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AXEL C. HÜNTELMANN, CHRISTIAN JASER,
MIEKE ROSCHER, NADIR WEBER (EDS.)

Animals and Epidemics

INTERSPECIES ENTANGLEMENTS
IN HISTORICAL PERSPECTIVE



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Animals and Epidemics

Interspecies Entanglements in Historical Perspective

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A Global War against Wild Rodents

Sanitary Tensions, Anti-Rodent Measures, and the Spectre of Sylvatic Plague, 1927–1950s

The role played by black and brown rats as potential carriers and spreaders of the plague bacillus was central to the sanitary management of the third plague pandemic, which occurred between 1894 and 1950. Thus in the first decades of the twentieth century, rat-catching, rat-proofing, and rat-poisoning practices flourished in many cities around the world that sought to diminish rat populations in order to control or prevent local plague outbreaks.¹ Moreover, in international forums, a consensus was progressively reached on the necessity of destroying rats not only to curb disease, but also to prevent the loss of goods and food the animals caused.² This kind of debate was particularly important in the maritime sphere, and different countries began imposing mandatory deratization on international trade ships in the early 1900s, a measure formalized globally at the International Sanitary Conference of Paris in 1926.³ In addition, several meetings were held to create national and international leagues against rats.⁴ Across these many fronts,

1 Michael Vann, *Of Rats, Rice, and Race. The Great Hanoi Rat Massacre, an Episode in French Colonial History*, in: *French Colonial History* 4/1 (2003), 191–203; Myron J. Echenberg, *Plague Ports. The Global Urban Impact of Bubonic Plague, 1894–1901*, New York 2007; Matheus Alves Duarte da Silva, “O Novo Comércio Oswáldico”. *Circulação de Conhecimento e o Controle da Peste Bubônica no Rio de Janeiro e em São Paulo (1894–1910)*, in: *Revista Brasileira de História das Ciências* 9/2 (2016), 189–202; Lukas Engelmann/Christos Lynteris, *Sulphuric Utopias. A History of Maritime Fumigation, Inside Technology*, Cambridge (MA) 2019; Jules Skotnes-Brown, *Scurrying Seafarers. Shipboard Rats, Plague, and the Land/Sea Border*, in: *Journal of Global History* (2022), 1–23. – I am very grateful to the co-editors of this book for their insightful comments on preliminary versions of this chapter.

Funding ID: Research leading to this article was funded by the Wellcome Trust (Grant No. ID 217988/Z/19/Z) for the project “The Global War Against the Rat and the Epistemic Emergence of Zoonosis”.

2 *Conférence internationale du rat, Première Conférence Internationale du Rat (Paris–Le Havre, 16–22 Mai 1928)*. Documents réunis et publiés par Gabriel Petit, Paris 1931; *Conférence internationale du rat, Deuxième Conférence Internationale et Congrès Colonial du Rat et de la Peste. Paris, 7–12 Octobre 1931*. Documents réunis et publiés par le Professeur Gabriel Petit, Paris 1932.

3 Office International d’Hygiène Publique [OIHP], *Modèle de Certificat de Dératisation (Ou d’exemption de Dératisation) Adopté par l’OIHP dans sa Session de Novembre 1927*, in: *Bulletin Mensuel de l’OIHP* XX/2 (1928), 295.

4 *Ligue Sanitaire Française Contre la Mouche et le Rat*, in: *Bulletin* No 1, 1914; *Conférence, Première Conférence* (note 2); *Conférence, Deuxième Conférence* (note 2); Karen Sayer, *The “Modern” Management of Rats. British Agricultural Science in Farm and Field during the Twentieth Century*, in: *BJHS Themes* 2 (2017), 235–263.

a truly global war against the rat, declared in the first decade of the twentieth century,⁵ unfolded over its first fifty years.

Alongside that war, however, this period also witnessed debates on the potential of wild rodents to “perpetuate” the plague bacillus and eventually spread it within national or even across international borders, which themselves prompted a varied range of anti-rodent measures. While not comparable in magnitude or in geographical range with the war against the rat, the sanitary actions against wild rodents shaped a sort of secondary global war, which could be divided into two “fronts”: on the one hand, locales where a plague reservoir among wild rodents had already been constituted – namely South Africa, the USA, China, and the Soviet Union; and on the other, those places that tried to avoid the constitution of such a reservoir among wild rodents. In a previous study, I explored the emergence and transformations of the idea of sylvatic plague, a term coined to explain the persistence of plague among wild rodents around the world.⁶ In this chapter, I examine the reverse side of the medal, e. g., how measures were deployed against wild rodents in the 1930s, 1940s, and 1950s to avoid the formation of sylvatic plague reservoirs. I argue that the concept of sylvatic plague became understood in several countries as a sort of prophecy of a last stage of plague that could not be eradicated. Nonetheless, anti-rodent precautions were taken in the hopes of avoiding the fulfilment of this prophecy.

