential Cetacean By-catch Mitigation Measures with Positives and Negatives aspects.

Mitigation Measure	Description	Known Examples	Positives	Negatives
1. Effort Limitations				
Fishery bans	The general prohibition of a specific fishery – most usually legally defined by a combination of gear characteristics and geographical area.	1. UN moratorium on use of large-scale pelagic gillnets on the high seas. EU Lists of species included for which it is illegal to land. 2. US ban of pelagic pair trawls in NE Atlantic for tuna and swordfish 3. Prohibition on driftnet fishing in the Baltic for EU member states 4. UK ban of pelagic pair trawls fishing for European sea bass in a specific area. 5. Ireland & Norway ban of driftnet fishing for salmon in coastal waters. 6. Prohibition of carriage & use of monofilament gillnets - Scotland	1. Successful if applied to fewer vessels/ small fisheries with high by-catch rates – political 'fallout' is reduced. 2. Successful if the enforcing state has the ability to ensure compliance / the area is well policed. 3. Successful if legislation is carefully drafted	1. Enforcement of moratoria by RFMOs in certain areas may be weak. Banning fisheries on wide scales is problematic as probability of detection is low. 2. Politically unacceptable if many people derive livelihood from fishery 3. May have an unacceptably large impact on fishery yields.

Fishing effort limitations	A limit imposed on the amount of fishing allowed. Can apply to the amounts of gear allowed per boat (e.g. length of nets), or can reflect the number of days fished by the fleet overall.	1. UN moratorium on use of large-scale pelagic gillnets on the high seas, including the restriction on nets >2.5km long. 2. US Mid-Atlantic Bight pelagic long line sets limited to 20nm upper limit on mainline length[277]. 3. US Mid-Atlantic selected gillnet fisheries have limits on the number of net panels & total float line length they can deploy[278]. 4. Effort caps in NZ arrow squid trawl fishery: when by-catch ceiling of sea lions is reached, the season is terminated.	1. Effort caps with by-catch limits may be more successful.	1. Effort caps only compatible with small sized fleets and requires good level of observer coverage.
Specific time or area based closures	This may involve an area with a known high by-catch rate that is closed off for a specified period of time.	1. US Mid-Atlantic selected gillnet fisheries have time area restrictions. 2. US Gulf of Maine gillnetting closed for 1-8 months in high risk by-catch areas, at specific times	1. Successful if closed areas are for animals with a restricted range (to cover a significant proportion of the population).	1. Times and areas of closures are subject to significant modification over the years of introduction.

[277] *NMFS (2009). Federal Register / Vol. 74, No. 95 / Tuesday, May 19, 2009 / Rules and Regulations. [Online]. Available: http://www.nmfs.noaa.gov/pr/pdfs/fr/fr74-23349.pdf [Accessed 20/08.2014].*

[278] *NOAA (2010). Harbour Porpoise Take Reduction Plan: Mid-Atlantic. [Online]. Available: http://www.nero.noaa.gov/prot_res/porptrp/doc/HPTRPMidAtlanticGuide_Feb%202010.pdf [Accessed 20.08.2014].*

		of year. Some areas allow gillnet use if pingers are added279. 3. Closed areas to fishing in NZ to protect Hectors dolphins. 4. Gillnet ban over stretch of Mekong River in Cambodia to protect population of dolphin occurring at high density in this zone[280.]	2. Successful if area represents a zone of high by-catch rates ('hot-spot') 3. Successful if 'hot-spot' does is covered by the area closure, year after year.	2. Often areas are too small to prevent continued population decline.[281] 3. Much information about a population distribution or the spatial aspects of by-catch rates is needed.
2. Specifications for design and use of gears				
Modification of particular aspects of gear design or use	Banning, for example a particular mesh size or fishing practice that is harmful to cetaceans (e.g. banning setting purse seines around dolphins), or only allowing a particular	1. Ban on night time use of medium mesh gillnets in North Carolina for specific time period to minimise Bottlenose Dolphin by-catch[282.]	1. Successful if used in conjunction with seasonal or spatial restrictions on fishing effort	1. Much information and research is required on the technical aspects of the gear design and usage. 2. Gear may become less effective in catching original target species. 3. Hard to design gear types to reduce cetacean by-catch as process

[279] *NOAA. Harbour Porpoise Take Reduction Plan Homepage. [Online]. Available: http://www.greateratlantic.fisheries.noaa.gov/protected/porptrp/ [Accessed 20.08.2-14].*

[280] *France-Presse, A (2012). Cambodia creates safe zones for Mekong dolphins (article). [Online]. Available: http://www.mnn.com/earth-matters/animals/stories/cambodia-creates-safe-zones-for-mekong-dolphins [Accessed 20.08.2014].*

[281] *Rayment, W., Clement, D., Dawson, S., Slooten, E., & Secchi, E. (2011). Distribution of Hector's dolphin (Cephalorhynchus hectori) off the west coast, South Island, New Zealand, with implications for the management of by-catch. Marine Mammal Science, 27(2), 398–420. doi:10.1111/j.1748-7692.2010.00407.x*

[282] *Federal Register (2012). Taking of Marine Mammals Incidental to Commercial Fishing Operations; Bottlenose Dolphin Take Reduction Plan. [Online]/ Available: https://www.federalregister.gov/articles/2012/04/12/2012-8770/taking-of-marine-mammals-incidental-to-commercial-fishing-operations-bottlenose-dolphin-take#h-9 [Accessed 20.08.2014].*

	mesh size/ aspect of gear type.	2. Minimum twine diameters (0.9mm) US Mid-Atlantic selected gillnet fisheries278		of by-catch and selectivity is not fully understood.
Switch to alternative gear	Encouraging a switch to an alternative gear (e.g. the adoption of hand lining instead of gillnetting)	1. The replacement of gillnets with hand lines in Argentina (now a gillnet fishery again)[283] 2. Sweden and Germany cod trap fishery to replace gillnet fishery (under development).	1. A more positive approach than simply banning a gear type.	As above. 1. May require persuasion that it is a better option, needs to be economically and socially viable. 2. Catch compositions and volumes change 3. Hand lines require more work than gillnets
3. Additional Measures				
Acoustic deterrent devices (ADDs), i.e. Pingers.	Small battery powered ADDs create electrically generated aversive noises that may deter cetaceans from approaching fishing gear.	1. US Mid-Atlantic selected gillnet fisheries use pingers. 2. Many trials in Europe and the US.	1. Trials in N. America and Europe have shown significant (generally >90%) reduction in porpoise by-catch using different devices284, under experimental conditions.	1. Less effective when deployed in commercial fisheries[284] due to reduced frequency of device checking when compared to experimental work. 2. Expensive for fishermen: boats with long nets need many. Issues

