

# SIFIDS

Scottish Inshore Fisheries  
Integrated Data System

Work Package (10) Final Report

**Project Management**

Project code: WP00(10)SIFIDS



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# 1. INTRODUCTION

Work Package 10 is concerned with the co-ordination of the European Maritime and Fisheries Fund (EMFF) Scottish Inshore Fisheries Integrated Data System (SIFIDS) Project. The SIFIDS Project sought to address key data deficiencies that have to date hampered efforts to sustainably manage Scotland's inshore fisheries. It worked to develop hardware, systems and processes to efficiently and cost-effectively collect, collate, visualise and interrogate information on the location of inshore fishing activities, fishing effort, catch/bycatch composition and the socioeconomic role of inshore fishing.

The key objectives of the project were the assessment of current and alternative methodologies for shellfish data collection/stock assessment; the identification and adaptation of novel technological solutions (hardware and software) for use in harvesting and transmitting fisheries data at fine spatial scales, as well as the development of a relational data resource to collate vessel derived data streams and integrate these sufficiently with other parameters to facilitate the creation of a decision support tool for fisheries management and use in the wider marine planning framework.

The SIFIDS project was highly ambitious and given the interdependency of some elements of the Work Packages and timescale, effective and pro-active oversight of the project was essential. As part of the approach adopted under the 2014/15 EFF funded project 'Evidence Gathering in Support of Sustainable Scottish Fisheries' provision was made for a work stream dedicated to the collective oversight and management of the research Work Packages. This proactive strategy proved highly effective, and alongside the Project Facilitators was instrumental in the successful delivery of the project and the dissemination of its outputs to industry. It was proposed therefore that this proven approach be replicated under the SIFIDS Project.

WP10 did not contribute directly to the project's research outputs, however, the SIFIDS Project coordination team (comprising members of the MASTS Directorate based at the University of St Andrews) contributed indirectly through the active monitoring of progress made under Work Packages 1 through 9, using agreed milestones and research objectives as markers. The high level of interconnection between the Work Packages necessitated close monitoring and this ultimately proved instrumental to the successful delivery of the SIFIDS Project. In addition, the team worked to resolve any issues or problems that arose during the course of the project be those internal or involving external parties, as well as responding to queries. During the 2014/15 EFF funded project utilising designated points of contact (the Project Facilitators and Project management) rather than leaving such matters to be addressed by individual work package teams proved to be a highly effective approach. The Project coordination team were also responsible for overseeing the day to day activities of the two regionally based Project Facilitators recruited under WP7, the regular reporting of progress to the funders (Marine Scotland/Scottish Government) and the collation and submission of all claims against the projects EMFF grant.

The overarching management provided by the SIFIDS Project Coordination Team was to promote the cohesive working (between Work Packages) necessary for the achievement of the projects overall objective that being an effective, fit for purpose inshore fisheries data collection system and decision support tool. Facilitating this, regular collective project review meetings were organised to bring together the various work package teams to review progress

and discuss potential areas of overlap. These meetings proved extremely valuable during both the 2014/15 EFF funded project and SIFIDS, particularly in preventing duplication of effort across related Work Packages. Where deemed necessary and supplemental to these collective gatherings, remote meetings utilising online video conferencing were employed, whenever practicable, to maximise efficiency and minimise costs.

The SIFIDS Project ran from October 2016 to March 2020.

## **Work Package Final Reports**

### WP1

Mouat, B., Bergh, M., Shelmerdine, R. L. and Leach, K. (2018).. Published by MASTS. 169pp.

### WP2A/B

Ayers R., Course G.P. and Pasco G.R. (2019). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Development of an Autonomous Fisheries Data Harvesting System and Investigations into Novel Technological Approaches to Fisheries Data Collection. Published by MASTS. 174pp.

### WP3

Bates, C.R., Chocholek, M., Fox, C., Howe, J., and Jones, N. (2019). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Development of a Novel, Automated Mechanism for the Collection of Scallop Stock Data. Published by MASTS. 93pp.

### WP4

Billing, S-L., Anderson, S., Parker, A. Eichhorn, M. Vare, L.L. and Thomson, E. (2018) Scottish Inshore Fisheries Integrated Data System (SIFIDS): Assessment of Socio-economic and Cultural Characteristics of Scottish Inshore Fisheries. Published by MASTS. 206pp.

### WP5

James, M., Mendo, T., Ladd-Jones, H., McCann, P., Crowe, S., Coram., A., Northridge, S. (2019). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Capture and Incorporation of Experiential Fisheries Data. Published by MASTS. 74pp.

### WP6

Tidd, A.N., Ayers, R.A., Course, G.P. and Pasco, G.R. (2019). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Development of a Pilot Relational Data Resource for the Collation and Interpretation of Inshore Fisheries Data. Published by MASTS. 49 pp.

*And*

James, M., Ladd-Jones, H., McCann, P., Crowe, S., Mendo, T. (2019). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Development of a Relational Database and User Interface. Published by MASTS. 30pp

### WP7

Orr, K.K., McKnight, A., Logan, K. (2020). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Work Package 7 Final Report: 'Engagement with Inshore Fisheries to Promote and Inform. Published by MASTS. 39pp.

### WP8A

Course G.P., Pasco G.R., Royston, A., Ayers, R. (2018). Scottish Inshore Fisheries Integrated Data System (SIFIDS): On-Board Observers. Published by MASTS. 45pp.

## WP8B

Mendo, T., Smout, S. Ransijn, J., Durbach, I., McCann, P., Crowe, S. Carulla Fabrega, A., de Prado. I., James, M. (2019). Scottish Inshore Fisheries Integrated Data System (SIFIDS): Identifying fishing activities and their associated drivers. Published by MASTS. 67pp.

### **WP10 Project Coordination Team Members**

Mark James – Project Principal Investigator

John Thompson<sup>1</sup>/Hannah Ladd-Jones – Project Manager

Tanya Harkins – Financial Coordinator

Emma Defew – General Co-ordination and Recorder of Project Impact Related Materials and Statistics.

### **Work Package Objectives**

1. Monitor progress and ultimately oversee the delivery of the stated objectives of Work Packages 1 through 9, culminating in the provision of final reports (as well as any prototype equipment and systems) to the project funder (Scottish Government).
2. Agree and facilitate a series of collective project review meetings (including an inception meeting at the commencement of the project).
3. Prepare and submit timely claims against the EMFF project grant.
4. Oversee the day-to-day activities of the three regionally based Project Facilitators recruited under WP7.
5. Report on project/work package progress to designated individual/s within Marine Scotland.
6. In conjunction with the Project Facilitators act as the designated point of contact for the SIFIDS project and utilise opportunities to promote the project to industry, the scientific community and wider public.

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<sup>1</sup> John Thompson left the role as Project Manager in December 2017 and Hannah Ladd-Jones commenced January 2018

## 2. APPROACH

1. The SIFIDS Project Coordination Team arranged a project inception meeting (December 2016) where all Work Package contractors/leads met, and key project and financial reporting requirements were outlined and agreed upon. (Objective 1).
2. A schedule of collective project review meeting dates (every 3 to 4 months) were agreed by Work Package (WP) contractors/leads, Marine Scotland representatives and where applicable/appropriate Regional Inshore Fisheries Group (RIFG) Chairs. When necessary the date of an agreed collective review meeting was changed to facilitate logistics and accommodate the progress of a WP. If a WP was deemed to have deviated from the agreed schedule of work or it's approach to an objective needed to be amended (i.e. a primary milestone has been missed) additional meetings with that WP team were organised. A flexible approach to communicating and monitoring WPs was undertaken by the Project Coordination Team (PCT). Amendments to WPs were communicated to and consented by Marine Scotland and subsequently to the EMFF Grants team. (Objective 2).
3. The Project's Finance Coordinator and Project Manager managed the collation of evidence of project expenditure and submitted quarterly claims for repayment against the EMFF project grant. Requested amendments to WP budget totals or reallocation of budget purpose were communicated to and consented by Marine Scotland and subsequently to the EMFF Grants team. (Objective 3).
4. Through regular online/phone meetings and daily email correspondence the SIFIDS PCT oversaw and agreed the activities of the Project Facilitators ensuring that their time is allocated proportionally across WPs 1, 2, 4, 5, 6, 7 and 8. (Objective 4).
5. The SIFIDS PCT undertook the submission of regular (at least quarterly) project progress updates to the Head of Inshore Fisheries and Coastal Communities during the original duration of the project. The progress reports were also submitted alongside every financial claim onto the EMFF portal. Representatives of Marine Scotland Science received a standing open invitation to all collective project review meetings. Internal meetings between the PCT and representatives of Marine Scotland were organised throughout the entire duration of the Project, in addition to the larger collective review meetings. (Objectives 1 and 5).
6. The PCT oversaw the submission of all the interim and final Work Package reports to the Head of Inshore Fisheries and Coastal Communities, or other designated representatives of Marine Scotland, as well as the handover of any applicable hardware or software developed under the project. The Project Manager organised for the final reports of Work Packages 1, 3, 4, 5, 8B to be both internally (a representative

from Marine Scotland) and externally (an expert in the field) reviewed, prior to their submission to the Head of Inshore Fisheries and Coastal Communities, or other designated representative of Marine Scotland. (Objective 1).

7. The SIFIDS Project Manager responded, where appropriate, to all correspondence/queries relating to the project within 48-72 hours of receipt. Online or face-to-face meetings were also organised with members of external teams or organisations to the project who were interested in SIFIDS. (Objective 6).
8. The SIFIDS PCT reviewed and signed off on all publicity and external media forwarded by the work package teams relating to the SIFIDS Project. All material was sent to the Head of Inshore Fisheries and Coastal Communities, or other designated representative of Marine Scotland for approval before release. (Objective 6).
9. The SIFIDS PCT organised, in agreement with Marine Scotland and WP contractors/leads, to have the Project represented/promoted at appropriate public meetings, such as; Scottish Inshore Fisheries, Annual Scottish Fishing Conferences and the MASTS Annual Science Meeting. (Objective 6).