After briefly highlighting the novelty afforded by the concept of sylvatic plague, coined by the Portuguese doctor Ricardo Jorge, I focus on three different contexts – Angola, the UK, and Brazil – to discuss how local actors engaged with this new idea and which sort of anti-rodent measures were applied, ranging from direct destruction to quarantine and rodent-proofing. I focus first on Angola, which in 1932 was confronted with the menace of a plague invasion connected to migratory gerbils from South Africa and South West Africa (present-day Namibia). In response, the Portuguese government created a service whose goals, among others, was the direct and indirect destruction of wild rodents. In 1932, the idea of sylvatic plague was not completely established in Angola, but by 1935, after exchanges between Jorge and Portuguese doctors based in the colony, it had become an important justification for the country’s anti-rodent actions. Next, I examine the discussion on the risks of plague seeding and constituting a permanent sylvatic reservoir in the UK via wild rodents imported from the US for exhibition in zoological gardens. This point was addressed by Charles Elton in 1938–1939 after he read works on sylvatic plague written in the US by Karl Meyer, who was informed by Jorge’s work. The outcome of the debate led by Elton was the imposition of a three-month quarantine over all rodents imported to the UK susceptible to catching and

5 Albert Calmette, *Déclarons la Guerre aux Rats*, in: *La Revue du Mois* 3/28 (1908), 432–444.

6 Matheus Alves Duarte da Silva, *Between Deserts and Jungles. The Emergence and Circulation of Sylvatic Plague (1920–1950)*, in: *Medical Anthropology*, 2023.

dying from plague. Finally, I investigate the debates on the possible role played by wild rodents on conserving the plague bacillus in north-eastern Brazil in the late 1930s and a national anti-plague campaign starting in 1941 conducted by the Brazilian national plague service. Influenced by the works of the Chilean doctor Atilio Macchiavello, who was central in the circulation of the concept of sylvatic plague in Brazil, this campaign aimed to control plague cases related to rats and avoid the constitution of an independent reservoir among wild rodents. To achieve its goals, the Brazilian national plague service focused on the destruction of rats and wild rodents, as well as on measures to stop interaction between the two groups of animals.

By examining these three cases, I aim to contribute to the history of plague and of plague management, and to the history of the entanglements between animals and epidemics. I will show how, in the second quarter of the twentieth century, plague management, on a global scale, was no longer exclusively focused on destroying rats in big cities and ports. Indeed, alert to the idea of sylvatic plague and its risks, several countries passed legislation to deal with wild rodents, and as a result new spaces of sanitary interventions appeared, such as zoological gardens, farms, rural villages, and wild areas.

1. The Invention of Sylvatic Plague

Plague re-emerged as a global menace in 1894, when the disease broke out in the British colony of Hong Kong, an important economic hub. This outbreak led not only to the discovery of the causative bacillus of the plague, but was also considered the beginning of the third plague pandemic, which ultimately killed more than 12 million people by the 1950s, most of them in India.⁷ While rats were primarily framed as epidemic villains, the relationship between wild rodents and the plague bacillus was already being studied and discussed in the earliest years of the pandemic. For instance, Chinese and Russian (and later Soviet) scholars were deeply concerned about the role played by Siberian marmots in conserving the plague bacillus, which could explain historical outbreaks of plague in Manchuria, and especially the huge and violent epidemic of pneumonic plague in 1910–1911. Consequently, not only these animals, but also their burrows and hibernation cycles were studied, scrutinized, and often blamed as primary causes for

7 Henri H. Mollaret/Jacqueline Brossollet, Alexandre Yersin, 1863–1943. *Un Pasteurien en Indochine*, Paris 1993; Echenberg, *Plague Ports* (note 1); Prashant Kidambi, “An Infection of Locality”. *Plague, Pythogenesis and the Poor in Bombay, c. 1896–1905*, in: *Urban History* 31/2 (2004), 249–267; Matheus Alves Duarte da Silva, *Quand la Peste Connectait le Monde. Production et Circulation de Savoirs Microbiologiques entre Brésil, Inde et France (1894–1922)*, Thèse de Doctorat, Paris, Ecole des Hautes Etudes en Sciences Sociales, 2020.

the persistence of plague in Manchuria.⁸ In the US and South Africa, the role played by ground squirrels and gerbils, respectively, in maintaining and possibly spreading the plague bacillus to humans in California and the Orange Free State was also studied in the 1910s and 1920s. These studies gave birth to the concepts of squirrel plague in the US, and of veld plague in South Africa,⁹ and were coupled with the adoption of destructive measures in the form of direct hunting, poisoning, and the creation of rodent-free zones.¹⁰

In international forums, however, such as the International Sanitary Conferences and the *Office International d'Hygiène Publique* (OIHP),¹¹ the role played by wild rodents in maintaining or spreading plague did not receive significant attention until the early 1920s. Indeed, in the 1910s these phenomena were understood as local particularities which posed no risk outside the areas where infected wild rodents were endemic. This attitude was based on the assumption that the circulation or migration of these animals was limited or negligible when compared to the sanitary risks posed by the international circulation of domestic rats.¹² An initial revision of this viewpoint, and an important milestone for the global awareness of the relationship between wild rodents and plague, was achieved only in 1924, when the OIHP, following a proposal made by Jorge, the Portuguese delegate in that agency,¹³ decided to sponsor a global survey on the possible