[283] *Bordino, P. (2008). By-catch Mitigation of Franciscana Dolphins Pontoporia blainvillei in Argentina. Presentation to the 2008 annual meeting of the Consortium for Wildlife By-catch Reduction, Boston. [Online]. Available: http://www.neaq.org/conservation_and_research/projects/fisheries_by-catch_aquaculture/by-catch/consortium_for_wildlife_by-catch_reduction/annual_meetings/2008/bordino.pdf [Accessed 21.08.2014].*

[284] *Dawson, S., Northridge, S., Waples, D., & Read, A. (2012). To ping or not to ping; the use of active acoustic devices in mitigating interactions between small cetaceans and gillnet fisheries. Endangered Species Research. doi:10.3354/esr00464.*

			2. Tests have shown no reduction in fish catch from the nets that use them. 3. May be successful if compliance and enforcement are of high importance.	with time, crew safety, efficient net deployment[285,287] and maintenance. 3. High rates of pinger failure[286] 4. Often not used properly. 5. May not be as effective for bottlenose dolphin284. 6. Faulty pingers or partially equipped nets may attract animals284 7. Widespread and uncontrolled use may displace cetaceans from foraging grounds or prevent access to sites of biological importance[287]

[285] *Larsen, F 2004, A note on improving the mechanism of pinger attachment for the Danish North Sea gillnet fishery. Journal of Cetacean Research and Management, **6**, no. 2, pp. 147-150.*

[286] *Morizur Y, Le Niliot P, Buanic M, Pianalto S (2009) Expérimentations de répulsifs acoustiques commerciaux sur les filets fixes à baudroies en mer d ' Iroise. IFREMER. Retrieved from http://archimer.ifremer.fr/doc/00000/6864/*

[287] *Kingston, A. and S Northridge, 2011. Extension trial of an acoustic deterrent system to minimise dolphin and porpoise by-catch in gill and tangle net fisheries. Report to the Marine Management Organisation. Fisheries Challenge Fund. [Online]. Available: https://risweb.st-andrews.ac.uk/portal/en/researchoutput/extension-trial-of-an-acoustic-deterrent-system-to-minimise-dolphin-and-porpoise-by-catch-in-gill-and-tangle-net-fisheries(32906d7d-3320-49a8-82da-b2dcb9810658).html [Accessed 21.08.2014].*

Reflective/stiff nets	The addition of metal filler compounds (barium sulphate) to nylon twine to increase its acoustic reflectivity.	Initial study in Canada suggested porpoise and seabird by-catch could be reduced288	Would be a simple switch of gear material with little additional expense, so not interfering with fishing practice	1. Trials were not consistently effective in reducing by-catch[288,]290[,289,] 2. Method assumes by-catch is a result of cetacean sensory deficiency. 3. Trials where by-catch was reduced288[,290] may be to do with another aspect of a change in net behaviour, rather than a change in
Escape hatches	Can be used in trawl nets.	1. UK escape hatch trials in pelagic trawl fisheries for European bass[291]	1. Some dolphins did escape trawls through hatches291.	2. Method not yet fully developed – trials ongoing but sample sizes are too small292[,293.]

[288] *Trippel EA, Holy NL, Palka DL, Shepherd TD, Melvin GD, Terhune JM (2003) Nylon barium sulphate gillnet reduces porpoise and seabird mortality. Marine Mammal Science* ***19****:240-243.*

[289] *Bordino P., Mackay A.I., Werner T.B., Northridge S.P., Read A.J., 2013. Franciscana by-catch is not reduced by acoustically reflective or physically stiffened gillnets. Endangered Species Res 21:1-12*

[290] *Larsen F, Eigaard OR, Tougaard J (2007) Reduction of harbour porpoise Phocoena phocoena by-catch by iron-oxide gillnets. Fisheries Research* ***85****:270-2787).*

[291] *Northridge, S., Kingston, A., Murphy, S., and A. Mackay. 2008. Monitoring, Impact and Assessment of Marine Mammal By-catch. Final Report to Defra. Project MF0736. August 2008. 28pp + Annexes.*

[293]*Dotson, R. C., Griffith, D. A., King, D. L., & Emmett, R. L. (2010). Evaluation of a marine mammal excluder device (MMED) for a Nordic 264 mid-water rope trawl. NOAA-TM-NMFS-SWFSC-455 (p. 19). [Online]. Available: http://docs.lib.noaa.gov/noaa_documents/NMFS/SWFSC/TM_NMFS_SWFSC/NOAA-TM-NMFS-SWFSC-455.pdf [Accessed 21.08.2014].*

		2. Trials in Australia and US for pelagic trawl fisheries[292]		
Changes in fishing behaviour	The backdown procedure, used in the Eastern Tropical Pacific tuna purse seine fishery, where dolphins are deliberately encircled as an aid to catching tuna, are released during the lowering of the float line.	1. Eastern Tropical Pacific tuna purse seine fishery. 2. Dutch mid-water trawlers do not discard during net haul[294]. 3. Turning off of sonar equipment before haul in Scotland.	1. Changes have resulted in dramatic decreases in dolphin mortalities[295] 2. Fish catch is not reduced 3. Devised by fishermen involved and pursued by the relevant management authority 4. Sonar switch off virtually eliminated by-catch events.	1. Success of timed discarding untested. 2. Unclear why sonar switch off worked. 3. Need detailed knowledge about and observation of a fishery as each is unique. Methods may not work universally. No comparable changes in fishing behaviour that have resulted in reduced by-catch in gillnet fisheries.
Weak links	Sinking lines used on the upper ends of buoy lines between pots and traps to ensure free floating lines do not pose a risk of entanglement to cetaceans.	1. US Atlantic Large Whale Take Reduction Plan - sinking lines used in the lobster pot fisheries.	1. Catches are not reduced	1. Fishing is less convenient for fishermen and fishing gear may be damaged during hauls. 2. No evidence that they are effective in limiting entanglements.