### 3. DELIVERABLES AND OUTPUTS

A breakdown of activities held or attended by the Project Coordination Team and/or Project Facilitators can be found in Appendix 1.

1. Five collective project review meetings were attended by representatives of all Work Packages. The meetings were organised to allow the various project work package teams to come together to present their progress to date/next steps and discuss potential areas of overlap and synergy. For each meeting there was an open invitation extended to Marine Scotland Science colleagues with an interest in the research being conducted to attend these meetings. Attendees external to the SIFIDS Project are listed in the Appendix 2.

The collective review meetings were held:

May 2017

September 2017

April 2018

October 2018

February 2019

2. Written or verbal briefings to the Head of Inshore Fisheries and Coastal Communities (or designated representative) on project progress were held on at least a quarterly basis. The scheduling of these were often organised to coincide being prior to the collective project review meetings to maximise efficiency. Internal meetings were also held when it was felt appropriate, particularly when there had been significant developments.
3. Regular communication with the Project Facilitators took place throughout the duration of the SIFIDS Project, including regular emails (daily – weekly), online meetings and telephone discussions (as and when required) in addition to the collective review meetings. Amendments to WP7's objectives were approved by Marine Scotland and are documented in the Work Package's final report.
4. The response to any queries/requests from industry, contractors or Project Facilitators were handled predominately by the Project Manager by phone or email within 72 hours of receipt. On occasion, meetings were organised and held at the University of St Andrews. The Project Facilitators were the first point of contact for fishers wishing to become more involved in the project or to find out more information. More information on their communication with industry can be found in WP7's final report.

a. Throughout the SIFIDS Project the project management team received many enquiries from external organisations and researchers regarding the project and its Work Package outputs. The Project Management team responded to each enquiry and often organised an online meeting to outline the Project in full. In addition, the project received many invitations to present the objectives and preliminary work of the project (see Appendix 1). External interest received came from organisations, such as:

- i. Hydrographic Office
- ii. Fisheries Innovation Scotland
- iii. Coastal Producer Organisation
- iv. Community of Arran Seabed Trust
- v. EMODnet
- vi. Vericatch
- vii. Joint Nature Conservation Committee
- viii. Open Seas
- ix. Marine Scotland Science
- x. Future of Fish
- xi. Met Office
- xii. Fish Mongers Company
- xiii. Bangor University
- xiv. Marine Management Organisation
- xv. Fishmongers – Future of Fisheries
- xvi. Inshore Fisheries and Conservation Authorities
- xvii. Regional Inshore Fisheries Groups
- xviii. Seafish

5. To distribute information regarding the project a SIFIDS Project webpage was created: <https://www.masts.ac.uk/research/emff-sifids-project/>. A project brochure was designed and printed; this was distributed conferences, meetings, workshops were appropriate to individuals interested in the project. The brochure was also uploaded to the SIFIDS website. A short, animated video was created by Kyla Orr (WP7) summarising how the SIFIDS Project was uploaded onto SIFIDS Project website and MASTS YouTube page. Various local and national papers published pieces on the project's success as obtaining funds.

An article outlining the Project and its objectives was published in the 2018 spring Scottish Regional Inshore Fisheries Groups newsletter. An update article was

subsequently published in the newsletter's 2019 spring edition. In addition, an interim online update was circulated to project participants August 2018 (Appendix 3).

To provide project participants, fishery officers and any other stakeholders a summary of the project's outputs and work, a round up newsletter was drafted December 2019 and sent to Marine Scotland for circulation. At the end of the Project in March 2020 the newsletter had not been published (Appendix 4).

Short videos summarising the results and findings of selected Work Packages were produced (2 – 7 minutes). The videos provided an alternative and engaging format to disseminate the results of the Work Packages. The videos were uploaded on the SIFIDS webpage and MASTS YouTube channel. The aim of uploading the videos online was to provide the opportunity for anyone to watch the videos, use them at meetings or share them with others. Videos were submitted to Marine Scotland for authorisation to publish. Further information regarding the videos can be found in the final WP7 report. At the end of the Project in March 2020 the videos had not been published.

6. A key responsibility of the PCT was to keep inshore fishery stakeholders updated with the project's progress, this was also undertaken by the Project Facilitators. Representation of the SIFIDS Project at the Scottish Inshore Fisheries Conference (2017 and 2018) and MASTS Annual Science Meeting (2018 and 2019) assisted this objective. Other forms of project representation undertaken by the PCT and Project facilitation is outlined in Appendix 1.
  
7. Upon successful completion of a work package its final report was submitted to Marine Scotland. At the end of the Project in March 2020 none of the final reports had been released into the public domain. The PCT will upload all final reports onto the SIFIDS webpage when granted the authorisation to do so from Marine Scotland. All final reports were reviewed by the PCT before final submission to Marine Scotland. Due to their technical nature, the final reports from Work Packages 2A/B, 6, 7 and 8a were not reviewed externally. Work Packages 1, 3, 4, 5 and 8B were externally reviewed. The aim of the external review was to have the Work Package's approach critically evaluated and to ensure their objectives had been achieved (Table 1). An additional final report was created for WP6, the WP6 Plus final report documents the additional research undertaken by the PCT and technical members within the University of St Andrews with regards to low-cost tracking device field tests and the further development of the SIFIDS graphic user interface.

**Table 1.** The reviewers of each Work Package (WP) and their affiliated organisation.

WP	Reviewer	Organisation
1	Liz Clarke	Marine Scotland Science
1	Paul Hart	University of Leicester
1	Magnus Johnson	University of Hull
1	Helen Dobby	Marine Scotland Science
3	John Baxter	Previous Principal Marine Adviser at Scottish Natural Heritage
4	Cornelius Chikwama	Marine Analytical Unit of Marine Scotland
4	Estelle Jones	Marine Scotland Science
4	Kate Johnson	Hariot Watt University
4	Nick Hanley	University of Glasgow
5	David Donnan	Scottish Natural Heritage
8b	Andronikos Nikos	Marine Scotland Science
8b	Estanis Mugerza	AZTI Tecnalia
8b	Lucia Zarauz	AZTI Tecnalia

Information regarding the hardware specifications developed and software written by Work Package teams were passed to Marine Scotland.

8. Throughout the project there were several amendments to the way that WP's were to meet their objectives, for instance, to ensure WP2B met its objective of "*Design a deck based data collection tool that can capture species, sex, length, fishing effort, fate of catch, and quantity caught, and be able to automatically process some of this data and send it to the OBCDCS being developed in WP2A*" there had to be a reallocation budget which was approved initially by Marine Scotland and then communicated to the EMFF team. Financial amendments are discussed below in the Financial Claims section.

Other amendments that did not require a budget reallocation included the project's extension from its original end date of 31<sup>st</sup> May 2019 to 29<sup>th</sup> February 2020. The Project's extension was the result of underspend in some University of St Andrews based Work Packages, such as poor weather restricting field work for WP3. The extension also provided staff the time to collate all the requested information for the financial claims, which included additional evidence for previously submitted and accepted claims.

9. Despite being unable to distribute the SIFIDS newsletter and Work Package videos at the end of the project, all fishers who assisted the project by either hosting kit on their vessels or used the SIFIDS FISH1 app (see Work Package 5 for more details) were contacted in March 2020 with their personal log-in details to the SIFIDS graphic user interface. This action was to provide fishers/vessel owners the opportunity to see the data that was collected by SIFIDS developed kit and software about their vessels. Fishers were contacted individually with their log-in details and a user-guide document. By allowing fishers access to the SIFIDS graphic user interface the project has built a demonstratable feedback loop to the fishers – providing them their data. This action was not an original objective of the project, but it was a fundamental principle to enable

fishers access to their data. The University of St Andrews will maintain the graphic user interface until the end of May 2020. The PCT will collate any feedback on the graphic user interface from the fishers in order to understand what worked and what did not, but this will not form a formal report.

## Financial Claims

Throughout the project's duration financial claims were collated by the Project's financial coordinator and University of St Andrews Finance and Support team (FAS). It was agreed within the SIFIDS Project award letter that a financial claim would be uploaded onto the EMFF portal. Claims included all of the Project's financial expenditures during that quarter, including invoices from subcontractors and University of St Andrews salary information. In October 2018 the SIFIDS PCT were notified of an upcoming random financial audit by the Scottish Government Internal Audit Directorate. The audit covered the Project's procurement and second financial claim (March, April and May 2017). Upon notification, two meetings at the University of St Andrews were organised by the Project Manager to assist the audit, 4<sup>th</sup> and 11<sup>th</sup> December 2018. Relevant paperwork was provided at both meetings and uploaded onto an online secure shared folder by which members of staff could submit requested documentation as and when needed. Communications between the Project Manager and the Internal Audit and Assurance team assisted the audit of both the project's procurement and second financial claim.

A consequence of the audit was that the subsequent financial claims submitted to EMFF were required to be more in depth than initially agreed at the outset of the Project. In particular, the salary breakdown information for each member of University of St Andrews staff working on the project, including information regarding individuals pay from previously submitted and paid claims. The PCT was heavily dependent on the University's internal Human Resources team for the provision of the required information, however, due to sheer volume of data requested this was a hugely time-consuming exercise for all members of staff involved. In particular, many data entries had to be redacted from official documentation to protect other working members of staff payment details. Due to the size of the Project's financial claims, face to face meetings between the Project's key finance team and EMFF were held at the University of St Andrews. It was found to be highly beneficial for all to discuss the financial claims in person and allowed staff to provide requested information on the day directly to EMFF team.

During the project, there were five between Work Package budget reallocations. Justification for the requested reallocation of budget was sent to the Head of Inshore Fisheries and Coastal Communities, or other designated representatives of Marine Scotland. Each movement was documented as a Notification of Change on the EMFF online portal. A new Amended Award Letter which was signed by the Head of Marine Scotland Grants Team and by the Head of Financial Advice and Support at the University of St Andrews after each movement.

### Movement 1

£5,500 from WP10 to WP2B (Seascope Fisheries Research Ltd)

To pay for the salary of a PhD student who conducted the brown crab and lobster morphometric study discussed in the WP2A/B final report.