-
- 8 Christos Lynteris, Tarbagan's Winter Lair. Framing Drivers of Plague Persistence in Inner Asia, in: id. (ed.) *Framing Animals as Epidemic Villains*, Cham 2019, 65–90, Susan D. Jones/Anna A. Amramina, *Entangled Histories of Plague Ecology in Russia and the USSR*, in: *History and Philosophy of the Life Sciences* 40/3 (2018) 49.
- 9 George W. McCoy, Some Features of the Squirrel Plague Problem, in: *California State Journal of Medicine* 9/3 (1911), 105–109; James Hunter Harvey Pirie, Plague on the Veld, in: id./James Alexander Mitchell/Alexander Ingram, *The Plague Problem in South Africa. Historical, Bacteriological, and Entomological Studies*, Johannesburg 1927, 138–162.
- 10 Jules Skotnes-Brown/Christos Lynteris, blog, From Mink to the Wild. COVID-19 through the Mirror of Sylvatic Plague, in: *Somatosphere*, <http://somatosphere.net/2021/mink-covid-sylvatic-plague.html/> (April 2021); Jules Skotnes-Brown, Preventing Plague, Bringing Balance. Wildlife Protection as Public Health in the Interwar Union of South Africa, in: *Bulletin of the History of Medicine* 95/4 (2021), 464–496.
- 11 The OIHP was created in 1907 and dismantled after WWII. On its history, see Céline Paillette, *Épidémies, santé et ordre mondial. Le rôle des organisations sanitaires internationales, 1903–1923*, in: *Monde(s)* 2/2 (2012), 235–256; Marcos Cueto/Theodore M. Brown/Elizabeth Fee, *The World Health Organization. A History*, Cambridge (UK) 2019, 32–36.
- 12 Henri Pottevin, La Dératisation. Rapport sur l'État Actuel des Méthodes Applicables à la Destruction des Rongeurs et de leurs Parasites Établi pour Être Présenté au Comité Permanent de l'OIHP par M. Le Docteur Henri Pottevin, Secrétaire Général de l'Office, in: *Bulletin Mensuel de l'OIHP* II/4 (1910), 542.
- 13 On Ricardo Jorge, see Maria Antónia Pires Almeida, Fighting Disease and Epidemics. Ricardo Jorge and the Internationalization of Portuguese Science, in: *Vesalius. Acta Internationales Historiae Medicinae* 19/1 (2013), 19–23; Jaime Larry Benchimol, Ricardo Jorge e as Relações entre Portugal, Brasil e África. O Caso da Febre Amarela, in: Carlos Fiolhais/Décio Martins/Carlota Simões (eds.), *História da Ciência Luso-Brasileira. Coimbra entre Portugal e o Brasil*. Imprensa da Universidade de Coimbra, Coimbra 2013, 229–249; Rui Manuel Pinto Costa, Caminhos Batidos de um Peregrino do Saber. Ricardo Jorge

connections between domestic rats, wild rodents, their ectoparasites, and the plague bacillus. The agency invited its members, who represented more than thirty countries, to share their local observations on the role played by these animals in connection with the disease.¹⁴

The survey, presented by Jorge between 1926 and 1927, concluded that there were two “types” of plague, both caused by the same bacillus, but conserved and/or spread by two separate sets of animals in two sets of landscapes. The more common was the “pandemic plague”, conveyed by domestic rats present in almost every port and city on the planet. The other type Jorge called the “sylvatic plague” (*peste selvatique*, in the original French), described by him as the plague infection among wild rodents living in what he referred to as “desert-like” environments.¹⁵ According to Jorge, four hotspots (*foyers*) of sylvatic plague had been identified by 1926: the “African *foyer*”, in the South African veld; the “European *foyer*”, in the steppes of Astrakan; the “Asiatic *foyer*”, in the steppes of Manchuria and Transbaikalia; and the “American *foyer*”, in California.¹⁶ In each of these places, a few species of rodents played a central role in maintaining the plague infection, constituting what Jorge called a “living virus reservoir”: the gerbil in Africa; the sousliks in Europe; the Siberian marmot (also known as tarbagan) in Asia; and the ground squirrel in North America.¹⁷

As I have argued elsewhere, with his idea of sylvatic plague, Jorge invented a generic space of plague maintenance among wild rodents, which unified different landscapes – steppes, deserts, the veld.¹⁸ As he wrote: “The sylvatic plague should not be confused with the plague of wild rodents that sometimes invade houses. The sylvatic plague occurs in the desert”.¹⁹ I have also discussed elsewhere the ambiguities of the desert as the locus of sylvatic plague, stressing how it could mean either a place with low rainfall or simply an uninhabited place.²⁰ Here, it is worth emphasizing the main point of Jorge’s idea: to him, the sylvatic form of plague was constituted by a cycle of transmission among wild rodents living in so-called desert-like landscapes, a cycle that was maintained without the concurrence of humans and domestic rats.

no Contexto Científico Europeu, in Maria Manuela Tavares Ribeiro et al. (eds.), *Cidadania, Política, Segurança e Cultura Científica*, Coimbra 2018, 345–385.

14 OIHP, Session Extraordinaire d’Avril-Mai 1924 du Conseil Permanent de l’OIHP. Procès-Verbaux des Séances, Paris 1924, 205.

15 Ricardo Jorge, *Les Faunes des Rongeurs et des Pucés dans leurs Rapports avec la Peste* (Deuxième Partie), in: *Bulletin Mensuel de l’OIHP*, XIX/9, 1927, 1257–1288.

16 *Ibid.*, 1272–1280.

17 *Ibid.*, 1272 and 1280; OIHP, Session Extraordinaire d’avril-mai 1927 du Conseil Permanent de l’OIHP. Procès-Verbaux des Séances. Paris, 90.

18 Silva, *Between Deserts and Jungles* (note 6).

19 OIHP, Session Extraordinaire d’avril-mai 1927 (note 17), 90.

20 Silva, *Between Deserts and Jungles* (note 6).

Jorge did not aim to propose any new sanitary policies with this categorization. He supported measures already employed in the four sylvatic plague hotspots, such as the imposition of rodent-free and rat-free zones in areas where domestic rats and wild rodents could meet, or measures already under discussion, such as the regulation of the tarbagan fur trade.²¹ In that sense, the purpose of his system of categorization was above all academic, intending to provide a global standard for describing plague maintenance among wild rodents. In countries where sylvatic plague was not present in 1927, the subject passed almost unnoticed. However, from the 1930s onwards, some countries which had previously been free from this type of plague started to seriously consider the risks of sylvatic plague appearing in their territories and used the new concept, and the condition it described, to justify preventive measures.