[292] *Lyle, J. M. ., & Willcox, S. T. . (2008). Dolphin and seal interactions with mid-water trawling in the commonwealth small pelagic fishery , including an assessment of by-catch mitigation strategies (p. 49). Australian Fisheries Management Authority. [Online]. Available: http://www.imas.utas.edu.au/__data/assets/pdf_file/0005/149648/R05_0996_Final-Rep.pdf [Accessed 21.08.2014].*

[294] *Simon Northridge personal communication with A.S. Couperus.*

[295] *AIDCP Dolphin Safe. Description of method. [Online]. Available: http://www.iattc.org/DolphinSafeENG.htm [Accessed 20.08.2014].*

Tie downs	Float lines fitted with a strop attached to the lead line, which makes the net form a bag underwater and keeps the profile close to the seabed.	1. US tie downs used in flatfish nets to protect harbour porpoises.	Simple measure that does not impact flatfish catch rates.	May affect some target species catch rates or increase by-catch of other protected species. Careful testing required.[296]

[296] *Sturgeon Gillnet Study (EA-133F-12-RQ-0697) (undated). Year Three, the Influence of Sink Gillnet Profile on By-catch of Atlantic Sturgeon in the Mid-Atlantic Monkfish Fishery Recipient Name: Endeavor Fisheries Inc. [Online]. Available: http://www.nefsc.noaa.gov/publications/reports/EA-133F-12-RQ-0697.pdf [Accessed 22.08.2014].*

Cetacean by-catch mitigation measures should be centered on:

1. **The application to a small target group** – measures are best applied to fewer vessels or to small fisheries with high by-catch rates as: a) the group is easier to control or monitor and, b) there is less political fallout whereby many livelihoods are affected by a dramatic change in a sector of, or the whole of the fishery. This requires a suitable group of vessels, a fishery or an area with relatively high by-catch rates to exist and to be identified.

2. Robust enforcement and assured compliance – Considering point a) above, successful monitoring of compliance to mitigation measures relies on a robust Monitoring, Control and Surveillance (MCS) sector of the acting management body. This might include a regular coastal fisheries patrol, an observer programme on the vessels concerned, or a market based compliance scheme.

3. Correctly used and drafted legislation – A key aspect for enforcement of mitigation measures is that the legislative framework is robust. It should not contain loopholes for non-compliance and should be understood by all relevant parties (i.e. fishermen, fishing co-operative leaders, government officials). Time and money are also saved if legislation can be based on existing measures or instruments, otherwise all parties are at risk of confusion as one clear objective may be lacking.

4. Involvement of fishermen – Compliance levels are unlikely to be high if fishermen see no need for the by-catch reduction measures, so it is important that they are involved in all discussions to understand the nature of the conservation threat or the concerns of the wider public. To this end clear conservation goals are required. Fishermen will have the greatest knowledge of the by-catch problem and their experience will inevitably assist in designing effective measures. Similarly, with direct involvement, the fishermen are empowered and implementation of the measure into fishery practice may be more successful.

5. Detailed research and trials – Long before measures can be implemented successfully, detailed research into, for example, the population structure and spatial distribution of the affected cetaceans is required. For example, if a high risk by-catch area, or 'hot-spot' is identified, specific time or area closures will need to cover inter-annual variability in this hot-spot (varying concentrations of cetaceans in feeding areas between months). Research will also be important when designing alterations to fishing gear. The trialing of new devices/net alterations should be tested not only in experimental conditions, but in the active commercial fishery as feasibility studies.

7.3. Mitigation measures with potential for application in the Black Sea

The utility of the measures outlined in Table 7.2 will depend upon the nature of the fisheries involved in by-catch in the Black Sea, their scale and distribution, and the areas of highest by-catch rates. Any mitigation measures need to address a coherent conservation objective.

7.2.1. Identification of fishing gears and areas with highest impacts on cetaceans

Higher risk fisheries, seasons and areas have been explored in preceding sections of this report from pre-existing regional observer reports (section 6.1.1) and from the fishermen's survey (section 6.1.2), in which questions regarding marine mammal interactions were posed. A large sample (440) of vessels was surveyed at representative ports in Bulgaria, Romania, Turkey and Ukraine and from this certain high risk fisheries and seasons have been identified.

While some fisheries have been identified and some seasonal trends have become apparent, there is too little spatially explicit information on by-catch rates to establish geographical 'hot spots' with any degree of certainty. Nevertheless results presented in section 6 suggest there are:

1. Higher cetacean by-catches in late spring & early summer.
2. Higher by-catches in areas off the western coast of the Crimean Peninsula, off Romania's coast and off Sinop in central Turkey.
3. Higher by-catch rates in turbot gillnet fisheries than other fishery sectors.
4. Higher by-catches for harbour porpoise (by more than one order of magnitude) than bottlenose dolphin or common dolphin.

Except for lift nets and hand lines, by-catch appears to be possible in any gear. Aside from the turbot gillnet fishery, high rates were also reported in the dogfish gillnet fisheries - a species that was more traditionally taken with long lines.

Identifying high risk sectors, such as geographical hotspots of cetacean by-catch clearly needs further work and will only be achieved through a more wide scale independent by-catch monitoring scheme. The interview surveys are usually only regarded as stop gap measures to provide an overview of likely by-catch rates and they rely upon the large assumption that interviewee selection and the responses are both un-biased.

Given the very high by-catch rates that have already been observed in the small scale observer schemes that have been conducted – it is likely that a more comprehensive by-catch monitoring scheme could produce useful results in a relatively short time frame or for relatively little ongoing cost.

Whether interview surveys alone or independent monitoring is used to determine by-catch rates, it will also be imperative to have a reliable measure of fishing effort for the entire fleet in each country. We have assumed that the number of boats (official statistics) used to extrapolate fishing effort are correct – although in reality they may be too high. On the other hand we have not been able to quantify IUU fishing effort.

