Gouvèrnément d'JÈRRI

European Lobster (*Homarus gammarus)* in Jersey, Channel Islands

Summary Report 2024

Marine Resources, Jersey

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1.0 Introduction

The European Lobster (*Homarus gammarus* Linnaeus, 1758) is at the centre of Jersey's commercial fishing industry. Since at least the late nineteenth century it has been the most important species (in terms of economic value) fished by Jersey vessels. Current (2021) lobster landings by Jersey vessels are valued at £2.5 million which is about 35% of the fishing economy although this has been as high as 50% in recent years. Most lobster landed in Jersey, around 85%, are exported to Europe via France either as direct landings from Jersey fishing vessels or via the islands fish merchants.[1]

Jersey waters are also fished by vessels from Normandy and Brittany and were, until 1 January 2021, subject to joint management through the Bay of Granville Agreement (GBA). Data provided by Ifremer suggests that the lobster fishery is dominated by Jersey vessels with statistics for the latest available year (2018) suggesting that Jersey vessels landed 190 tonnes of lobster in comparison to 26 tonnes by French vessels.[2]

In 2011 the joint Normandy and Jersey lobster fishery gained Marine Stewardship Council (MSC) certification as a sustainably fished stock. In that year Jersey landings reached a peak of 262 tonnes but afterwards declined until, by 2017, landings were 232 tonnes against a level of fishing effort that had remained static. Since 2017 annual landings have decreased sharply so that in 2020 just 111 tonnes were landed which represents a decrease of 58% compared with 2011. Since 2017 there has been a decrease in fishing effort of circa 25% but this alone cannot explain the decrease in landings. The fishery continues to receive ecolabel certification from the MSC but concern about the state of the stock has led to urgent calls by industry and government for management reform.

In 2019 the Jersey Marine Resources Panel (a stakeholder consultation group) convened a lobster management working group whose members were drawn from commercial and recreational fishing, merchants and government. At the same time the Jersey Marine Resources team have intensified their research into aspects of lobster stock health and the economics of the fishery. Parallel discussions around the regional and international lobster fisheries have been undertaken through the GBA working groups, contacts with UK IFCAs and the ICES WGCRAB group.

This report summarises the current position of the Jersey lobster especially in relation to concerns around its health and sustainability and the discussions, administrative and research activity that this has generated.

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[1] Lobster landing and economic statistics: Marine Resources Annual Report: 2019. The 85% export figure was the situation before the Covid-19 pandemic and post-Brexit changes to import/export regulations that came into force on 1 February 2021

[2] Foucher Eric, Laurans Martial, Leblond Emilie, Le Grand Christelle, Le Blond Samuel (2020). Réponse à la saisine de la Direction des Pêches Maritimes et de l'Aquaculture relative à l'activité des navires français en baie de Granville. Activité des navires français et diagnostic sur l'état des stocks exploités en baie de Granville. DPMA - Direction des Pêches Maritimes & de l'Aquaculture, Sous-direction des ressources halieutiques, Bureau de l'appui scientifique et des données,La Défense, Ref. Saisine DPMA 2019-14995, 66p., 30p., 25p., 8p. https://archimer.ifremer.fr/doc/00620/73208/

1.1 Ecology and Biology of the European Lobster

The European Lobster (*Homarus gammarus*) is a large, distinctive decapod crustacean which can reach a theoretical total body length of 59 cm which equates to a weight of *circa* 6 kg although historical lengths of 65 cm are claimed. However, in moderate to heavily fished populations the average lobster size (which is measured by carapace length) will be considerably less and perhaps in the region of 25 to 40 cm.[3]

Lobsters have a geographic range stretching from southern Norway to Morocco through into the Mediterranean. The densest populations occur in the cool and temperate waters of the NE Atlantic Ocean in areas such as North and Irish Seas, English Channel and Bay of Biscay. Genetic work suggests that there may be four subpopulations within this range. These are: (1) Norway; (2) the Mediterranean; (3) the Netherlands; and (4) a broader group distributed from the North Sea to Biscay.