2. Sylvatic Plague in Angola, 1932–1937

In January 1932, a plague epidemic was declared in the Ovamboland, in the north of South West Africa, a former German colony under South African mandate since the end of WWI. To study the situation, the South African government dispatched Louis Fourie, an assistant health officer of the South African Department of Public Health, and a former South West African medical officer.²² Following fieldwork conducted between April and May 1932, Fourie affirmed that the Ovamboland epidemic was linked to a plague epizootic among gerbils, the same wild rodents responsible for several plague outbreaks in South Africa. Furthermore, Fourie concluded that the Ovamboland outbreak “was caused by the spread of an epizootic of rodent plague from the Union [of South Africa] northwards through the Kalahari [Desert]” in the wake of the gerbils’ migration.²³

In the Portuguese colony of Angola, which bordered the Ovamboland, this episode was met with apprehension. The first plague outbreak in Angola, linked to domestic rats, had occurred in 1921, when the disease reached the capital, Luanda. From that year onwards, other outbreaks emerged around the coast and its hinterland, but a plague “invasion” connected to wild rodents coming from the southern border had seemed, until then, highly unlikely.²⁴ Such a prospect threatened the politically fraught Baixo Cunene region, which had only been incorporated into the Portuguese Empire in the first decades of the twentieth century, and where insurrections and resistance were still

21 Jorge, *Les Faunes* (note 15), 1286.

22 E. N. Thornton, *La Peste dans l’Union Sud-Africaine et le Territoire Sous Mandat du Sud-Ouest Africain*, in: *Bulletin Trimestriel de l’organisation d’hygiène II/1* (1933), 79–81.

23 Louis Fourie, *Report on Plague in Ovamboland, South West Africa*, Annual Report of the Department of Public Health, Year Ended 30th June, 1932, Pretoria, 1932, 79.

24 Ricardo Jorge, *La Peste en Angola*, Paris 1935, 1–2.

frequent.²⁵ The Ovamboland episode thus sparked both imperial anxieties and sanitary concerns, which led to the creation of a scientific mission financed by the Angolan colonial government. Directed by Francisco Venâncio da Silva, a medical doctor, the mission was sent to Baixo Cunene in June 1932.²⁶ Silva carried out studies on the local rodent fauna, catching and examining them with the help of the local population,²⁷ and sending some specimens to the Bocage Museum in Lisbon.²⁸ Furthermore, Silva gathered evidence to support the presumption that some wild rodents previously unknown to the population of Baixo Cunene were "invading" the Baixo Cunene coming from the Ovamboland, where they were linked to the plague outbreak.²⁹

Based on Fourie's report and Silva's initial observations, the Portuguese colonial government concluded that a plague outbreak in Baixo Cunene was probably just a matter of time, given that the region shared the same environment and several species of wild rodents with the contaminated parts of South West Africa and South Africa. In the face of this menace, Silva's mission was promoted to a permanent plague service in November 1932.³⁰ In the first communications by Portuguese officials about the outbreak in the Ovamboland, they did not use the term sylvatic plague, but spoke merely of plague among wild rodents. However, in a confidential report sent to Jorge, written in 1935, Silva began to mobilize the new concept to describe the situation he was observing on the border between the Ovamboland and Baixo Cunene. Silva's use of the term could thus be due to this direct interaction with its inventor.³¹

From its beginning, Silva's plague service targeted wild rodents. Silva himself travelled throughout the Baixo Cunene region demanding that the indigenous population make their dwellings rodent-proof, chase rodents from the vicinities of their villages, and protect the rodents' natural enemies, such as snakes and birds, in an effort to break the chain of human-rodent interactions.³² In addition, the local population was pressed to inform Silva's service of any case of plague among humans or any epizootic among wild rodents. The service would then come to the village in question, vaccinate its population, and pump cyanide gas into wild rodent holes in the fields nearby. These

25 Francisco Venâncio da Silva, Serviço Permanente de Prevenção e Combate à Peste Bubônica no Sul de Angola/Relatório 1933, Lisboa 1936, 6.

26 Ibid., 12–15.

27 Ibid., 16.

28 Ibid., 138.

29 Francisco Venâncio da Silva, Animais Bravos nas Suas Relações com os Problemas Sanitários do Sul de Angola, Luanda 1939, 25.

30 Ministério das Colônias/Gabinete do Ministro, Decreto n. 21:866, in: Diário do Governo I/270, 17 November 1932, 2231–2233.

31 Francisco Venâncio da Silva, Relatório Sobre a Peste Selvática em Angola. Elaborado a Pedido do Prof. Dr. Ricardo Jorge, 25 June 1935, Biblioteca Nacional de Portugal - Reservados. Espólio 18, caixa 18, maço 5, Biblioteca Nacional de Portugal - Reservados.