### Movement 2

£11,500<sup>2</sup> from WP8B to WP2B (Seascope Fisheries Research Ltd)

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<sup>2</sup> Originally written to Marine Scotland in two separate movements of £8000 to develop the ASSSID equipment and £3500 as incentive payment - £2500 (5x£500) and a further £1000 one off payment to cover the vessel chosen to conduct additional ASSSID trials.

To pay for the development of the crab and lobster 2D laser ASSSID (Automated Species, Size and Sex Identification) in WP2b and to provide payment to fishers who granted Seascope to trial equipment on their vessels, Please see the WP2A/B final report for more information.

### Movement 3

£17,416.80 from WP3 to WP2B (Seascope Fisheries Research Ltd)

To pay for additional observer work on other scallop dive vessels and *nephrop* creelers to extend the applicability of the models developed for crabs and lobster creelers under WP8b.

### Movement 4

£8395.14 from WP5 and £3549.89 from WP8B to WP10

The resulting increased workload due to EMFF requests for further documentation as part of the financial claims had not been budgeted for in the Project Manager's and Financial Coordinator salary, thus budget was moved.

### Movement 5

A total of £1,449.82 was removed from WPs 2b, 9 and 10 and added to WP7, 9a and 10a<sup>3</sup>. The movement covered a small overspent in WP7 and the overhead expenditure for WP9 and 10. The resulting increasing workload due to EMFF request for further documents for the financial claims has not budgeted for the project Managers and Financial Coordinator overhead, thus budget was moved.

The overall budget total for the SIFIDS Project did not change. Final expenditure of the project was £1,497,980.52. Project financial claim components that were not accepted due to insufficient paperwork totalled £1,763.88.

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<sup>3</sup> WP9a and WP10a were the "Simplified cost option (overheads)" budgets for the University of St Andrews WPs.

## APPENDIX 1. INDUSTRY ENGAGEMENT ACTIVITIES

**Table 1. Meetings, presentations and other forms of engagement summary given or attended by the Project Coordination Team and/or Project Facilitators (WP7).**

Month/Year	Communication	By	Main Audience
Feb-17	Presentation to Outer Hebrides RIFG Meeting, via video conference (VC).	Ali McKnight, Kyla Orr (WP7 facilitators)	Outer Hebrides RIFG executive committee and attendees
Mar-17	Attended North and East Coast RIFG Meeting, Perth	Kathryn Logan (WP7 facilitator)	N&EC RIFG executive committee and attendees
Mar-17	Presented at the Marine Scotland Compliance Conference	Mark James	various members of Marine Scotland Compliance, predominately Fishery Officers
Apr-17	Presented at West Coast RIFG Meeting, Glasgow	Kyla Orr (WP7 facilitator)	WC RIFG executive committee and attendees
Apr-17	Scottish Inshore Fisheries Conference - Session to introduce the EMFF-funded Scottish Inshore Fisheries Integrated Data System (SIFIDS) Project	presentations from Mark James, Jim Watson, all Work Package team leaders, including WP7 facilitators	Conference attendees
Apr-17	Meeting with Fisherman's Mutual Association, Pittenweem about recruiting fishers to host observers (WP8)	Kyla Orr and Kathryn Logan (WP7 facilitators)	Chair of Fisherman's Mutual Association, Pittenweem
May-17	Collective Review meeting of all SIFIDS Work Package and overall progress	Presentations from all Work Package team leaders	Members of Marine Scotland and chair of WC rIFG <i>Members from Marine Scotland Policy, Compliance and Science and any other teams deemed appropriate were openly invited to the meeting</i>
May-17	Meeting with North West Responsible Fisherman's Association, Kyleakin, about recruiting fishers to host observers (WP8)	Kyla Orr (WP7 facilitator)	Members of North West Responsible Fisherman's Association
May-17	SIFIDS leaflets circulated and contacts made at Skippers expo	Kathryn Logan (WP7 facilitator)	Fishermen delegates and stand-holders

<b>Sep-17</b>	Collective Review meeting of all SIFIDS Work Package and overall progress	Presentations from all Work Package team leaders	Members of Marine Scotland and chair of WC rIFG <i>Members from Marine Scotland Policy, Compliance and Science and any other teams deemed appropriate were openly invited to the meeting</i>
<b>Sep-17</b>	Brief project update provided at North and East coast RIFG meeting, Perth	Kathryn Logan (WP7 facilitator)	N&EC RIFG executive committee and attendees
<b>Oct-17</b>	Attendance and delivery of SIFIDS presentation at Marine Scotland Compliance Conference, Aviemore	Kyla Orr, Ali McKnight (WP7 facilitators) and Tania Mendo	Conference attendees (MS Compliance)
<b>Oct-17</b>	Presented at West Coast RIFG Meeting, Glasgow	Kyla Orr (WP7 facilitator)	WC RIFG executive committee and attendees
<b>Oct-17</b>	Port visits made by facilitators to following locations to recruit vessels to host observers for WP8: Oban, Balvicar, Stonehaven and Montrose	Kyla Orr and Ali McKnight (WP7 facilitators)	Face-to-face communication with fishers at ports
<b>Nov-17</b>	Port visits made by facilitator to recruit vessels to host observers for WP8 incl. Eyemouth, Burnmouth and St Abb	Kathryn Logan (WP7 facilitator)	Face-to-face communication with fishers at ports and local Fishery Officer
<b>Jan-18</b>	Brief update and flyer provided at North and East Coast RIFG, Perth	Kathryn Logan (WP7 facilitator)	N&EC RIFG executive committee and attendees
<b>Feb-18</b>	SIFIDS internal update meeting	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>Mar-18</b>	Presented at Marie Scotland Compliance Conference	Hannah Ladd-Jones, Kyla Orr (WP7) and Ali McKnight (WP7)	various members of Marine Scotland Compliance, predominantly Fishery Officers
<b>Apr-18</b>	Collective Review meeting of all SIFIDS Work Package and overall progress	Presentations from all Work Package team leaders	Members of Marine Scotland and chair of WC rIFG <i>Members from Marine Scotland Policy, Compliance and Science and any other teams deemed appropriate were openly invited to the meeting</i>
<b>Apr-18</b>	SIFIDS article published in Spring 2018 RIFG newsletter	Project Co-ordination Team and WP7 facilitators	Marine Scotland, RIFG members, SIFIDS participants and wider stakeholders and fisheries interests.

<b>Apr-18</b>	Presentation to Outer Hebrides RIFG Meeting, via video conference (V-C).	Ali McKnight, Kyla Orr (WP7 facilitators)	Outer Hebrides RIFG executive committee and attendees
<b>Apr-18</b>	Update provided at North and East Coast RIFG Meeting, Perth	Kathryn Logan (WP7 facilitator)	N&EC RIFG executive committee and attendees
<b>May-18</b>	Presented at West Coast RIFG Meeting, Glasgow	Kyla Orr (WP7 facilitator)	WC RIFG executive committee and attendees
<b>Jun-18</b>	Port visits made by facilitators at following locations recruit vessels to host observes for WP8: Mallaig, Glenuig, Gairloch, Ullapool, Achiltiebuie	Kyla Orr and Ali McKnight (WP7 facilitators)	Face-to-face communication with fishers at ports
<b>May-18</b>	Attended and distributed information at Aberdeen Skipper Expo	Hannah Ladd-Jones and Kathryn Logan (WP7)	Public and other organisations attending
<b>Jun-18</b>	Poster presented at International Fisheries Observer & Monitoring Conference "Identifying fishing behaviours of inshore fishing vessels targeting crabs and lobsters around Scotland"	Mark James and Grant Course (Seascope, WP2a, 2b, 6 and 8a)	Conference attendees
<b>Jul-18</b>	Attended the Bi-Annual Scottish Fishing Conference 2018 for networking and disseminating the work of SIFIDS where appropriate	Hannah Ladd-Jones	Conference attendees
<b>Aug-18</b>	Brief update provided at North and East Coast RIFG, Perth	Kathryn Logan (WP7 facilitator)	N&EC RIFG executive committee and attendees
<b>Aug-18</b>	e-Newsletter issued to SIFIDS participants providing project update	Project facilitators	All SIFIDS participants
<b>Sep-18</b>	SIFIDS internal update meeting	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>Oct-18</b>	Online SIFIDS Internal update meeting to discuss the content of SIFIDS workshop at the MASTS ASM 2018	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>Oct-18</b>	Collective Review meeting of all SIFIDS Work Package and overall progress	Presentations from all Work Package team leaders	Members of Marine Scotland and chair of WC rIFG <i>Members from Marine Scotland Policy, Compliance and Science and any other teams deemed appropriate were openly invited to the meeting</i>

<b>Oct-18</b>	Hosted a SIFIDS workshop at the Inshore Fisheries Conference which aimed to inform attendees of the SIFIDS WPs and their results/work, and to get feedback from the industry	Led by Hannah Ladd-Jones and Mark James with presentations from all Work Package team leaders	Attendees of the workshop: fishers, Marine Scotland members, national and local fishing associations
<b>Oct-18</b>	Hosted evening port-side meetings / drop-in sessions in Kyleakin and Arbroath for fishers to learn about WP5 smartphone App and enrol in trial	Kyla Orr (WP 7 facilitator)	Meetings were intended for fishers, however attendance was very low (~ 2 fishers per event).
<b>Nov-18</b>	Hosted evening port-side meetings / drop-in sessions in Tarbert and Campbeltown for fishers to learn about WP5 smartphone App and enrol in trial	Ali McKnight (WP 7 facilitator)	Meetings were intended for fishers, however attendance was very low (~ 2 fishers per event).
<b>Nov-18</b>	Poster at MASTS ASM 2018 "Using mobile phone technology to capture small scale fisheries data – is this the future?"	Hannah Ladd-Jones	MASTS ASM attendees
<b>Nov-18</b>	Hosted a SIFIDS Workshop at the MASTS ASM to discuss the results of the SIFIDS Work Packages and to feedback from those in government involved in aspects of inshore fisheries management	Led by Hannah Ladd-Jones and Mark James with presentations from all Work Package team leaders	Members of Marine Scotland and chair of WC rIFG <i>Members from Marine Scotland Policy, Compliance and Science and any other teams deemed appropriate were openly invited to the meeting</i>
<b>Jan-19</b>	Attended the Fishing Industry Coastal Community Conference to disseminate the work of SIFIDS where appropriate	Mark James	Attendees
<b>Jan-19</b>	Attended Community Inshore Fisheries Alliance (CIFA) meeting in Glasgow to liaise with key members and promote SIFIDS	Ali McKnight (WP 7 facilitator)	Members of CIFA, members of Marine Scotland, the wider public and politicians.
<b>Feb-19</b>	SIFIDS internal update meeting	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>Feb-19</b>	Collective Review meeting of all SIFIDS Work Package and overall progress	Presentations from all Work Package team leaders	Members of Marine Scotland and chair of WC rIFG <i>Members from Marine Scotland Policy, Compliance and Science and any other teams deemed appropriate were openly invited to the meeting</i>