7.2.2. Recommendations from national experts

Experts from the national teams of Romania, Bulgaria, Ukraine and Turkey have collectively proposed by-catch and general management measures for the Black Sea. This is one of the main outputs of the mid-project meeting. The proposed measures are listed below:

1. **Increase control of the Turbot fishery.** This is needed particularly in the turbot closed season, from the 15th of April to the 15th of June. It was suggested that this control measures should include searching and grappling for both abandoned and illegally set gillnets during this period.

2. **Improve enforcement of existing and newly proposed legislation**. This can be achieved through improved Monitoring, Control and Surveillance (MCS) which should reduce (by detection or as a deterrent) illegal fishing activity and a large part of the fishing effort. Subsequently, the levels of by-catch will decrease depending on the fishery. This will be particularly applicable to 1.

3. **Introduce a programme of education for fishermen**. This is recommended to improve their knowledge of the current legislation, how it is applied practically in the fishery and to develop an understanding in the fishing community of why measures to protect cetaceans are needed. Fishermen may also be able to make suggestions for practical by-catch mitigation measures as they experience it first-hand, and will be more likely to comply with proposed mitigation measures if they are involved in their development.

4. **Implement pilot projects for pingers on gillnets**. This might be considered for at least the turbot gillnet fishery. However, this approach was seen as somewhat unlikely to be effective in the circumstances prevailing in the Black Sea.

5. **Switch to alternative fishing gear**. This should be considered for turbot, switching gear from gillnets to trawl or long-line, possibly in some restricted well-defined zones. Similarly, longlines might be used for dogfish rather than gillnets

6. **Ban the use of Dogfish nets**. Dogfish gillnets were considered dangerous to cetaceans (in particular for younger individuals) and juvenile turbot. They are also implicated in the illegal catch of sturgeon. This fishery should be replaced by long lining.

7. **Investigate the impact of the new 400mm mesh size with a max twine diameter of 0.5mm**. These nets are now in use in Romania and Bulgaria. They are to be introduced to Turkey in September 2016. Research into the impact of these gear modifications on cetacean by-catch should be initiated.

8. **Establish a regionally coordinated observer programme**. This is required to sufficiently monitor cetacean by-catch and establish a more robust series of estimates of by-catch rate by fishery. It should be conducted using randomised stratified sampling, and with clear sampling targets to determine by-catch levels with predefined measures of certainty. Existing data do not provide a coherent or reliable picture of the extent of by-catch, except that is appears to greatly exceed expected conservation targets. This will only be effective if there is better quantification of total fishing effort among the sampled sectors.

We have used these suggestions further below in developing a conservation action plan that is placed within an institutional framework centered on the Black Sea Commission that would rely on

internationally agreed conservation goals. The Conservation Plan also draws on recommendations from various regional forums.

7.2.3. Conservation goals for the Black Sea

Black Sea conservation goals

At present, all national governments of Black Sea coastal states are signatories to or have adopted multilateral environmental agreements, global and regional, that identify the conservation and protection of marine biodiversity, including cetaceans, as a priority. There is a well-developed network of scientists who continue to contribute to the understanding of Black Sea cetaceans and working towards their being afforded adequate protection to achieve favourable conservation status. The human activities that have an adverse impact on cetacean populations are well understood and there are clear signs that, although unquantified, incidental catch in fishing gear is an issue that adversely impacts the conservation status of cetaceans. Finally, Black Sea cetaceans, as individual species, are recognised as requiring a stringent protection regime to achieve their favourable conservation status. Despite this, cetacean conservation is not a priority at national or regional level. This situation is not unique to the Black Sea, but the fact remains that national governments are not fulfilling commitments to cetacean conservation.

The situation with the environment and fish stocks of the Black Sea, which have been urgent issues for many decades, gives cause for concern, as the issues remain largely unresolved. Human activities within the Black Sea and its catchment area have resulted in a series of environmental crises, including fisheries collapses, severe eutrophication and invasions of nonindigenous species (Goulding *et al.* 2014[297]). In response to the concerns about pollution, the Convention on the Protection of the Black Sea against Pollution (the Bucharest Convention) and the Black Sea Commission was signed in 1992. The Convention and the Commission were ratified by all 6 legislative assemblies of the Black Sea coastal countries, and this remains the only ratified regional framework for action to address environmental issues in the Black Sea. However, although the need for regional cooperation on fisheries and environmental management across the Black Sea is widely recognised – not simply to protect biodiversity, but also to safeguard the livelihoods of coastal communities in all countries – attempts to introduce regional governance structures for the management of fisheries and marine living resources have been unsuccessful, except perhaps in the context of pollution control. The Black Sea Commission's Legally Binding Document on Fisheries and the Conservation of Living Marine Resources remains under discussion. External support to broker a fisheries and living marine resource convention has also had limited success; in 2011 the European Parliament passed a resolution calling on the European Commission to use all diplomatic and financial means available to achieve concrete results regarding sustainable fisheries in the Black Sea (European Union, 2011[298]), but the deadlock remains. The geopolitical instability of the Black Sea region and substantial differences among the countries of the region (cultural, governance, economic reform, *etc*) contribute to the conclusion that there is insufficient commonly held political will for creating a Regional Fisheries Management Organisation (RFMO) for the Black Sea (Goulding *et al*. 2014). Against this background, it is difficult to foresee the conservation of cetaceans become a priority item on the political agenda, particularly given the inconsistent funding and political interference that undermine existing institutional

[297] *Goulding, I. C., K. A. Stobberup, and T. O'Higgins. 2014. Potential economic impacts of achieving good environmental status in Black Sea fisheries. Ecology and Society* ***19****(3): 32*

[298] *European Union. 2011. Parliament resolution of 13 September 2011 on current and future management of Black Sea fisheries (2010/2113(INI)). Text adopted by European Parliament, single reading T7-0365/2011 (Summary) 13/09/2011. [online]*

frameworks (Knudsen, 2013[299]). The question of whether it is logical or correct to commit human and economic resource to the conservation of cetaceans is hopefully one that does not need to be answered, based on the international recognition of their importance as an important component of marine biodiversity due to their apex position in trophic webs (e.g., Bowen, 1995[300]) and the loss of apex predators risking the integrity and resilience of ecosystems in which they live (Bascompte *et al*. 2005[301]).