32 Jorge, La Peste en Angola (note 24), 6–7.

measures sought to kill both the rodents and their parasites, reducing the risk of plague outbreaks among humans and breaking the chain of infection among rodents.³³

In 1933, fears of an invasion of plague in the Baixo Cunene became a reality when eleven cases of plague among humans, nine of them fatal, were observed in the locality of Namacunda, not far from the Ovamboland border.³⁴ In the following years, however, although important epizootics among wild rodents were registered in the Baixo Cunene, very few human cases were reported or officially diagnosed.³⁵ After 1937, plague cases among humans and animals ceased to be reported entirely. After that date, the “epidemic wave” was considered over and the risk of plague taking root in southern Angola was officially dismissed. Nevertheless, as Silva wrote in 1953, the disappearance of human cases did not mean that sylvatic plague had vanished from Angola; on the contrary, it likely remained a “latent problem” that could re-emerge at any time.³⁶

3. The Risk of Sylvatic Plague in the UK via Imported Rodents from the US, 1938–1939

Sylvatic plague as a new concept, as well as the awareness of the risks posed by wild rodents in conserving and spreading the plague bacillus, gained global traction in the 1930s, following the publication of a new report by Jorge, this time focused exclusively on Africa and deeply connected with the situation of South West Africa and Angola.³⁷ In the US, a Sylvatic Plague Committee, led by Karl F. Meyer, was created in 1935 to study and address the presence of plague among wild rodents in California and other states on the West Coast.³⁸ As Meyer admitted, he was informed by Jorge’s works and described the Portuguese doctor as an important reference for understanding the different problems posed by the plague among wild rodents when compared with the more common case of plague among domestic rats.³⁹ In October 1938, as part of a research trip to Canada and the US, the prominent English ecologist Charles Elton visited Meyer and his colleagues in California. Elton discussed the problem of plague in

33 Silva, Serviço Permanente (note 25), 151.

34 Silva, Relatório, (note 31), XII.

35 Ibid., XII–XIV.

36 Francisco Venâncio da Silva, Peste Selvática, Problema Sempre Latente em Angola, in: Anais do Instituto de Medicina Tropical X/3 (1953), 976.

37 Ricardo Jorge, La Peste Africaine, in: Bulletin Mensuel de l’Office International d’Hygiène Publique XXVII/9 (Supplement) (1935), 1–67.

38 W. P. Shepard, Concerning Sylvatic Plague, in: California and Western Medicine 43/5 (1935), 386–387.

39 Karl F. Meyer, The Sylvatic Plague Committee, in: American Journal of Public Health and the Nation’s Health 26/10 (1936), 961.

rodents in the US with them and studied techniques to trap squirrels and collect their parasites.⁴⁰

Elton's interest in wild rodents and the plague was not new, especially when it came to the latter's role in regulating animal populations. However, Elton's trip to North America had another effect: it consolidated his fears about the risk of sylvatic plague seeding in the UK via imported wild rodents to be exhibited in zoological gardens. In fact, a few months earlier, in March 1938, Elton had already written to his friend Julian Huxley, a biologist and secretary of the Zoological Society of London, expressing his concerns. He first explained to Huxley in general terms the problem of plague among wild rodents, affirming that he

had been reading all the recent reports from the United States on sylvatic plague, that is, bubonic plague which has become established in the wild rodent population, much in the same way as it has in South Africa during the last twenty years, and from time immemorial in Siberia.⁴¹

Then, based on his reading of the recent research in the US, Elton told Huxley about the risks sylvatic plague posed to the UK:

Although thousands of specimens of ground squirrels have been examined in different places [in the US], lesions are very seldom discovered. But when pooled quotas of fleas from a number of individuals are ground up and injected into guinea pigs, bubonic plague develops. It is that there is a real danger of introducing bubonic plague into this country [Britain] or other countries through the medium of specimens which any quarantine officer would pass as for as their individual health is concerned. The implication [...] is obvious: that you [Huxley] should keep a careful watch on the situation, especially if you are going to import prairie dogs or other marmots and squirrels, especially from the West and Western regions of North America.⁴²

In this letter, Elton also clarified that the primary problem was not that the imported wild rodents could spread the disease among humans, as domestic rats were feared to do, but rather that a permanent plague reservoir could be constituted among Britain's wild animals. This was not without precedent, as Elton pointed out: in 1910, a small plague outbreak among humans occurred in East Anglia,⁴³ which was related to plague

40 Charles Elton, Typescript diary of a visit to Canada and USA 29 August–17 October 1938, Bodleian Library, Oxford, UK [hereafter BoL]. Catalogued Archives MS. Eng. C. 3329, C. 24.

41 Charles Elton to Julian Huxley, 9 March 1938, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol. Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1.

42 Ibid.

43 On that outbreak, see Karen Sayer, *Vermin Landscapes. Suffolk, England, Shaped by Plague, Rat and Flea (1906–1920)*, in Christos Lynteris (ed), *Framing Animals as Epidemic Villains*, Cham 2019, 27–64.

epizootics among field rodents and rabbits.⁴⁴ Therefore, if plague could be newly imported via wild rodents, and if the infection then spread to England's native rodents and other animals, Elton worried that "there [was] practically no chance of eliminating it [sylvatic plague] by any measure at present known by us".⁴⁵

Elton was not exactly clear, however, on how plague could pass from imported wild rodents to Britain's native animals. Therefore, we can only wonder whether Elton feared that wild rodents would escape from the zoological gardens and meet local animals, or that rats or other animals could encounter caged wild rodents on the premises of the zoos, or whether his concerns were, in fact, that wild rodents' ectoparasites infected with the plague bacillus could leave their hosts and establish themselves among local animals.