<b>Feb-19</b>	Poster at Scotland's International Marine Conference "Electronic reporting and collection of data on Scotland's small-scale inshore fishing fleet"	Hannah Ladd-Jones	Public and other attendees
<b>Mar-19</b>	Presentation at West Coast RIFG meeting	Ali McKnight (WP 7 facilitator)	WC RIFG executive committee and attendees
<b>Apr-19</b>	SIFIDS internal update meeting	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>May-19</b>	Attended "tackling Marine plastics through the fishing gear value" to understand the impacts of fishing gear on the environment and highlight work on vessels monitoring techniques developed in the SIFIDS Project	Hannah Ladd-Jones and Kathryn Logan (WP7)	fishers, national and local fisher association representatives, environmental groups, members of Marine Scotland and other governmental teams
<b>May-19</b>	Presentation at Clyde Fishermen's Association AGM	Kathryn Logan (WP7)	Clyde FA members and guests including various Marine Scotland and other agency representatives
<b>Jun-19</b>	Presentation (by VC) to Outer Hebrides RIFG meeting	Ali McKnight (WP 7 facilitator)	Outer Hebrides RIFG members and attendees
<b>Jun-19</b>	SIFIDS internal update meeting	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>Jul-19</b>	Attended the Future of Fisheries National Discussion Event to participate in discussion with interests in inshore fisheries and disseminate the results of SIFIDS where appropriate	Hannah Ladd-Jones and Ali McKnight (WP7)	Attendees: members of Marine Scotland, environmental groups, representatives of national and local fishery associations,
<b>Aug-19</b>	Presentation at WC RIFG meeting	Ali McKnight (WP 7 facilitator)	WC RIFG executive committee and attendees
<b>Sep-19</b>	SIFIDS internal update meeting	Hannah Ladd-Jones and Mark James	Marine Scotland policy
<b>Sep-19</b>	Presentation at Solway Firth Coastal partnership meeting	Ali McKnight (WP 7 facilitator)	Solway Firth Partnership members and invitees
<b>Sep-19</b>	Presented at NE Coast rIFG meeting	Hannah Ladd-Jones and Mark James	Attendees: RIFG members, local fisher representatives, organisations and Marine Scotland members
<b>Sep-19</b>	Presentation at Solway Firth Partnership Sub-group meeting	Ali McKnight (WP 7 facilitator)	Solway Firth Partnership - sub group members

<b>Sep-19</b>	Presented a talk at the Seafish UKFEN inshore fisheries socio-economic symposium summarising the results of WP 4 and discussing other results of the SIFIDS Project	Hannah Ladd-Jones and Andrew Parker (Imani, WP4)	Members of inshore fishery research group, socio-economists, environmental groups, representatives of national and local fishery associations
<b>Oct-19</b>	Attended Priority Marine Features Review meeting, Edinburgh, to share information	Ali McKnight and Kyla Orr (WP 7 facilitators)	Delegates representing multiple organisations
<b>Oct-19</b>	2 x posters at MASTS ASM - "Low-cost solar trackers – how off-the-shelf equipment can be used to collect data from small-scale fisheries" and "The feedback loop – providing Scottish inshore fishers their unseen data "	Rene Swift and Swithun Crowe	MASTS ASM attendees (including Hannah Ladd-Jones and WP7 facilitators networking.)
<b>Oct-19</b>	2 x presentations at MASTS ASM - "Factors affecting small scale fishers' behaviour in Scotland" and "The Scottish Inshore Fisheries Integrated Data System - what has been achieved?"	Janneke Ransijn and Mark James	MASTS ASM fisheries session attendees
<b>Oct-19</b>	Presentation at 'International Conference of Oceans Governance in Archipelagic Regions' about the Governance for sustainability highlighting the results of using low-cost trackers as a cost-effective system for managing small-scale fisheries using SIFIDS work as an example	Mark James	Conference attendees
<b>Oct-19</b>	Attended the Seafish 'Future of Our Inshore Fisheries' Conference to distribute information about the SIFIDS Project	Hannah Ladd-Jones	Attendees: inshore fishery researchers, environmental group representatives, fishers from across the UK, representatives of national and local fishery associations
<b>Oct-19</b>	Presented at SNH's 'Understanding Fish in Inshore Waters' workshop about SIFIDS technological developments and results from initial trials	Hannah Ladd-Jones	Attendees: fishery researchers, SNH members, governmental environment teams
<b>Oct-19</b>	Presented at the Berwickshire Shellfish Symposium discussing the results of the SIFIDS project	Hannah Ladd-Jones	Attendees: local fishers, fishery researchers, representatives of national and local fishery associations and teams

<b>Oct-19</b>	Presented at Peru's National Innovation Program on Fisheries and Aquaculture the innovative technological solutions SIFIDS had developed for management small-scale fisheries	Mark James	Attendees: fishery researchers from South American countries and around the world, representatives of national and local fishery associations
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## APPENDIX 2. EXTERNAL ATTENDEES TO THE COLLECTIVE REVIEW MEETINGS

A list of all attendees external to the SIFIDS Project who attended the collective review meetings

13 <sup>th</sup> December 2016	5 <sup>th</sup> May 2017	27 <sup>th</sup> September 2017	3 <sup>rd</sup> April 2018	4 <sup>th</sup> October 2018	14 <sup>th</sup> February 2019
<ul style="list-style-type: none"> <li>• Jim Watson (Marine Scotland)</li> <li>• Nick Lake (Marine Scotland)</li> <li>• Alastair McNeill (Chair, West Coast RIFG)</li> <li>• Jim Furness (Omni Marine (consultant))</li> </ul>	<ul style="list-style-type: none"> <li>• Nick Lake (Marine Scotland)</li> <li>• Estelle Jones (Marine Scotland)</li> <li>• Alastair McNeill (Chair, West Coast RIFG)</li> </ul>	<ul style="list-style-type: none"> <li>• Jim Watson (Marine Scotland)</li> <li>• Nick Lake (Marine Scotland)</li> <li>• Estelle Jones (Marine Scotland)</li> <li>• Alastair McNeill (Chair, West Coast RIFG)</li> </ul>	<ul style="list-style-type: none"> <li>• Jim Watson (Marine Scotland)</li> <li>• Nick Lake (Marine Scotland)</li> <li>• Allan Gibb (Head of Sea Fisheries Policy)</li> <li>• Jane MacPherson (Marine Scotland)</li> <li>• David Turnball (Marine Analytical Unit)</li> <li>• Kerrie Campbell (Marine Scotland Change Projects)</li> <li>• Ally Young (Marine Scotland Compliance)</li> <li>• Andronikos Kafas (Marine Scotland Science)</li> <li>• Carlos Mesquita (Marine Scotland Science)</li> <li>• David Donnan (Scottish Natural Heritage)</li> <li>• Alastair McNeill (Chair, West Coast RIFG)</li> </ul>	<ul style="list-style-type: none"> <li>• Cornilius Chikwama (Marine Scotland)</li> <li>• Estelle Jones (Marine Scotland)</li> </ul>	<ul style="list-style-type: none"> <li>• Nick Lake (Marine Scotland)</li> <li>• David Turnball (Marine Analytical Unit)</li> <li>• Ally Young (Marine Scotland Compliance)</li> <li>• David Donnan (Scottish Natural Heritage)</li> <li>• Alastair McNeill (Chair, West Coast RIFG)</li> <li>• Diane Buchanan (Marine Scotland)</li> <li>• Gordon Hart (Marine Scotland Policy)</li> <li>• Campbell Pert (Future Fisheries Management)</li> <li>• Ally Young (Marine Scotland Compliance)</li> <li>• Anne McLay (Marine Scotland Science),</li> <li>• Paul Haddon (Senior Fishery Officer)</li> <li>• Norman Fletcher (Fully Documented Fisheries)</li> </ul>

# APPENDIX 3. SIFIDS NEWSLETTER SENT IN AUGUST 2018 TO PROJECT PARTICIPANTS (3 PAGES)

AUGUST 2018

ISSUE 1

## SIFIDS NEWS

### CONTACT US

Project Facilitators:

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or

FREEPHONE: 0800 043 3474



# SIFIDS

Scottish Inshore Fisheries  
Integrated Data System

## Observation Sea Trips 2017/2018 - Thank you!

### INTHISISSUE:

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### OBSERVATION SEA TRIPS -THANK YOU!

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### MOBILE PHONE APP / E-FISH FORM

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### INSHORE FISHERIES CONFERENCE 2018

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A big thank you goes to all who supported Work Package 8A by having a SIFIDS researcher on board your vessel during 2017 and 2018. We are very pleased to say that with your help we have now met our target of over 130 sea trips (see distribution below).

The information gathered will provide a much clearer picture of how 12 meter and under static gear vessels and crews operate when fishing and recording the composition of their catch. This, in turn, will help SIFIDS ensure the development of the prototypic 'on-board data management system' and data recording apps (that are part of the overall SIFIDS objectives) is practical and workable.