The conservation of cetaceans therefore faces significant challenges and seems unlikely to be achieved independently of other sustainability challenges, notably fisheries. The key conservation goals could therefore include the following:

- The agreement of a single, ratified body that takes responsibility for monitoring, assessing and determining measures to address incidental catch and co-ordinating cetacean conservation through: improving coordination on scientific research and advice; standardising scientific methods for monitoring and research; that provides recommendations to be adopted at national level to reduce threats to cetaceans (and other marine biodiversity); and that provides a basis for a conservation framework enforceable in international law. The framework would be a necessary vehicle for reaching a regional by-catch limit goal that is adopted by all coastal states. The European Commission has a critical role in supporting the achievement of a ratified Convention among the Black Sea coastal states, notably because fisheries management within EU waters (but beyond territorial waters) is a matter for the European Commission. The European Commission therefore will play a key role in the adoption of measures to reduce incidental catches of cetaceans and thus in the development of a functional Black Sea fisheries management organisation.
- Strengthening existing fisheries legislation by bringing fisheries legislation within environmental strategic priorities and explicitly recognising the need to monitor and, where demonstrated, apply effective measures to address incidental catches of cetaceans in fisheries.
- Integrating strengthened fisheries legislation with legislation that provides strict protection of endangered species and which aims to achieve favourable conservation status of endangered species through surveillance of conservation status and taking appropriate and effective measures. Strict protection of endangered species is a particularly useful concept for cetaceans, which are highly mobile and for which the identification of important parts of their habitat may be difficult and costly to identify or misguided.
- The development of national marine strategies that take into account the specificities of national waters and that reflect the overall perspective of the Black Sea marine environment. Bulgaria and Romania, as EU Member States are obliged to develop such strategies under the Marine Strategy Framework Directive, which provides a comprehensive benchmark for the protection of marine biodiversity taking into account the ecosystem based approach to the management of human activities and to protect marine biodiversity to achieve 'Good Environmental Status'. The initial assessments (fulfilling the reporting

[299] *Knudsen, s. 2013. Marine governance in the Black Sea. In M. Gilek and K. Kern. (Eds) Marine Governance in Europe. Ashgate*

[300] *Bowen, W. D. 1997. Role of marine mammals in aquatic ecosystems. Marine Ecology Progress Series 158:267-273*

[301] *Bascomte, J., C. J. Melian, E. Sala. 2005. Interaction strength combinaations and the overfishing of a marine food web. PNAS 102(15):5443-5447*

obligations for MSFD reporting on Initial Assessments (Art. 8), Good Environmental Status (Art.9), Env. targets & associated indicators (Art.10) and related reporting on geographic areas, regional cooperation and metadata), provide a useful foundation to support a collaborative regional approach to adopting a coherent set of basin wide targets and indicators.

- The adoption of basin wide indicators would support a coordinated approach to the surveillance and monitoring of cetacean populations in the Black Sea, and of incidental catches of cetaceans in fishing gear. Coastal states could agree to populate a shared database, accessible to all, with data on population monitoring and by-catch monitoring according to an agreed survey methodology. The adoption of a single methodology would greatly enhance the knowledge and understanding of the conservation status of Black Sea cetaceans at national and regional levels.
- The development and implementation of national marine strategies in each coastal state that take into account the protection of marine biodiversity and the management of human activities that affect the marine ecosystem would be a major step forward for the protection of marine biodiversity (including cetaceans) and for coastal livelihoods. For countries to develop feasible strategies would require coordination and collaboration across the six coastal states. Such strategies would lead to coordinated legislation, measures and, hopefully, enforcement at national and regional levels.
- Enforcing existing and future legislation relevant to the conservation of cetaceans and management of incidental catch of cetaceans. Without enforcement, legislation is meaningless. A legally enforceable framework that is ratified by all coastal states is essential, as this provides the vehicle under which the appropriateness and effectiveness of measures to achieve strict protection and favourable conservation status can be verified, and would legislate for systematic and permanent monitoring of Black Sea cetaceans.

7.2.4. Proposed conservation actions relating to the interactions between cetaceans and fisheries in the Black Sea

Preceding sections of this report have discussed cetacean abundance estimates, potential sustainable take limits and inferred by-catch rates. We have highlighted a number of key uncertainties. Our abundance estimate relates only to the western end of the Black Sea and a single ferry route over the eastern part of the Black Sea, covering a mere 29% of the total area. It is very unfortunate that plans to conduct a complimentary survey over the eastern and southern parts of the Black Sea at the same time did not come to fruition. Nevertheless we have produced estimates of 29,000 porpoises, 60,000 common dolphins and 26,000 bottlenose dolphins in the area surveyed. Estimates for the rest of the Black Sea are 'guesstimates'.

Removal limits for cetaceans that are consistent with conservation targets are thought to be at most 2% of the population. Existing data on by-catch rates from independent observer schemes and the results that we obtained from interviews with fishermen make it clear that by-catch rates are very likely to exceed sustainable take limits by some margin.

Very crude estimates from the 440 vessels that we interviewed suggest annual by-catch totals of 20,000 porpoises and 14,000 dolphins. Neither of these numbers is consistent with a sustainable take

level, unless the total population of porpoises exceeds a million animals and that of 'dolphins' (2 species together) exceeds 700,000 animals. Neither of these totals is conceivable.

Our summary of fishing effort and fishery history in the Black Sea, however, suggests that high annual by-catch totals are not a new phenomenon. Indeed gillnet effort has been higher in previous decades. It is likely that such catch levels have been ongoing for decades. So the best information we have suggests a currently unsustainable take level, yet if by-catch rates of the magnitude that we propose have been ongoing for decades, it is also hard to see how the abundance and density estimates have remained apparently buoyant.

While a reduction of the current levels of by-catch would seem a priority, equally important should be an attempt to rationalize the seemingly contradictory information that we have in order to better focus Black Sea ecosystem conservation plans for the future. This would include better by-catch monitoring, better fleet effort documentation and better information on cetacean population dynamics and distribution.

We have also noted an absence of clearly stated by-catch management goals and limits for the Black Sea which will only be attained by closer collaboration between riparian member states through the appropriate management body – in this case the Black Sea Commission.