Elton's pleas were at first rejected by Huxley, who considered them quite "alarmist".⁴⁶ Elton then decided to contact the Minister of Health, Sir Arthur MacNalty.⁴⁷ MacNalty took Elton's concerns more seriously, and in November 1938 imposed a compulsory quarantine of three months on "all animals known to be commonly susceptible to epizootic plague" imported to the UK via zoological gardens. It was also decided that these rodents had to be submitted to a periodical removal of their fleas and parasites.⁴⁸ Elton considered this solution: "If this advice is consistently carried out", he wrote, "it will greatly reduce the chance of sylvatic plague getting into this country".⁴⁹ The quarantine solution was nonetheless criticized by Huxley for the problems it created for zoological gardens. In fact, since wild rodents had very short lifespans, their exposition time to the public was considerably reduced after a three-month quarantine. The issue triggered new discussions between Elton and Huxley, this time on the possibility of British zoological gardens breeding rodents instead of importing them.⁵⁰

44 Charles Elton to Julian Huxley (note 41).

45 Charles Elton to Arthur MacNalty, 18 November 1938, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol. Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1.

46 Julian Huxley to Charles Elton, 10 March 1938, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol, Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1.

47 Charles Elton to Arthur MacNalty, 24 March 1938, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol. Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1.

48 Arthur MacNalty to Charles Elton, 14 November 1938, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol. Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1.

49 Charles Elton to Arthur MacNalty, 18 November 1938, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol. Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1. I could not find any information if these quarantines practices stayed in place after 1938.

50 Julian Huxley to Charles Elton, 3 July 1939, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol, Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1 and Charles Elton to Julian Huxley, 4 July 1939, Zoology Elton Archive: Correspondence about sylvatic plague 1938–1939, Bol, Catalogued Archives MS. Eng. C. 3329, C. 24. 22/1/1.

In short, to Elton, British zoological gardens were seen as a kind of intermediary space where a connection, albeit one neither fully described nor understood, would be achieved between the sylvatic plague *foyer* in North America and wild rodents in Britain. In that sense, what was feared was not immediate human outbreaks, as in Angola, but the plague bacillus's circulation among British wild rodents and the formation of an independent and ineradicable local sylvatic plague reservoir. The idea of sylvatic plague thus appeared in Elton's writings both as a standardized concept to describe plague among wild rodents in several parts of the world and as a justification for imposing preventive measures against wild rodents in Britain.

4. The Transformation of Plague into Sylvatic, Brazil, 1940s and 1950s

The Angolan and British cases exposed the risk of plague being carried across international borders by migratory rodents or via the circulation of wild rodents by humans, respectively. The fight against wild rodents in Brazil in the 1940s reveals some interesting correlations and particularities. In Brazil, while there was a fear that a sylvatic reservoir would be formed, the danger was seen to lie not in importations from foreign countries, but rather in the local expansion from a reservoir among domestic rats into one among wild rodents.

Plague arrived in Brazil in 1899 and caused several important outbreaks in the country's main ports, and especially in its capital, Rio de Janeiro, in the first decade of the twentieth century.⁵¹ After a resolute campaign of deratization starting in 1903, the disease progressively decreased in Rio de Janeiro.⁵² Nevertheless, in the 1920s, scattered outbreaks appeared in mid-sized cities and rural villages far from the coast.⁵³ This was a problem especially in the backlands (*sertões*), a region in the north-east prone to recurrent drought. A series of decisive missions to study these outbreaks was carried out in 1935 and 1936, covering the states of Pernambuco, Ceará, and Paraíba. They took place in a moment of increased centralization of public health in Brazil during

51 Dilene Raimundo do Nascimento/Matheus Alves Duarte da Silva, "Não é Meu Intuito Estabelecer Polêmica": A Chegada da Peste ao Brasil, Análise de uma Controvérsia, 1899, in: *História, Ciências, Saúde-Manguinhos* 20/1 (2013), 1271–1285.

52 Silva, *Quand la Peste Connectait le Monde* (note 7).

53 It does not mean, though, that plague completely disappeared from the Brazilian coast. The city of Fortaleza, the capital of Ceará state, localized in the Atlantic coast, was touched in 1934, which created a momentum for the 1935–1936 missions. See Amadeu Fialho, *Estudos Sobre a Peste Bubônica no Ceará*, in: *Revista de Hygiene e Saúde Pública* IX/6 (1935), 183.

the Vargas regime⁵⁴ and were intended “to collect data and study the local conditions aiming to elaborate a general plan to eradicate the plague”.⁵⁵

These missions initially arrived at a rather a classical conclusion, pointing out that most of the human outbreaks in the north-east could be traced to infected domestic rats, which nested in the poor houses, granaries, and cotton storage facilities abundant in rural villages.⁵⁶ These experts also noticed that some wild rodents, such as *preás*, *punarés*, and *mocós*,⁵⁷ commonly found close to rural villages and valued as bush meat by locals, seemed potentially implicated in the plague outbreaks. As hunters, farmers, and other local actors informed the plague experts in 1935 and 1936, human outbreaks in the backlands were commonly preceded by wide annual epizootic waves, which affected both wild rodents and domestic rats.⁵⁸ While no one was certain of the cause of these epizootics, some experts were thoroughly convinced that it was the plague.⁵⁹ The enquiries conducted between 1935–36 left open the question of whether wild rodents could be considered the main reservoir of plague in Brazil’s north-east or whether, on the contrary, their infection was only incidental and dependent upon their contact with infected domestic rats, who would therefore be the main reservoir of the disease. Brazilian authorities, however, remained convinced that the plague would be best controlled by focusing on domestic rats, since their connection to human plague outbreaks was well established. Consequently, the main measure adopted in the late 1930s in farms and villages in the north-east was rat poisoning, coupled with anti-plague vaccination and the support, albeit feeble, of rat-proofing practices.⁶⁰

In July 1939, the Pan-American Health Organization, in agreement with the Brazilian authorities, commissioned the Chilean doctor Atilio Macchiavello to study the plague in the north-east of Brazil.⁶¹ At the end of his mission, in 1940, Macchiavello affirmed that domestic rats played the crucial role of spreading and conserving the plague, but conceded that local wild rodents could likewise be infected by the plague and die from it in epizootic outbreaks. However, he found no evidence “of a primary wild rodents epi-

54 Getúlio Vargas ruled Brazil from 1930–34 as a “temporary president”, from 1934–1937, as elected president, and from 1937–1945 as dictator. From 1950 until his suicide in 1954, he was again Brazilian President, elected by popular vote.