Jersey is situated in the centre of the lobster's general geographic range with an average annual sea temperature of 12.6°C (1960 to 2020; average seasonal range: 7.8 to 17.9°C) that is close to the species' preferential temperature of 12°C. This may provide a buffer against a measured rise in sea temperature of over 1°C since the 1980s, much of which has occurred over the winter months. It may not, however, protect lobsters from biological and other changes associated with climate change (e.g. breeding patterns, ocean acidification, etc.).[4,5]

Information on the ecological preferences of the European lobster is limited but they are thought to utilise a range of different habitats in relation to different parts of their life cycle. Lobsters may be found across a variety of depths (intertidal to 150+ metres below chart datum) and substrates (sand to bedrock) but are most abundant in shallow coastal waters (<50 metres) with rocky or mixed substrates and especially where there is sufficient boulders, crevices, holes or other cover.[6]

Data collected in Jersey indicate that lobsters may be commonly found on rocky seashores from mid-tide, where they are generally juvenile, to the lower shore where adults are more common. Offshore the greatest concentration of lobsters occurs around the island's rocky coastlines and the offshore reefs (Les Écréhous and Les Minquiers being the principal ones). However, they may also occur in more open seabed areas, especially those dominated by sand and gravel in the sedimentary basin areas between Jersey, France and the offshore reefs. Lobster seems to be rarer in the deeper (>40 metres) more scoured seabed areas to the west of the islands where cover (e.g. boulders and crevices) will be scarce.

In comparison to the American lobster (*H. americanus*), comparatively little is known about the biology and behaviour of the European lobster and especially its larval and early life stages.[7] Whereas studies on the American lobster have successfully traced its planktonic, settling and early

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[3] Holthuis, L.B. 1991. FAO Species Catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. FAO Fish. Synop. 125(13):292p. Rome: FAO.

[4] Cheung, W.L., R. Watson and D. Pauly 2013. Signature of ocean warming in global fisheries catch. Nature 497:365-368.

[5] Jersey annual temperature statistics: Jersey Met (pers. comm.); rising sea temperature: Jersey Marine Resources (pers. comm.).

[6] Ingle, RW and Christiansen, ME, 2004. Lobsters, mud shrimps and anomuran crabs. Synopses of the British Fauna (New Series). No. 55. Linnean Society of London.

[7] Linnane et al. 2000. On the occurrence of juvenile lobster Homarus gammarus in intertidal habitat. Journal of the Marine Biological Association of the UK. 80(2):375-376.

development stages, similar research in Europe (often using the same methodologies) has struggled to find and map the distribution and preferred settling habitats for lobsters.

For example, attempts at capturing zoea and megalopa from lobsters in Jersey waters using light traps and plankton nets has so far been unsuccessful (pers. comm. Marine Resources). Indeed, the inability of various research projects to find planktonic lobster larvae has proved to be something of an enigma locally. For this reason, information on the early life stages of lobsters in this report is drawn from research that occurred outside the area, but which is presumed to apply to Jersey waters.

The lobster reproductive cycle begins when males and females reach sexual maturity and are capable of mating and breeding successfully. For Jersey lobsters Bossy (1986) used the ratio between abdomen width and carapace length in females (and the presence of eggs) to estimate a sexual maturity length of *circa* 99.8 mm (CL). 77.1 mm was estimated to be the minimum size for sexual maturity. Studies on morphometric changes in male and female lobsters from across the UK and northern France have identified changes in females at 79 mm CL and in males at 98 mm CL that are indicative of sexual maturity. Annual scientific trials in Jersey suggest that morphometric changes in abdomen shape start to occur at about 75 to 80 mm with egg production starting at circa 82 mm but occurring sporadically until 87 mm. This suggests that successful breeding requires at least one further shell moult after initial signs of maturity and that many females have not bred prior to reach the current MLS.

Mating occurs immediately after the female has moulted at which time the hard-shelled male will transfer sperm to the female. The female may retain this sperm until the eggs have been laid and are ready for fertilisation. Research in Norway suggests that mating generally occurs in the summer months and that eggs are retained by the female until the following spring or early summer when they are shed. The Norway female lobsters mostly operated on a two-year reproductive cycle with only a small number of so-called ‘super-females’ that will moult and spawn in successive years. Studies by Ifremer on lobsters from Les Minquiers suggest that spawning within local waters occurs in the spring and autumn months which suggests that the super-female phenomenon may play an important role locally. Additionally, berried females (females with visible eggs on the underside of their abdomen) are caught in both the spring and autumn potting surveys conducted by Jersey Marine Resources, adding further evidence to this claim.