The areas involved and the number of trips completed were:

	Summer trips	Winter trips
Outer Hebrides	17	-
Argyll	17	7
West Highlands	24	3
Outer Moray Firth	5	-
North East	21	11
Forth and Tay	17	10
<b>TOTAL</b>	<b>101</b>	<b>31</b>

Continued...



Thank you also to those skippers/owners who have agreed to further this work by taking part in Work Package 2A, which aims to test the 'on-board data capture system' which will collect data from a variety of automated onboard sources.

Your trips have been invaluable for the researchers and equipment testing.

### Observation Sea Trips continued

31 skippers hosted two trips (one summer and one winter) to provide a valuable comparison, so an extra thanks goes to those of you who permitted this for your additional time and input.

You have told us that the researchers succeeded in minimising any disruption to your normal fishing activities, but we appreciate there is always some time required before, during and after trips so we very much appreciate your help.

Due to the early gales, the late start to the season and to minimise travel time / costs, the observers unfortunately were unable to complete a trip with everyone who volunteered, but we are grateful for your offer and hope there may be an opportunity for you to take part in another project element.

## Smartphone App / e-FISH 1 Form

Information will be coming soon about a prototype (Android) mobile phone application we are developing which you may be interested in trialling (Aug - Nov 2018). Under the trial, skippers of 10 meter and under vessels will be able to:

- Complete an **electronic FISH1 form** and email this direct to their Fishery Office via their phone;
- Use an **optional GPS tracker** to record co-ordinates when fishing starts and automatically insert these and the ICES square on the form; and
- Record any **sightings or observations** on a range of marine species.

Fishermen helped to shape the app by giving their views on the usefulness of different features and as a result we are now working with the Fishery Offices to check the e-FISH1 form meets their requirements .

Please email us at [SIFIDS.app@gmail.com](mailto:SIFIDS.app@gmail.com) or contact the SIFIDS Freephone helpline- **08000 433474** for more information.



## Inshore Fisheries Conference 2018

Have your say on how Scotland's inshore fisheries are managed!

FREE Registration is now open for the Scottish Inshore Fisheries Conference being held in Inverness on Friday 5th October.

As well as the plenary and networking sessions, there are four breakout sessions including a presentation on next steps by our SIFIDS team. You can choose to attend two of the four:

- What Coastal Fishing Communities Can Bring to Science, Sustainability & Governance
- The potential of low impact fishing for Scotland
- Implementing the Scottish Inshore Fisheries Integrated Data System
- Improving Inshore Fisheries Data

We hope to see you there. For more details and to register please visit <https://t.co/WYYTPNc5mL>



SCOTTISH  
INSHORE FISHERIES  
CONFERENCE 2018

5th OCTOBER 2018  
EDEN COURT  
INVERNESS

Join us for the fifth Scottish Inshore Fisheries Conference at Eden Court, Inverness on Friday 5th October 2018, and have your say on how inshore fisheries are managed!

The theme of this year's conference will be the future of fisheries management in Scotland, and a range of interesting topics will be up for discussion. Fergus Ewing MSP, Cabinet Secretary for the Rural Economy and Connectivity, will be in attendance to open proceedings and give the keynote speech.

The conference is an ideal opportunity to meet people from around Scotland and beyond with an interest in inshore fishing. Active fishermen are encouraged to attend and share their knowledge and experiences with others in an informal setting.

Delegate registration will open in July, and we look forward to welcoming you to the 2018 Scottish Inshore Fisheries Conference in October.



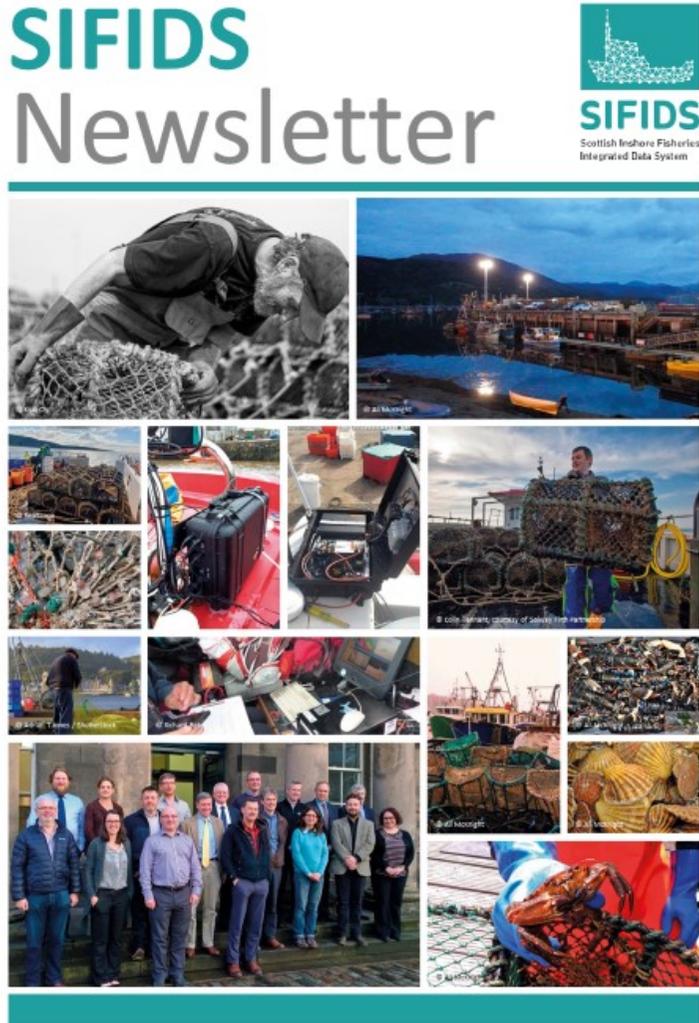
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Riaghaidh na h-Alba  
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# APPENDIX 4. SUMMARY SIFIDS ROUND-UP NEWSLETTER (16 PAGES)



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# SIFIDS News – End of Project Reporting (2016- 2019)

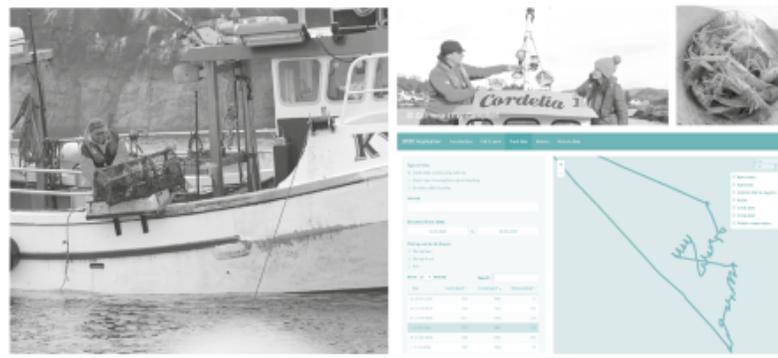
January 2020

## A BIG THANK YOU!

The SIFIDS team warmly thanks the many individual fishers, groups and organisations who have contributed to the success of the SIFIDS project. Support and feedback from fishers, industry representatives, Marine Scotland staff and many other stakeholders around Scotland has been pivotal to the SIFIDS Project carrying out wide-ranging work to identify ways to improve data collection across the inshore fleet. Over 130 vessel skippers in 43 ports around Scotland hosted research trips, while others have undertaken longer-term trials including GPS tracking, gear sensing or shellfish scanning devices. Many more took part in the socio-economic and online surveys and several fishers contributed significantly to equipment and software development.

## Main Project Outcomes and Recommendations

- A possible blue-print for an integrated, secure and cost-effective system of data gathering and sharing to empower fishers and managers;
- New, prototypic technology to automate data collection and minimise reporting burdens e.g.
  - simple low-cost GPS tracking equipment trialled, with solar-powered options;
  - linking GPS tracks, gear deployment sensors and catch data to assess fishing intensity and Catch Per Unit Effort;
- A world-first prototypic crab and lobster scanner capable of determining the sex and size of live animals at-sea;
- Proposals to enhance methods of shellfish stock-assessments and scallop habitat monitoring;
- Combining socio-economic data with fishing drivers to inform policy and business planning.



## Why Do We Need to Improve Data?

Accessible data on the location of fishing, fishing effort, and more timely stock assessments are required at a finer spatial resolution to improve local fisheries management, to fulfil compliance regulations and to help ensure that stocks are sustainably managed. The concept of adaptive management can only be realised when individual fishers and associations also have data needed to monitor and enhance the performance of their own businesses and demonstrate good practice.

A key priority of the Government's Scottish Inshore Fisheries Strategy and Regional Inshore Fisheries Groups is to acquire better data through the inshore fleet. Scotland's National Marine Plan, while recognising the importance of the inshore fishing industry to local communities, to Scotland's economy and future food security, underlines the wider range of cross-sectoral data requirements.

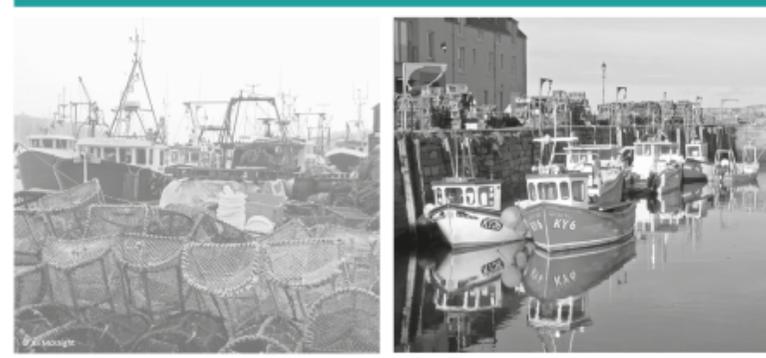
It is crucial that any systems and processes designed to address these requirements are proportionate and appropriate for use on inshore vessels. A fundamental principle of SIFIDS has been to identify options that use open-source software and off-the-shelf technologies – minimising the cost and retaining a lot of future flexibility to adapt and develop optimal data collection and analysis solutions.