55 Mario da Camara Motta, O Problema da Peste no Estado da Parahyba, in: Archivos de Hygiene VI/1 (1936), 210.

56 Decio Parreiras, Notas e Estudos Sobre a Peste no Nordeste do Brasil, Problema Nacional, 1935, 429.

57 Respectively *Cavia aperea*, *Thrichomys apereoides*, *Kerodon rupestris*. While the *preá* can be found in other South American countries, the *punaré* and *mocó* are endemic to Brazil.

58 Marcelo Silva Junior, ‘Peste no Ceará’, in: Archivos de Hygiene VI/1 (1936), 177.

59 Fialho, Estudos (note 53), 198.

60 João de Barros Barreto, A Peste no Brasil nos Últimos Cinco Anos, in: Archivos de Hygiene 8/2 (1938), 366–368.

61 Atilio Macchiavello, Contribuciones al Estudio de la Peste Bubonica en el Nordeste del Brasil, Guayaquil 1941, 9–10.

zootic”; quite the opposite: wild rodents were almost always killed by primary plague epizootics among rats, which suggested that the rats in fact represented the real plague reservoir in Brazil.⁶² Macchiavello affirmed that what existed in the backlands was a condition he called “rural plague”, characterized by its widespread distribution in an area of scattered population. To Macchiavello, rural plague was completely linked to domestic rats, which led him to conclude that sylvatic plague “possibly did not exist” in the country.⁶³

Macchiavello played an important role in the circulation of ideas such as rural plague and sylvatic plague in Brazil. His reasoning influenced the creation of the Brazilian National Plague Service (*Serviço Nacional de Peste*, hereafter SNP) in 1941 and its mission.⁶⁴ The SNP aimed primarily to control rats in cities, villages, and rural areas, but also to prevent plague from becoming sylvatic in Brazil. As Almir de Castro, the director of the SNP, put it when explaining the evolution of plague in Brazil up to 1941 to the Minister of Health, Gustavo Capanema: “fortunately, we still have not yet reached [...] the sylvatic plague moment, whose eradication would be almost impossible”.⁶⁵

Following the creation of the SNP, the fight against rats was intensified, mainly in the north-east. The measures implemented by the new service included not only rat poisoning, but also direct hunting, trapping, and most importantly, the destruction of rats inside their holes by means of flamethrowers or toxic gas.⁶⁶ During this campaign, wild rodents occupied an ambiguous place. On the one hand, their infection was considered peripheral and often dependent on domestic rats. On the other hand, they represented a risk, because if the plague bacillus started to circulate freely among them in the north-east without depending on humans and domestic rats as hosts, and if this enzootic cycle came to affect wild rodents in the backlands and other regions, such as the Amazon, then plague would probably never be eradicated from Brazil.⁶⁷ Aware of this risk, the SNP often targeted wild rodents alongside domestic rats. When destroying rat-holes by flamethrowers, for example, the SNP commonly killed wild rodents as well, which nested close by and sometimes even in the same holes. When hunting rats by means of traps and sticks, the SNP also often destroyed a plethora of wild rodents.⁶⁸ Because of these direct hunting practices, in 1951, João Moojen de Oliveira, a zoologist attached to the Museu Nacional and Brazil’s foremost rodent expert, proposed establishing a rodent collection, which

62 Ibid., 152–153.

63 Ibid., 101.

64 Simone Luna, *O Serviço Nacional de Peste e o Controle da Peste Bubônica no Nordeste Brasileiro (1941–1956)*, Master’s Thesis, Rio de Janeiro, Fundação Oswaldo Cruz/Casa de Oswaldo Cruz, 2021.

65 Almir de Castro, *Atividades de Profilaxia Antipestosa do Departamento Nacional de Saúde do Ministério da Educação e Saúde 1937–1941*, Rio de Janeiro, 31 October 1942, Fundação Getúlio Vargas Archives, 2, GC h 1940.03.11.

66 Almir de Castro, *Serviço Nacional de Peste*, in: *Archivos de Higiene* 17/3–4 (1947), 316.

67 Roland Simon, *Verificação da Sensibilidade dos Roedores da Região Neotrópica*, Rio de Janeiro 1951.

68 Serviço Nacional de Peste. *Boletins de Captura de Pequenos Mamíferos’ (1944)*, Museu Nacional, Setor de Vertebrados.



Fig. 1 Taxidermized *punarés* (*Thrichomys apereoides*), caught by the SNP in the Brazilian north-east from 1951–1956 (Museu Nacional, Rio de Janeiro/Brazil).

could improve knowledge of the species of rodents in the north-east, their distribution, sensibility to plague, and other related data. Moreover, the specimens collected could serve as valuable goods for exchange with other museums. One of the largest in the world, the SNP collection now contains 55,291 specimens, a testament to the SNP's capacity for catching and killing rodents (see fig. 1). In addition to direct destruction, the SNP also employed specific rodent-proofing measures, ordering the removal or increased distance of live fences (*cerca de avelós*) from the house. Frequently erected very close to rural dwellings, these live fences were seen by SNP doctors as places where wild rodents and domestic rats could meet and, therefore, where plague could spread and circulate among wild rodents.⁶⁹ In sum, although it remained dependent on anti-rat measures, the fight against wild rodents in the north-east of Brazil – informed by the menace of the possible emergence of sylvatic plague – became a central sanitary measure in the 1940s and 50s.⁷⁰

69 Celso Arcoverde Freitas, *Histórias da Peste e de Outras Endemias*, Rio de Janeiro 1988, 75–76.

70 João Alves de Oliveira/Stella Maris Franco, *A Coleção de Mamíferos do Serviço Nacional de Peste no Museu Nacional, Rio de Janeiro, Brasil*, in: *Arquivos do Museu Nacional* 63/1 (2005).