The capacity for egg production increases as females grow because a larger abdomen has more space to hold eggs. It is also thought that older females are more efficient breeders and produce a higher number of viable eggs than younger lobsters. In Norway females below the minimum size of 88 mm (CL) were estimated to contribute 3 to 8% of available eggs in the local system (the eggs that contribute to the larval stock) while those above 100 mm (CL) might contribute up to 50%. Assuming this phenomenon applies to local populations, it emphasises the important role that a correctly set legal minimum size plays in fecundity and the maintenance of stock resilience.[8]

The extruded eggs remain on the female’s pleopod until they hatch, usually during the hours of darkness. The hatched larvae are planktonic and remain so for anywhere between two and three weeks, depending on the water temperature. During this time the lobster will undergo four development stages. The first three stages are as a zoea (the free swimming planktonic larval form) where it will grow from around 2.3 to 4.6 mm (stage one) to 9.9 to 16.5 mm (stage three). The

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[8] Agnalt, A-L., Kristiansen T. S., and Jorstad K. E. 2007. Growth, reproductive cycle, and movement of berried kuropean lobsters (Homarus gammarus) in a local stock off southwestern Norway. – ICES Journal of Marine Science, 64: 288–297.

fourth and final planktonic stage is the megalopa (the larval stage following the zoea stage) which may be up to 18.8 mm long and broadly resembles the adult in shape.[9] In Jersey, there are reports of the megalopa stage being found on shore.

The presence of berried female lobsters in Jersey waters suggests that the hatching and planktonic phase occurs locally. Despite local research, the distribution, pathways and settling areas for lobster larvae remain undocumented with no lobster larval stages having been found. One factor currently being explored concerns the complexity of local tidal currents, and especially the gyres created by offshore reefs and islands. This creates a long water residency within the Bay of Granville area and a limited exchange of water with the wider English Channel. This means that sea water entering Jersey waters may remain trapped there from several weeks to a year. Whether such local factors could play a role in the distribution of larval lobsters is the subject of current investigation.

During the 1980s regional plankton studies[10] found a paucity of lobster zoea in the Normano-Breton Gulf area between May and August and hardly any megalopa (in August). In contrast, sampling at Flammanville, just a short way north of Jersey, produced many more zoea although not many more megalopa, perhaps because these had already settled onto the seafloor. Studies from lobster hatcheries suggest that just 0.005% of released larvae survive the planktonic phase to settle onto the seafloor. This means for every million eggs released, just 50 larvae will survive to become megalopa on the seafloor.[11]

The megalopa of American lobsters are specific about which habitats they will settle onto with a high preference for coarse sediment and cobble. Laboratory studies have shown early benthic stage American lobsters will utilise gaps between cobbles as hiding spaces[12] and will dig into sediment.[13] However, observing and documenting the settlement and early juvenile phase of the European lobsters has proved difficult and the early benthic phase of their lifecycle (up to around 45 mm CL) remains something of a mystery.

Understanding the distribution and ecological association of plankton and early benthic lobsters in Jersey waters is important but has so far eluded researchers. A possible indication of settling/juvenile habitat preference in Jersey waters comes from a recent (and ongoing) intertidal survey of 126 lobsters on the east and west coasts. The survey results suggest that the west coast has a larger lobster population (93 individuals across 20 survey days) compared with the east coast (24 individuals across 16 survey days).

The survey included 21 lobsters (17.5%) with CL of <50 mm including one of 15 mm, most of these were in association with complex rock habitats on the west coast of Jersey. This apparent relative abundance of lobsters on the west coast could perhaps be reflective of habitat preference by settling megalopa. Or it may reflect differences in habitat, wave exposure, tidal currents, depth profile, etc.

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[9] Free, E.K. 1998. Reproduction in the European lobster (Homarus gammarus (L.). In: “The European lobster Homarus gammarus (L.)”. van der Meeren, G. and O. Saldol (eds.), Proceedings from the Seminar at Kvitsoy 1995, Fisken og Havet NR 13 1998. Institute for Marine Research, Norway, 4-25.