### Policy, Legislative and Regulatory Context

The Scottish Government's Programme explicitly identifies as a priority the modernisation of the Scottish inshore fisheries fleet, including the deployment of technologies such as remote electronic monitoring (REM) for scallop fishing vessels and the introduction of tracking systems across the inshore fleet (<https://www.gov.scot/publications/inshore-fleet/> (<https://www.gov.scot/publications/protecting-scotland's-future-governments-programme-scotland-2019-20/>)).

The Regulation of Scallop Fishing (Scotland) Order 2017 (RSFO), prescribes for scallop dredge vessels operating in Scottish waters, the specification for REM equipment and its functionality ([http://www.legislation.gov.uk/ssi/2017/127/pdfs/ssi\\_20170127\\_en.pdf](http://www.legislation.gov.uk/ssi/2017/127/pdfs/ssi_20170127_en.pdf)).

It is likely that in the near future the Scottish Government will require all Scottish-managed commercial fishing vessels under 12m in length, operating in Scottish waters to carry some form of basic tracking device. Some vessels may also be required to carry additional equipment for detecting when gear is deployed and retrieved.



## The SIFIDS 'Integrated Data System' Model

The combined results of all the SIFIDS work packages have enabled us to identify a comprehensive package of protocols offering a partially-automated, integrated, cost-effective and low-maintenance system of data collection and reporting. We believe this could meet the requirements of government and the fishing industry, without overburdening fishers in terms of reporting.

This combined data system offers an approach that would involve fishers in the central provision of data needed for the future sustainability of the sector and provide rapid feedback to fishers for dynamic and adaptive management. However, this approach would require a step-change in current practice and thinking.

Understandably the majority of fishers prefer that their data remains confidential. By using mobile phone technology, GPS tracks and other data can be transmitted to a secure database that would provide

fishers with access to their own data. An agreed level of access to data would then also be required for statutory/regulatory purposes. Fishers could also elect to provide others with access to their data for operational and business reasons.

The model proposes 5 main advances:

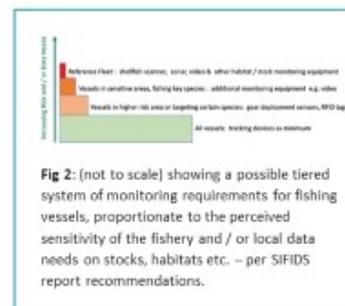
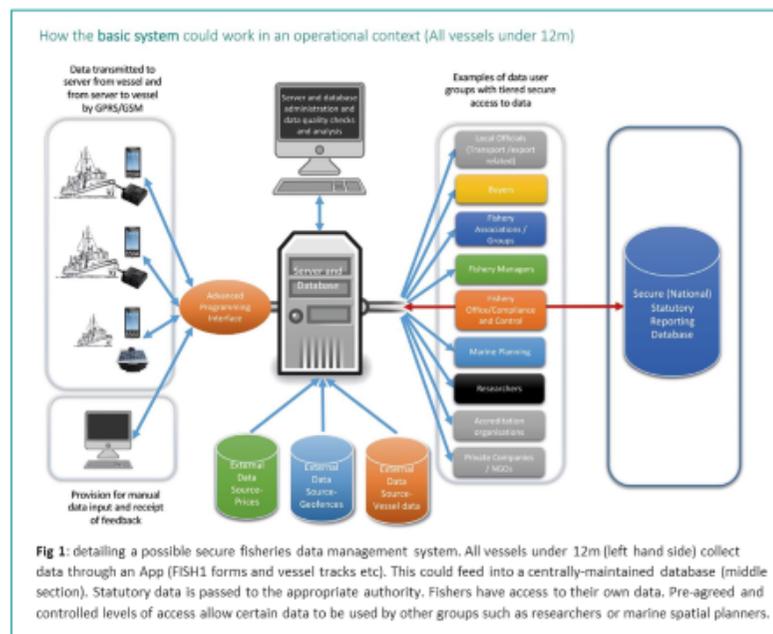
1. **Installing simple GPS tracking systems** on all under-12 metre inshore fishing vessels to provide better information on fishing location and effort, in conjunction with the current statutory records of landings and gear deployed. Ideally, an App, similar to the FISH1 mobile phone App that was developed as part of the SIFIDS project, would be used to provide a daily record of catch as well as landings (This minimum level of data is expected to provide sufficient information for the majority of the inshore fleet in Scotland, c. 1500 vessels)



2. **Using gear-sensors** to demonstrate when and where gear is being deployed or recovered, for example on some vessels using specific gear types, and/or operating in a sensitive area. SIFIDS trialled off-the-shelf RFID tag sensors, induction sensors, mechanical and hydraulic-hauler sensors. These devices (used in tandem with our On-Board Central Data Collection System (OBCDCS) which has GPS, GPRS and high data storage capacity), can provide near real-time data on when and where individually-identified gear or strings/fleets of gear are deployed or recovered. The extent of reporting or monitoring would be proportionate to the 'risk' level, or overall data needs of the fishery managers (see Fig 2).

carry the OBCDCS, gear sensors and occasionally, an operational version of the prototype Automated Species, Sex and Size Identification System (ASSSID – see below). This system can provide the necessary data for basic stock assessment.

4. **Developing low-cost, non-invasive methods to identify scallop grounds**, that could be deployed from an inshore fishing vessel. SIFIDS tested a range of techniques including state-of-the-art sonar which demonstrated that scallop grounds can be identified non-invasively. However, a simple collapsible tripod equipped with a Go-Pro-like video camera (drop-down camera) has proven an effective and cost-effective option and is, in principle, capable of recording images of scallops on the sea floor which could then be analysed automatically using Artificial Intelligence (AI). A suite of 4,000 scallop images is currently being used to "train" the AI system. If successful, further testing of the drop-down camera system and the trained AI system will be needed to confirm whether it will work effectively for scallop stock-assessment purposes.
5. **Creating a secure, relational database** with a simple user interface (visual display) to allow different user groups to access data in different ways e.g. fishers would see only their own data, MS Compliance could see data required for statutory purposes while fisheries managers and others would see aggregated, anonymised data.



3. **Establishing a small 'reference fleet'** to collect data that could assist stock assessments. The fleet would consist of selected fishing vessels that would

Detail on each component is given across the next 3 sections.

## GPS Tracking Trials

The SIFIDS project has built on the results of earlier projects trialling AIS reception and functionality around Scotland (including the 'Establishing the Location of Fishing Activities within Scotland' project (2014-2016) funded through the European Fisheries Fund (EFF)).

SIFIDS investigated the use of simple GPS units, connected to mobile telephone (GPRS) technology, to transmit vessel locations securely, rather than AIS which broadcasts location information using a radio signal that can be picked up by anyone with a receiver. After reviewing some of the IVMS technology available and conducting tests with simple GPS trackers, SIFIDS focused on tracking devices used widely in the road transport sector. As the tracking of commercial vehicle fleets takes place on a global scale, there are many well-tried, robust, and mass-produced tracking units. These sophisticated systems have excellent technical support, are produced in large numbers and are relatively inexpensive. For testing purposes, SIFIDS used Teltonika FMB202 and FMB204 tracking units. For vessels with reasonable power supply, the unit can be fitted directly to the vessel's ignition system. For vessels with poor or no power, a solar-powered version of the tracker has been developed.

Critical to the choice of tracking system was the ability to purchase inexpensive, but well documented and accessible hardware that is not limited by the licence conditions or costs associated with many commercial IVMS and fleet tracking systems. This approach enables the use of open-source software solutions to acquire the data from the tracking devices and to store, process, analyse and display the outputs with complete flexibility.



SIFIDS Newsletter

Results are very encouraging, and units seem to be easy and quick to fit, reliable and inexpensive to use. The solar system trials have provided important feedback which continues to inform ongoing trials over the winter period when low levels of sunlight and low temperatures might be expected to affect battery charging and endurance. The ability to put the tracking devices into "hibernation" when not in use is key to conserving battery power. Further field testing will allow us to refine the way the solar system operates to ensure that it functions seamlessly throughout the year.

### Potential Benefits of GPS Tracking for the Industry:

- Allows fishers to accurately document their ongoing use of fishing grounds, important both for fishery management and compliance purposes, and to inform other potential marine users (e.g. demonstrating fishing activity for marine renewable energy developments, aquaculture and Marine Protected Areas).
- GPS tracks are transmitted via mobile phone (GPRS) technology and are not visible to other vessels or to the public, therefore fishing locations remain confidential.
- The track data can be stored (on the tracker) and automatically transmitted when in mobile signal range.
- Cheaper and more flexible to use than AIS, important if we are to maximise the potential to use vessel track data as outlined below.
- Units can be programmed remotely, therefore require minimal attention.
- Vessel track-analysis can predict where gear has been hauled, potentially addressing some of the challenges around gear conflict.
- Catch Per Unit Effort calculations can be produced by combining vessel track-analysis with submitted weekly FISH1 forms.
- GPS track data could help show the provenance of catch for MSC or other certification schemes.

Final project reports and video: <https://www.masts.ac.uk/research/sustainable-scottish-inshore-fisheries/>

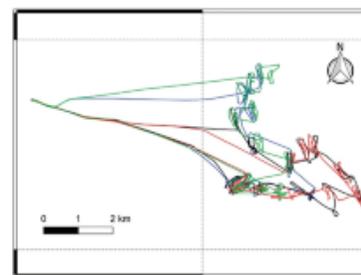


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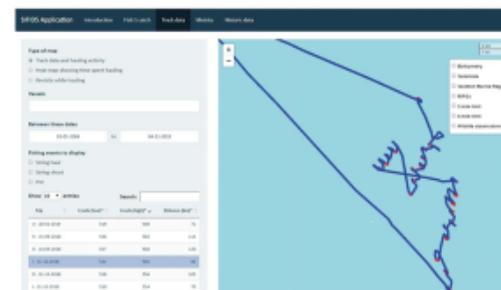
## What can a GPS Track tell us about Fishing Activities?