If these actions are to be successfully implemented, countries will need to improve and harmonize their legislation under the umbrella of a well-managed and dedicated regional organisation. This will include the education and training of the Black Sea Community (scientists, fishermen, industry, NGOs, local and national governments, and appropriate intergovernmental organisations).

Five broad approaches are required in parallel:

1) Refinement of information on spatial, temporal and métier specific by-catch rates to further identify areas, seasons and fishery types for focused by-catch mitigation, including a better understanding of the rates at which each species is taken by each fishery.

2) Improved information of fleet dynamics and effort: we have a made a start in characterising seasonal and fishery specific effort patterns, but are hampered by lack of robust quantitative data on the numbers of vessels fishing, days absent and net quantities used.

3) Implementation of by-catch mitigation strategies where there are already obvious requirements.

4) Further investigation of the population dynamics, distribution, density and migration patterns of the three species of concern.

5) The building or improvement of a management organisation to deliver on conservation goals, shared management, fleet documentation, training and outreach.

To address these objectives, and with the recommendations of the national experts from section 7.2.2 in mind, we propose the following conservation actions should be implemented (Table 7.2).

These proposed conservation actions should be discussed through the relevant regional bodies. Priority actions have been highlighted in bold.

Table 7.7.1 Proposed conservation actions relating to the interactions between cetaceans and fisheries in the Black Sea

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
1. Improved information on by-catch rates by season, area and metier				
1.1 Establish co-ordinated national by-catch monitoring schemes	National observer programmes have been recommended for Black Sea countries by several organisations, including the EC[302] (for EU member states) and ACCOBAMS[303,304]276**Error! Bookmark not defined.**. Both ACCOBAMS and ICES[305] have provided guidelines on how such schemes should be organised. It is recommended that guidelines are followed but regulators should bear in mind that these will need to be extended and adapted to particular local circumstances. ACCOBAMS set out detailed guidelines304[,304], but some important points to consider in the development of programmes include: a. Monitoring should be spread as evenly as is practicable across the entire fleet and in proportion to fishing effort yet as we know for the Black Sea – the turbot gillnet fisheries could be a priority.	All Black Sea countries.	Independent on-board observations have been carried out in Bulgaria, Romania, Ukraine and Turkey but these are sporadic for only a few fisheries. Thus, there is a paucity of data relating to cetacean by-catch in the Black Sea, let alone specific by-catch information relating to each fishery. It is widely accepted that the most reliable estimates of cetacean by-catch rates are to be obtained from independent on-board monitoring, either using observers	a. Reluctance of skippers to take observers, lack of space on board boats, and vessel safety are all reasons why monitoring opportunities may be limited. These can be exaggerated however. b. High costs with training and data collection c. Need to define strata and determine necessary sample sizes.

[302] *See: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:150:0012:0031:EN:PDF*

[303] *See: Page 26: www.vliz.be/imisdocs/publications/228936.pdf*

[304] *See: Northridge, S. and Fortuna, C (2008). ACCOBAMS. Protocol for data collection on by-catch and depredation in the ACCOBAMS Region: http://151.1.154.86/meetingdocs/2009/SEP_(Tunis)%20%20WS%20on%20Selectivity/Protocole_data_collection.pdf*

[305] *See: http://www.nefsc.noaa.gov/fsb/references/ICES_CM2010-ACOM33.pdf*

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	b. Determine fishing effort by fishery – the results of the fishermen's survey in this study needs to be expanded on. c. Observers must be properly trained and have a good relationship with the fishermen and the fishing industry. d. There must be a reliable database system to manage the incoming data, preferably co-ordinated by the relevant RFMO. Also see FAO guidelines for developing at-sea fishery observer programmes[306].		or electronic monitoring using video recordings.	
2. Improved information on fleet effort by country and by metier - spatial and seasonal				
2.1 Establish a regional fleet register	This has been previously suggested by the GFCM in Recommendation GFCM/33/2009/5[307]. Countries in the Black Sea should submit a full dataset, at least at the beginning of each calendar year followed by updates as appropriate, of information on all vessels, boats, ships, or other crafts that are equipped and used for commercial fishing activity. Certain submission standards and protocols should be met. Bulgaria and Romani, under the auspices of the EU Data Collection Framework already submit vessel data to the EU Fleet Register.	All Black Sea countries.	The impact of fisheries on cetaceans relates directly to the size of the active fishing fleets – as shown in this study. It is likely that the sizes of the active fleets in each country have been overestimated and as such, would have provided inflated by-catch rates. A regional register also provides a way for countries to directly	a. The geographical region to cover is large and it will take a significant amount of time to gain cooperation in compiling this list. **b. Ideally information on activity levels should also be recorded and made**

[306] *See: http://www.fao.org/docrep/005/y4390e/y4390e00.HTM*

[307] *See: http://151.1.154.86/gfcmwebsite/Docs/RecRes/REC.DIR-GFCM_33_2009_5.pdf*

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	A Black Sea vessel list should be compiled.		monitor legal fishing activity and in turn, highlight illegal activity.	**available, through the Black Sea Commission**
3. Implementation of by-catch mitigation strategies for specific fisheries				
3.1 Enforce the seasonal closure of turbot gillnet fishery	The closed season should run from the 15th April to 15th June. Enforcement could take various forms and each approach will be more suitable for different countries: a. Direct removal of illegally set/abandoned nets by grappling. b. Increase region wide Monitoring, Control and Surveillance (MCS) of the fishery (see proposed **action 3.2**). c. Use of buyers and sellers regulation to restrict sale of turbot during the closed season.	All Black Sea countries.	The IUU fishery for turbot in the Black Sea is known to be significant, especially in Turkey.	a. The scale of the problem is large, and good coverage of the geographical area in the closed season will prove difficult. b. Greater enforcement of the closed season in some cases may lead to increasing catches in the legal fishery itself to compensate. This will also require regulation.
3.2. Improve Monitoring Control and Surveillance in all fisheries to ensure compliance	This is relevant for fisheries legislation that will have a direct impact on cetacean by-catch such as minimum mesh size and the amount of net permitted to be used on specific vessels.	All Black Sea countries.	Appears the fisheries in the Black Sea are not well-monitored, evidenced by the scale of the illegal fishery.	a. The introduction of new legislation, such as the new 400mm minimum mesh size for turbot gillnets in Turkey might have immediate impacts