In March 1956, the SNP was dismantled, partly because of the decline in plague cases in the preceding years, which rendered the service somewhat redundant. Between 1957 and 1960, some of the ideas that gave coherence and oriented SNP actions, namely the absence of sylvatic plague, started to be criticized by local and foreign plague experts working in the backlands. These new studies argued that wild rodents, instead of domestic rats, were the real reservoir of plague in Brazil, meaning that sylvatic plague had already emerged there.⁷¹ Such an understanding became progressively more accepted after new research conducted in the city of Exú in the late 1960s and early 1970s,⁷² and still remains the main paradigm for explaining the endemicity of plague in Brazil.⁷³

5. Conclusion

This chapter has provided the first global history of the fight against wild rodents in the second quarter of the twentieth century. The anti-rodent sanitary measures detailed here were prompted by the fear that the plague bacillus could start circulating among wild rodents in “natural” spaces, and that plague would therefore never be eradicated from those localities. These fears are reflected in the policies adopted against wild rodents in Angola, the UK, and Brazil, three countries with different political, ecological, and geographical conditions, but nonetheless connected by their wars against wild rodents.

The anti-rodent measures in these three countries – namely, direct destruction, quarantines, and the rodent-proofing of buildings – were introduced at a time when plague did not exist among local wild rodents. In other words, these measures were implemented before a cycle of infections independent of humans and domestic rats had been established. Therefore, the purpose of framing wild rodents as potential transmitters of plague in Angola, the UK, and Brazil was to anticipate and avoid a scenario of plague maintenance in natural environments. The risk this scenario posed was a double one: the constitution of a wild reservoir would mean, firstly, that plague could never be eradicated among wild rodents, and secondly, that the disease could potentially jump from them back to rats and humans.

Independent reservoirs among wild rodents already existed in other parts of the world, a phenomenon described by Ricardo Jorge as sylvatic plague. This new concept

71 Alberto Gonçalves Neves, *O Problema da Peste dos Roedores Silvestres no Nordeste Brasileiro*, Rio de Janeiro 1957; José Maria de la Barrera, *Relatório Sobre a Peste no Brasil*, April 1960, Museu Nacional, Setor de Vertebrados.

72 Celso Tavares, *Análise do Contexto, Estrutura e Processos que Caracterizaram o Plano Piloto de Peste em Exu e Sua Contribuição ao Controle da Peste no Brasil*, PhD Thesis, Recife, Fundação Oswaldo Cruz/Centro de Pesquisas Aggeu Magalhães, 2007.

73 Brasil. Ministério da Saúde, *Manual de vigilância e controle da peste*, Brasília 2008.

had particular relevance for the three cases discussed in this chapter, where it acted not only as a descriptive notion, but also as sort of cautionary tale and prophecy. Precisely because of this prophetic aspect, anti-rodent measures seemed justified because they were intended to prevent a direr future scenario – but this scenario itself could only be imagined in Angola, the UK, and Brazil because of Jorge’s new concept. Thus, while the idea of sylvatic plague justified a range of measures against wild rodents – amounting to a true global war –, these sanitary interventions served themselves to reinforce the concept, and in a way, transformed it into a new scientific paradigm for thinking about and combatting plague reservoirs.

Photo credit

Fig. 1 Taxidermized *punarés* (*Thrichomys aperoides*), caught by the SNP in the Brazilian north-east from 1951–1956, Museu Nacional, Rio de Janeiro/Brazil. © Photo by Matheus Alves Duarte da Silva. I am very grateful to Prof João Alves de Oliveira for letting me visit and photograph the collection.

Abstract:

The first half of the twentieth century witnessed debates on the part played by wild rodents on “conserving” the plague bacillus and eventually spreading it within national borders, and even beyond. This condition was christened by the Portuguese doctor Ricardo Jorge as sylvatic plague in 1926–1927. In the following years, sylvatic plague began to be seen as an important risk in places where an independent cycle of plague infection among wild rodents did not yet exist. This chapter examines three contexts where the spectre of sylvatic plague haunted health officers. Firstly, Angola, where the new concept framed a plague invasion by migratory gerbils coming from South Africa in 1932 and justified measures to destroy these animals. Secondly, the UK, where quarantine measures were applied in 1938–1939 against imported rodents to be exposed in zoos over the risks they could spread the sylvatic plague among local rodents. Finally, Brazil, where the menace of sylvatic plague appearing in the backlands and in the Amazon justified the creation of the Brazilian Plague National Service in 1941, and the deployment of anti-rat and anti-rodent measures in the 1940s and 1950s. Taken together, these contexts suggests that a truly global war against wild rodents unfolded in the second quarter of the twentieth century.

Keywords:

disease ecology | enzootic | global history | third plague pandemic | Charles Elton