SIFIDS researchers undertook 135 sea trips on static-gear vessels around Scotland, thanks to 117 skippers who volunteered to help, with some hosting both a winter and summer trip. Researchers made detailed, timed observations of the different vessel activities, including steaming, shooting and hauling gear, whilst recording a GPS track. SIFIDS then compared the timings of hauling and shooting activities with the GPS tracks to analyse typical or "signature" patterns of movement, turning angles and speeds when hauling or shooting gear.

As a result, a computer model was developed which has proved to be over 96% accurate in estimating the true spatial extent of creel-fishing activity from GPS tracks alone, (given a 100 metre margin of error). What this means is that by simply collecting and analysing track data it is possible to predict when and where static gear is being recovered.



GPS tracks



Analysed GPS tracks predicting when hauling activity occurred (red sections)

SIFIDS Newsletter

So far, the computer model has only been tested for creel fishing activity. However, a short extension of the project enabled a further fifteen observer trips to be completed on nephrops trawl and scallop diving vessels and this data is in the process of being reviewed to see if other fishing methods also show signature vessel movement patterns.

It takes a fraction of a second for the track data from one vessel to be computer-analysed, so the entire inshore fleet's track data for any one day could be analysed in a few seconds. More detailed information is now available in published scientific papers (e.g. Mendo et al., 2019<sup>3</sup>). In addition to providing information on where fishing is taking place, it is also possible to estimate the number of creels being deployed and the soak time of the gear, providing important measures of "effort".

### GPS 'Ping' rates

The GPS trackers used can be set to record a location ("ping") every second, but we discovered that a "ping" once every 60 seconds provides enough information about creel-vessel movements to accurately estimate activity, without recording (and transmitting) unnecessary data. Other fishing gears may require a different "ping" rate.

A short project video about the interpretation of GPS tracking is available at <https://youtu.be/E2Pc9p2cH9k>

<sup>3</sup> Mendo, T., Smout, S., Russo, T., D'Andrea, L., & James, M. (2019). Effect of temporal and spatial resolution on identification of fishing activities in small-scale fisheries using pots and traps. *ICES Journal of Marine Science* <https://doi.org/10.1093/icesjms/fsz025>

Mendo, T., Smout, S., Photopoulou, T., & James, M. (2019). Identifying fishing grounds from vessel tracks: model-based inference for small scale fisheries. *Royal Society Open Science*, 6(10), 191161. <https://doi.org/10.1098/rsos.191161>

James, M., Mendo, T., Jones, E. L., Orr, K., McKnight, A., & Thompson, J. (2018). AIS data to inform small scale fisheries management and marine spatial planning. *Marine Policy*, 91, 112-121. <https://doi.org/10.1016/j.marpol.2018.02.012>

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## Calculating Fishing Effort Through Gear Deployment Sensors

Where it is considered necessary, additional equipment can be used in conjunction with a GPS track such as RFID (Radio Frequency Identification) tags and induction sensors to show exactly when and where gear is being used, as well as to count the number of pots being hauled.

SIFIDS has trialled the fitting of RFID tags to creel fleet buoys, which were swiped past an RFID reader during hauling to identify each creel fleet. Induction sensors that detect when a creel is brought onboard were also tested, providing an accurate creel count for each fleet. Sensors were also attached to haulers to record when they were in operation. All data was collected via the On Board Central Data Collection System (OBDCDS), which contains a GPS tracker connected to the sensors, providing an accurate time and position for gear deployed or recovered. Data was then sent via mobile telephone (GPRS) network to a central, secure computer server to be analysed and made available to the fisher. In an operational system, such data would, where appropriate,

also be sent to the Fishery Office or to contribute to (anonymised) national statistics.

Tracking data can be particularly useful in providing estimates of Landings Per Unit Effort (LPUE) by combining data on the predicted duration of time spent fishing, the amount of gear being used and the weekly FISH1 catch landings information submitted to Fishery Offices. Adding data collected on discards (such as undersized or berried lobster and crab) then provides Catch Per Unit Effort (CPUE). CPUE offers those involved in fishery management a clearer understanding of the fishing pressures and status of the targeted stock, and to determine if they are being fished to 'Maximum Sustainable Yield'. This is work in progress and the SIFIDS team are investigating if CPUE information could be used along with weather, temperature, fuel cost, catch price etc., to help fishers understand how their businesses are performing and perhaps inform decisions about the way they operate.



The Onboard Central Data Collection System installed on the wheelhouse of a vessel



The Onboard Central Data Collection System installed under the winch of a vessel, tracking the hauling of the vessel

## Electronic Reporting via a 'FISH 1' Mobile Phone App

Fishers have called for simpler ways to log their mandatory catch information and SIFIDS rose to this challenge by developing a trial FISH1 Form Android smartphone App. Furthermore, fishers gain valuable scientific and environmental knowledge at sea and it is important that their observations can be recorded in a more scientific way and taken into account as part of managing the fishery.

SIFIDS combined these two reporting needs into one mobile phone and tablet App to:

- help fishers complete and submit their FISH1 forms quickly and accurately to the Fishery Office; and
- enable easy and structured reporting of environmental and ecological observations of interest.

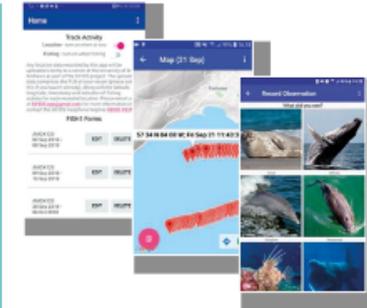
Examples of observations that could be recorded on the trial app were sightings of non-native, protected or endangered species (e.g. triggerfish, John Dory, wrasse, octopus and dolphins). Future versions would enable wider observations such as squid eggs on creels, soft shells on crabs and berried females, sightings of algal blooms or jellyfish swarms, fish spawning areas, or anything else of particular note.

To save fishers time, standard information for the FISH1 form such as the vessel, skipper and owner details, gear type and quantity, buyer registration number, target species etc. was entered only once to the App which automatically populated each week's form, with a facility to amend as required.

An optional GPS tracking function was built into the App to record the start of each fishing area. This automatically entered the specific latitude and longitude readings into the FISH1 form which saved fishers time in completing their returns.



The App became available for trial at the end of 2018 as an Android version and was trialled by twelve fishers, seven of whom regularly sent in their FISH1 forms under a special arrangement with the Fishery Offices.



Benefits reported by the fishers who used the App included:

- improved accuracy in their FISH1 forms
- submitted FISH1 forms on time
- daily catch data easy to access
- if used with tracking option it could potentially provide evidence of gear location

Feedback was very positive with various suggestions from fishers as to how a next version of the App could be enhanced such as:

- integrating with movement and export documents (digitised)
- the option for nominated data-sharing between partner boats or boat and processor
- showing MPAs or other sensitive areas on the map
- adding a geofence so the App starts automatically when the vessel leaves the port
- showing coloured tracks to distinguish between fishing and steaming
- provide a weekly spreadsheet with a summary of each day's data to allow future comparison
- adding more species to the observation list
- bigger on-screen buttons for easier use at sea

A short video provides an overview and fishermen's feedback on the trial app: <https://youtu.be/5wCjciHFVry>

## Reference Fleet for Stock / Environmental Data Collection

While SIFIDS has recommended that the majority of vessels would only need a GPS track to provide sufficient data for compliance purposes and to estimate basic effort, we also propose that fishers should be involved in the collection of biological data to feed into stock assessments. A small proportion of the fleet could, where appropriate, have the OBCDCS system together with the Automated Species, Sex and Size Identification (ASSSID) device.

### On-Board Central Data Collection System (OBCDCS)

An essential part of the integrated data system is the capacity to collect, store and forward a range of vessel position, fishing activity, effort and other data streams relevant to fisheries management.

SeaScope Fisheries Research developed an On-Board Central Data Collection System (OBCDCS) using 'off the shelf' components. This had to be easy to install and maintain, of low capital and running cost and require minimal power. The system developed provides a standard platform for the acquisition of sensor data and transmits both position and sensor data ashore using mobile phone networks. The system has the ability to accommodate a wide variety of sensors, and links that data with the position and time information.

Thirteen OBCDCS units were built and tested on board volunteer host vessels for up to a year, during which time the system logged over 35 million individual positional 'plings'. Skippers provided invaluable feedback on overcoming various design and operational challenges.



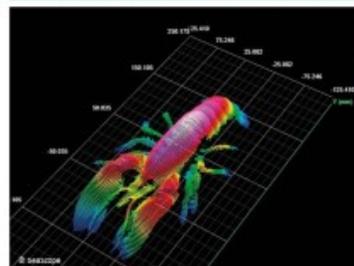
The RFID tags and inductive sensing kit developed was trialled on 5 vessels. This short video shows the system in operation: <https://youtu.be/eS-H-CdrzNw>

SeaScope's report identifies how these systems could be further developed and tested as part of a larger-scale

roll-out (Report reference: Ayers R., Course G.P. and Pasco G.R., 2019. *Scottish Inshore Fisheries Integrated Data System (SIFIDS): Development of an Autonomous Fisheries Data Harvesting System and Investigations into Novel Technological Approaches to Fisheries Data Collection*).

### ASSSID

The Automated Species, Sex and Size Identification (ASSSID) kit is a prototypic automated system created by SIFIDS team Seascope Fisheries Research to sex and measure common lobster and brown crab. The device contains a conveyor system and a 2D laser scanner, which captures and builds a 3D image of the animals passed under the laser on the small conveyor belt. The image is then analysed by bespoke software to rapidly identify the animal (crab, lobster or other), its carapace measurements and its sex. As stock assessments are time-consuming and expensive, the device was designed to be highly portable and can be installed either harbour-side to analyse landings or on the back of vessels to quickly analyse entire catches, or discards if required.

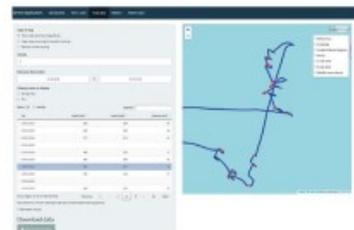


The ASSSID device can be linked to the OBCDCS to provide a date, time and GPS stamp for each animal scanned before it is either retained or discarded.