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	It is suggested that MCS developments could be based on the recommendations provided by the GFCM: a. The introduction of port state measures[308] b. The implementation of a regional Vessel Monitoring System (VMS)[309] c. The establishment of a list of vessels presumed to have carried out IUU fishing[310]. d. Joint regional vessel patrols and inspection schemes could also be conducted over, for example, known turbot fishing grounds during the closed season. This will require cooperation between national coast guards. Joint inspection schemes		The decline of important fish stocks such as turbot may be lessened through regulation of fisheries effort restriction.	following introduction, such as falling catch rates. This does not provide an incentive to fishermen and this will need to be addressed (see proposed **action 5.3**). b. The geographical region that requires coverage is large. c. Regional cooperation relies on political will.
3.3. Manage effort in the turbot fishery	This measure comes as secondary to **Action 3.1** – the enforcement of the closed season for turbot. If the illegal fishery can be curbed or better managed, reductions in legal fishing effort will need to be as significant.	All Black Sea countries.	It has been reported that turbot stocks in the Black Sea are on the brink of collapse (for example, in Turkey catches have decreased by 63.7% in the last 3 decades[311]. The	a. Turbot is a very important commercial species for all countries so reducing effort will directly affect livelihoods. As a result, cooperation of fishermen may prove to be an issue.

[308] *See: ftp://ftp.fao.org/FI/DOCUMENT/gfcm/web/GFCM_Recommendations2008.pdf*

[309] *See:http://151.1.154.86/GfcmWebSite/docs/RecRes/GFCM_2009_RecRes_en.pdf*

[310] *See: ftp://ftp.fao.org/FI/DOCUMENT/gfcm/web/GFCM_Recommendations2006.pdf*

[311] *Zengin, M. (2014). Last three decades of the turbot fisheries in the Turkish Black Sea coast. Turkish Marine Research Foundation (Pub. 40).*

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	The reduction of effort could be achieved in various ways (see Table 8.1 above for examples): a. Lengthening the closed season b. Restricting the number of licences granted to harvest turbot c. Closed areas If effort restrictions are to be enforced, the development of turbot farming in the Black Sea by affected fishermen should also be discussed as a potential option to help stocks recover. Fishermen must also be educated to see the long-term objectives and benefits of effort restriction.		majority of turbot appears to be caught by Turkey. Turbot fishing is considered to be the main problem for cetacean by-catch so effort reductions are also justified in this sense.	Incentives and alternatives must be proposed. b. Various reductions in legalised effort may lead to increases at other times/in other areas.
3.4. Ban dogfish nets	Countries should begin to restrict licences to fish dogfish with these bottom set gillnets. Improved MCS will aid the enforcement of this ban (proposed **action 3.2**). To avoid the negative impacts on the livelihoods of fishermen, countries should help fishermen switch to alternative gear types (proposed **action 3.5**).	All Black Sea countries.	These are considered to be particularly dangerous to cetaceans and juvenile turbot and are implicated in the illegal catch of sturgeon. This issue was highlighted by national teams at the mid-project Istanbul meeting.	a. The geographical region that requires coverage is large b. Fishermen may be reluctant to switch to alternative gears.
3.5 Switch to alternative gears in fisheries that are high risk to cetaceans	Fisheries which should be considered for a switch of gear: a. Turbot gillnet fishery → turbot trawl or long line fishery b. Dogfish gillnet fishery → dogfish long line fishery	All Black Sea countries.	These measures can be used as alternatives to fishery bans which have less impact on fishermen's livelihoods (see Table 8.1 above for more details).	a. Fishermen may be reluctant to switch to alternative gears as catch compositions and volumes may change and new techniques must be learnt.

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	c. Consider promotion of turbot farming to reduce pressure on wild stocks.			
3.6 Trial acoustic deterrent devices (ADDs) – pingers	This action has been previously suggested by ACCOBAMS[276]. They state specifically that: *These activities should be implemented in accordance with ACCOBAMS BYCAMS project. On application of the activities, the first priority should be given to harbour porpoise by-catches caused by bottom-set gillnet fisheries. This action could also be implemented by workshops in the different countries.* Fishermen will have to be trained and the devices should be regularly checked to ensure the use of deterrents are as effective as they would be in experimental conditions.	All Black Sea countries	Varying successes have been seen depending on the fishery so a trial is required to judge such devices' effectiveness in Black Sea fisheries, for the first time.	a. Successes vary between fisheries and between field and experimental conditions. See Table 8.1 above for more details. b. Require regular checks. c. Expensive to buy and maintain d. misuse can increase by-catch rates
3.7 Test effectiveness of mesh size and twine diameter reductions in applicable countries	There is a new 400mm mesh size limit and a 0.5mm twine diameter limit for the turbot gillnet fishery. This has been adopted in Romania and Bulgaria and will be in Turkey shortly. It would be useful to know if this has any significant impacts on porpoise by-catch rates.	Romania, Bulgaria, Turkey	If it can be shown that mesh size and or twine diameter has a significant effect on porpoise by-catch rates, further restrictions along these lines – or extensions to other countries may help.	a. Will require careful experimentation and co-ordination between countries. b. May not have a very large effect
4. Investigations on the population dynamics, distribution and density of cetaceans in the Black Sea				
4.1 Obtain improved basin-wide information on Black Sea cetacean abundance and distribution		All Black Sea countries.	Whist this study provided very useful estimates for the western Black Sea, a basin wide study is still required to truly determine abundance and distribution. More accurate by-catch rates can then	a. Funding, organisation and cooperation may take time b. Aerial surveys are very weather dependent