[10] Martin, J. 2001. Les larves de crustaces decapodes des cotes francaises de la Manche. Ifremer.

[11] www.nationallobsterhatchery.co.uk

[12] Howard, A. Bennett, D. 1979. The substrate preference and burrowing behaviour of juvenile lobsters (Homarus gammarus (L.)). Journal of Natural History. 13(4):433-438

[13] Wickins, J, Roberts, J, Heasman, M, 1996. Within-burrow behaviour of juvenile European lobsters Homarus gammarus (L). Marine and Freshwater Behaviour and Physiology. 28(4):229-253

Whether Jersey's intertidal area acts as a nursery area for juvenile lobsters which then migrate offshore is also unknown. The proportion of intertidal lobster above minimum size (18%) is similar to the 13% measured offshore during annual scientific trials by Marine Resources. A Bay of Biscay study found that adult lobsters exhibit a preference for reef edges where rocky seabed meets sediment in areas with medium to high wave energy and at a dept of 35 to 40 metres. Except for the depth, which seems quite deep for Jersey lobsters, this general description fits well with local knowledge. This is important as the availability of suitable habitat has been suggested as a key driver in the carrying capacity and size structure of *H. gammarus* populations (Seitz et al., 2014). [14]

Once settled, a lobster will grow by periodically moulting its shell, the regularity of which plays an important role in the maturation of individuals and, at a population level, general productivity, resilience and biomass. Sea temperature plays a key role in the growth (and therefore moulting) rate of European lobsters with warmer seas leading to decreased moult increments (i.e. difference in size pre and post moulting) which, in turn, may lead to a decrease in size at sexual maturity. Annual double moulting has also been observed to increase with rising sea temperatures. Given a measured rise in sea temperature in Jersey waters of 0.8°C since the 1980 (1.2°C during the winter), research could be needed to inform local management measures. [15]

The European lobster is territorial and, once established in an area, an adult may not afterwards move very far. Tagging experiments in Norway suggest that 40% of adult lobsters remain immediately adjacent to their release zone with a further 44% not travelling further than 500 metres. However, other tagging studies suggest that male and female lobsters may range up to 4 km from their burrow with some making journeys of up to 45 km. It is suspected that individuals will protect their holes or crevices from potential intruders and that, as with the American lobster, the number and size range of holes in an area will determine the size, structure and abundance of the local lobster population.

Unverified citizen science experiments by a Jersey fisher who used coloured bands placed on released lobsters produced a similar conclusion with the banded lobsters being recaught close to the release site. [Tom Vallois, pers. comm.] If accurate, then this may be relevant for lobster fisheries based on localised or semi-isolated areas such as Jersey's offshore reefs. If lobster populations in semi-isolated areas are largely self-contained and recruitment from other areas is low, then maintaining localised breeding stocks may require localised management measures.

The diet of adult lobsters is generalist and dominated by scavenging for live invertebrates (such as crabs and worms) and dead animals such as fish. Feeding beyond the immediate area around their hole is usually nocturnal and will peak just after sunset. Lobsters are thought to be more active during the summer months than over winter.[16] This seasonal activity may explain the consistently lower daily LPUE rates that are observed for Jersey vessels operating between May and September/October. Local data suggest that the resumption of activity may be related to a temperature threshold as some years the LPUE increases dramatically in a short space of time when the sea temperature reaches ~14°C in between May and June.

[14] Galparsoro, I, Borja, A, Bald, J, Liria, P, Chust, G, 2009. Predicting suitable habitat for the European lobster (*Homarus gammarus*), on the Basque continental shelf (Bay of Biscay), using Ecological-Niche Factor Analysis. *Ecological Modelling*. 220 (4): pp. 556-567

[15] Agnalt A. L. Farestveit E. Gundersen K. Jørstad K. E. Kristiansen T. S. 2009. Population characteristics of the world's northernmost stocks of European lobster (Homarus gammarus) in Tysfjord and Nordfolda, northern Norway. *New Zealand Journal of Marine and Freshwater Research*, 43: 47–57.