### Database with User-Friendly Visual Interface for Selected Users

SIFIDS developed a database and an online, easy-to-use interface that would allow different user groups to access data in different ways depending upon the privileges granted to them i.e. a fisher would only be able to see their own data, MS compliance would also see data required for statutory purposes, fisheries managers would see aggregated and anonymised data. This system enables data to be entered once and used multiple times, with controlled access to permit data-sharing while ensuring the confidentiality of individual fisher's data. The interface could provide the Scottish Government and industry with controlled access to meaningful and timely management information in the format required. The ambition is to enable users to interrogate data or to have data and other useful information pushed to their mobile phones or other devices.



## Review and Optimisation of Shellfish Data Collection Strategies

Whilst SIFIDS has been developing methods to obtain data to feed into shellfish stock assessments it was also important to assess how to conduct statistically robust sampling for the stock assessments themselves.

A drawback in the current system is the lack of access to data for local fisheries managers and Regional Inshore Fisheries Groups where this falls outside the current stock-assessment programme. The North Atlantic Fisheries College (NAFC) in Shetland in collaboration with OLSPS Group completed a desktop review of strategies used in Scottish inshore waters to look at what data is currently available and ways to optimise future data collection strategies, for example by collecting data from more vessels or by sampling a smaller number of vessels more often.

The report also looked at whether or not daily catch rates could be used as an indicator of stock abundance in areas where there was a lack of information.

The report proposed a flexible method for optimising data collection across a range of options that would better suit local needs. It outlines the potential for using inshore fishing vessels to collect a wide range of information and investigates the potential to select a limited number of vessels as a 'reference fleet', which would be equipped with additional technology to gather more, high quality data.

There may be no 'one size fits all' sampling programme that would suit all national, regional and local management requirements, but the report identifies that there is considerable potential for industry-derived data to make a significant contribution to both stock-assessments (currently carried out by Marine Scotland Science), and to provide valuable time-series data for use in fisheries management.

A clear next step would be to test the operation of such a stock assessment process within a defined area.



## Socio-economic Factors and Fishing Drivers

To deliver a better understanding of the significant contribution that the Scottish inshore sector provides to the social, economic and cultural fabric of Scotland, a detailed 'sustainable livelihoods' analysis was undertaken.

A team from SAMS Research Services Ltd (SRSL) & Imani Ltd collected and analysed cultural data in conjunction with already-available socio-economic datasets in a way that could be replicated and updated in future, using the 'Sustainable Livelihoods Approach' (SLA), which recognises both tangible and intangible factors required to make a livelihood sustainable and risk-resilient. Five types of 'capital' were defined which are critical to the function of the industry (Fig 3): **natural capital** (e.g. marine ecosystems and weather); **physical capital** (e.g. boats, harbours and roads); **financial capital** (e.g. income and access to loans);

**human capital** (e.g. skilled crew and training opportunities); and **social and cultural capital** (e.g. community and family relationships and cultural heritage).

Social and cultural factors are important drivers of the industry with clear linkages between these and economic impacts within inshore fishing and across the value chain. Factors such as access to finance in turn influence social and cultural factors such as succession planning. The report shows how important it is that policy-makers understand these links, and the reasons behind them that drive the diversity and related activities in different regions and sectors. For example, fish caught in the North West Highlands may be processed in central Scotland, or the lack of young entrants to the industry may be caused by competition for staff from other sectors.

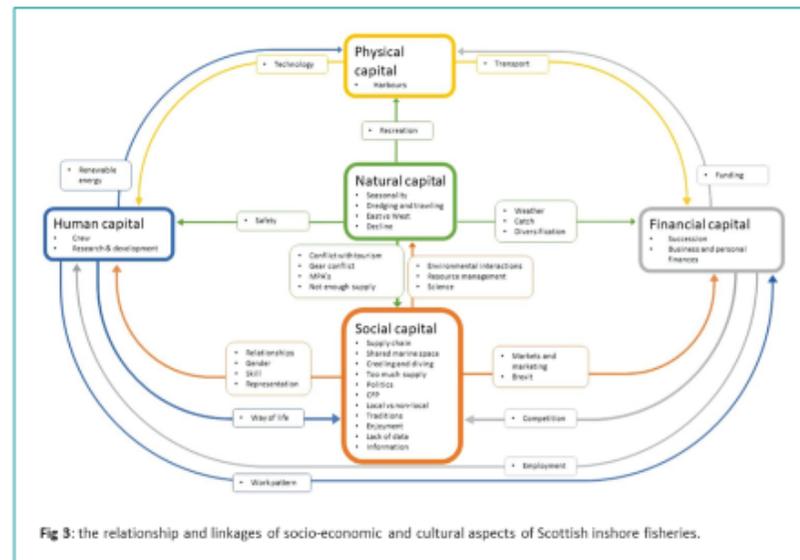


Fig 3: the relationship and linkages of socio-economic and cultural aspects of Scottish inshore fisheries.

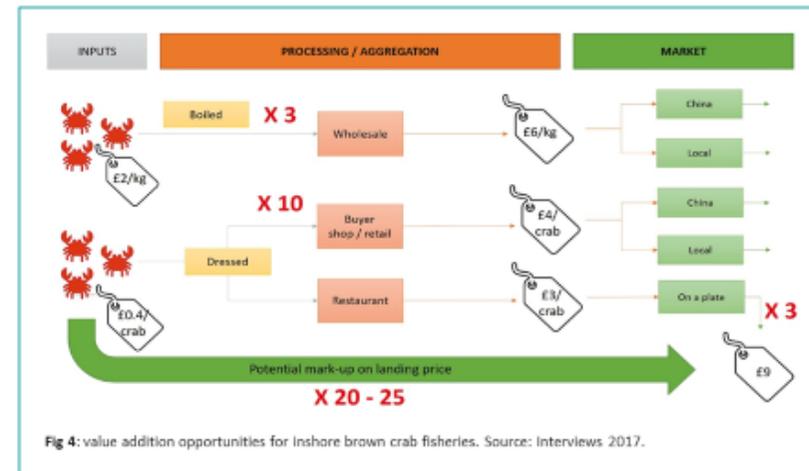


Fig 4: value addition opportunities for inshore brown crab fisheries. Source: Interviews 2017.

From an economic perspective, six different value-chain matrix models were identified and described across the whole **market system** reflecting different supply routes to market and local supply methods e.g. 'from boat to plate, locally' can generate local value addition of ten times or more, but this is a small proportion of the overall market and not always replicable across other volumes. Other supply methods such as direct transport out of region, can have very low additional local impact, although there may be significant added value in other UK areas where processing is carried out.

The figure 4 above illustrates the value added in processing and aggregation (by fishers themselves, or intermediaries) and final sale. While this will vary between products and markets, the importance of inshore products nationally and globally is demonstrated.

Key figures across the inshore fisheries market system matrix showed:

- a total of 3086 were employed in Scotland across this value chain (2374 people directly employed in fishing and 712 additional jobs generated through inshore fishing)
- direct income to inshore fishers was £63.66m, with an additional £38.20m to other sectors, giving a total of £101.85m in Scotland
- local impacts can be limited beyond the landing values unless local processing is undertaken
- often the wider economic impacts are significant but take place elsewhere. This is important for policymakers – jobs in Bellshill, Larkhall and Glasgow depend on inshore fishing – arguably, support for growth in processing could focus on more deprived areas than the fishing ports, though provenance is still a key selling point.

## Fishing Drivers

In a related piece of work, we interviewed 105 fishers at 42 ports to better appreciate the main drivers that influenced their business, including why they went fishing on a particular day or placed gear in a particular area. These responses were then used to inform a model that explored fishing behaviour (the probability a vessel would go fishing) based on a number of environmental and economic variables. The list of factors that influence when or whether a vessel goes fishing include changes in weather, wind speed and direction, fish stocks, catch prices, other marine users etc. Smaller vessels and those with a limited range were more likely to be affected. Whilst this work was experimental, the data gathered generated some basic statistical models that could be used to inform decision-making and suggests that more detailed research is merited. Developing a decision support tool could help fishery and marine managers to assess the potential implications of management or planning proposals for fishing activity, the effects of changing climate and extreme weather events, vessel modernisation, etc. It could also help inform the potential compound effects of, for example, the displacement of fishing activity in a given area and the potential knock-on effects for the fishermen and stocks in adjacent areas.



The rate of human-induced change on land and sea is significant. The seas are warming, pH is reducing, and deoxygenation is occurring. The biological consequences of these physical and chemical changes are becoming more apparent, including effects on fish stocks and distribution, with some species migrating northwards into cooler waters. Sea level rise and more extreme weather events may also impact fishers' ability to go to sea. Gathering and understanding the implications of such environmental and socio-economic drivers needs to be aligned with fisheries and other data to provide a comprehensive and ecosystem wide approach.

## International Interest in SIFIDS App and Systems Development

There is increasing international interest in the results and in the prototype equipment and processes developed by the SIFIDS project, with presentations made to stakeholders in Italy, Hong Kong, the Azores, Peru and, most recently, Lake Victoria in central Africa. A project designed to reduce by-catch in an artisanal shrimp fishery in Peru is currently underway using an adaptation of the 'FISH1 App' and GPS trackers to record where fishing is taking place, catch and landings.



## Final Reports

All final reports and videos will be uploaded onto the SIFIDS Project website in due course:  
<https://www.masts.ac.uk/research/emff-sifids-project/>

## Scottish Inshore Fisheries Integrated Data System (SIFIDS)

– a project co-ordinated by Marine Alliance for Science and Technology (MAST) with funding from European Maritime and Fisheries Fund (EMFF)

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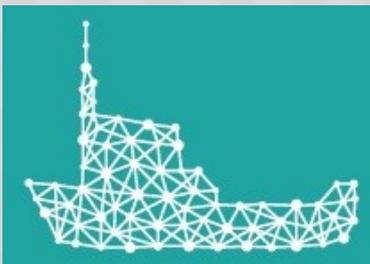
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