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	Based on the recent surveys of the western Black Sea presented in this study (see section 5- abundance) countries should strive to survey the entire Black Sea Basin. The same methodology should be applied to avoid unnecessary bias in the results to detect changes in Bulgaria and Romania in particular. Basin-wide cetacean surveys have also been previously recommended[276].		be calculated (if **action 1.1** is implemented). Dedicated aerial and vessel surveys are required for realistic estimates. By comparing future numbers in Romania and Bulgaria- which we assume is an important area – we might detect changes.	
4.2. Investigate cetacean distribution more closely with a view to identifying areas of persistent or regular high density that might warrant spatial management.	It has been suggested by ACCOBAMS that countries should develop regional networks of already operating protected areas containing cetacean habitats within their boundaries[276]. Seasonal distribution mapping, genetics and telemetry could all play a part in this action. A critical habitat study would also be required.	All Black Sea countries	This study did not identify any specific areas of significance or high density. Several years of monitoring would be required. It is clear that the whole of the shelf area of the Western Black Sea is of some significance to all three species. The shelf region off Georgia may also be important in the winter. Little is known about the movements of cetaceans within the Black Sea, and these are almost certainly linked to seasonal migrations of fish A better understanding of animal movements will help plan more effective management strategies	a. Enforcement of fisheries in MPAs is difficult for such a wide area and often takes a significant amount of time b. Without specific reference to cetacean conservation in MPA designations, full protection may be limited. c. Area based management for highly mobile species is problematic – it is likely very large areas would need to be considered to account for inter-annual changes in distribution.

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
			and may help identify areas that could be useful as MPAs. It is not yet know if the MPA approach would produce any meaningful conservation benefit to cetaceans in the Black Sea, but better information on migrations could help inform seasonal fishery restrictions.	
5. Institutional development, capacity building and outreach				
5.1 Ratification by all Black Sea coastal states of a single, legally enforceable convention for fisheries management and marine biodiversity conservation	The agreement of a single, ratified convention that addresses fisheries management and marine biodiversity conservation is essential to establish a coherent region wide body that takes responsibility for monitoring, assessing and determining measures to address incidental catch and co-ordinating cetacean conservation through: improving coordination on scientific research and advice; standardising scientific methods for monitoring and research; that provides recommendations to be adopted at national level to reduce threats to cetaceans (and other marine biodiversity); and that provides a basis for a conservation framework enforceable in international law. The framework would be a necessary vehicle for reaching a regional bycatch limit goal that is adopted by all coastal states.	All Black Sea countries	Incidental catch in fishing gear is a priority issue if cetacean populations are to be safeguarded. Given the transboundary nature of both cetaceans and fishing activities, a region-wide convention that is ratified by all coastal states and which is legally enforceable is necessary to safeguard cetaceans throughout their range.	Geopolitical instability of the Black Sea region and substantial differences among the countries of the region (cultural, governance, economic reform, etc), resulting in insufficient commonly held political will to agree and ratify a region-wide convention Different strategic objectives between regional and national authorities tasked with fisheries management and marine biodiversity conservation

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
				Implementation of regional obligations would ultimately fall under the competence of national authorities. National capacity and enforcement capabilities must be sufficiently strong to successfully implement conservation measures and be backed up by sufficient political will
5.2 14. Adopt a cetacean based conservation approach in fishery regulations	As suggested through ACCOBAMS, on the way towards the Black Sea Fisheries Convention, the intermediate Legally Binding Document (LBD) for Fisheries and Conservation of Living Resources of the Black Sea has been drafted by the Black Sea Commission (2002). This draft document includes some meaningful items devoted to the conservation of cetaceans. In order to rehabilitate the Black Sea ecosystem and achieve sustainable fisheries in the Black Sea, the fisheries management policies need to be improved. The Strategic Action Plan for the Rehabilitation and Protection of the Black Sea of the Black Sea Commission[312] envisages that the Black Sea coastal states should expedite the development of the Fisheries Convention and improve their national regulations on fisheries. Applicable to cetaceans are the following:	All Black Sea countries	The fisheries sector in the Black Sea is extremely important commercially and it appears that this is prioritised over cetacean conservation. The Black Sea international and national legislation on the management and use of living resources is adequately developed yet.	a. Regional cooperation over a wide geographical area and between different political situations will prove difficult. b. Priorities appear not be the conservation of cetaceans.

[312] *Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea (2009): http://www.blacksea-commission.org/_bssap2009.asp*

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	a. Develop regulations aimed at decreasing by-catch level b. Minimise ghost fishing caused by discarded, abandoned or lost fixed and floating nets, including those used in illegal/unregulated fishing activities Link to Article 12 of the EU Habitats Directive as an example, but this is an issue that is not relevant to other states.			
5.3 Educate and consult with fishermen	If new measures are introduced, fishermen would need to be trained and included in their implementation. On a more general level however, fishermen should be provided with a basic understanding of the Black Sea cetacean environment marine resource management, environmental protection, in the operation and management of fishers' organizations, and in activities associated with social development. Initial training of fishermen and other involved parties should follow a set of guidelines. The FAO provides some basic guidelines on training in the fisheries sector[313]. Some general points that are applicable to the Black Sea include: a. Governments should endeavour to provide incentives to ensure that those trained apply the measures correctly in the fishery.	All Black Sea countries.	Compliance levels are unlikely to be high if fishermen see no need for or are confused by the practical application of by-catch reduction measures, so it is important that they are involved in the initial stages of implementation. They also experience the by-catch problem first-hand and their knowledge may help to develop the most practical measures for a fishery. The fishermen's survey revealed that some could not tell the difference between species so education will be very important.	a. Fishermen may be reluctant to adopt new measures if no incentives are provided

[313] *See: http://www.fao.org/fishery/topic/13825/en*

Proposed action	Details	Applicable to	Justification for selection	Challenges posed
	b. Training and education of fishermen should be regularly reviewed to ensure their effectiveness and relevance to needs. c. Fishing cooperatives should be used for training and education. Discussions should also be held between fishermen and other stakeholders in the fisheries. Groups might consist of fishermen, heads of fishing cooperatives, NGOs and members of regional management organisations and governments.			

Annexes

Annex 1 - Fishermen's leader's awareness of legislation

Annex 2 - Fisheries Survey Questionnaire

Annex 3 - Review Density Abundance Distribution Cetaceans Black Sea

Annex 4 - Survey Methodology

Annex 5 - Survey Data

Annex 6 - Historical Black Sea Cetacean Surveys

Annex 7 - Survey Database

Annex 8 - Cetacean Distribution

Annex 9 - Cetacean By-catch in the Black Sea

Annexes are supplied with this report in electronic formats.