[16] Smith, I., Collins, K. & Jensen, A. Movement and activity patterns of the European lobster, Homarus gammarus, revealed by electromagnetic telemetry. Marine Biology 132, 611–623 (1998).

Male lobsters are thought to reach sexual maturity before female lobsters (in terms of CL). During a single season an inseminated individual female may mate with several males and an individual male may mate with several females. Laboratory experiments suggest that during moulting females release a pheromone that can be detected by males suggesting that the male's sense of smell plays an important role in reproduction. During mating the male will approach the female from behind, mounting and then turning her before copulating face to face. Copulation will last several minutes after which the animals separate, move apart and then groom themselves. [17]

A European wide study of lobsters suggests that overall genetic diversity is low across the species' range but that the population is composed of localised subgroups (island populations) within which gene flow is more restrictive. This may have implications for areas such as Jersey where the undersea topography and tidal current patterns may have the ability to create localised populations around isolated features such as offshore reefs. [18]

1.2 The Lobster Fishery in Jersey

The lobster, combined with crab, pot fishery is the mainstay of the Jersey commercial fleet. Its importance to the industry as well as to the island both as an export product and for local hospitality sales is well recognised by the Government of Jersey. In addition to its commercial value the recreational lobster fishery is seen as an important pastime by shore and boat based fishers alike and there is a long history and tradition of fisher's guarding the knowledge of their lobster holes and marks lest others find them.

1.2.1 An historical overview of lobster fishing round Jersey

Lobsters have probably been caught in Jersey waters for as long as there have been people living on the island although predominantly for subsistence or local sale. During late mediaeval times Jersey developed an export industry to the south coast of England based on cured conger meat. This trade may also have included other fish and shellfish species and by 1694 one local commentator noted that 'a good deal of the lobster eaten in London comes from the [Channel] Islands with boats going and coming for that purpose.'

Fresh shellfish has a much shorter shelf life than most agricultural or cured fish products which historically limited potential export markets by their distance and transport links. Regular wars between Britain and France also disrupted local markets and interrupted the fishing and export trades from the Channel Islands to the UK and France. Cessation of the Napoleonic wars in 1815 greatly improved security at sea and restored UK trade links so that by the 1820s Jersey had become a major exporter of live oysters to the English east coast and London. The lobster trade may have developed in tandem with oysters as records indicate that lobster exports to London went from *circa* two tonnes ('170 dozen lobsters') in 1829 to over 13 tonnes ('1,470 dozen lobsters') in 1833. This parallels the growth in oyster exports and suggests that traders on that route were carrying more than just bivalves. [19]

The first local lobster regulations were passed in 1862 when a minimum size of nine inches (body length) was required. In 1863 the oyster fishery collapsed forcing many local vessels to move off island to fish for oysters in UK waters. For those that remained on island, the conger and lobster

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[17] Skog, M, 2009. Male but not Female Olfaction is Crucial for Intermolt Mating in European Lobsters (*Homarus gammarus* L.). *Chemical Senses*. Volume 34(2): 159–169,

[18] Jørstad , KE, Farestveit , E, Kelly E, Triantaphyllidis, C, 2005. Allozyme variation in European lobster (Homarus gammarus) throughout its distribution range. *New Zealand Journal of Marine and Freshwater Research*. 39(3): 515-526.

[19] Export figures: *The Jersey and Guernsey Magazine*: 1837, p.215.

industries became the principal source of fishing income. In the nineteenth century lobsters were caught using strings of baited homemade wicker creels with surface marker buoys made from cork. The principal lobster fishing areas were much the same as they are today with Les Minquiers frequently being cited as the most productive grounds both locally and regionally. [20]

A near total removal of all fisheries laws in 1868 was followed by the 1877 UK Act (enacted in Jersey in 1881) limiting the minimum size of lobsters to a body length of eight inches (20.3 cm). This was not, however, enforced in the island with reports suggesting that the law was widely ignored. By the 1890s Jersey's fisheries (along with those of most of Europe) were showing the effects of several decades' overfishing, a situation which had been exacerbated by the introduction of steam-powered vessels.

The Jersey-based biologist James Hornell raised concern over the local stocks including lobster whose catch numbers he had monitored closely for some years via merchants and exporters. His publicly expressed concerns led to the passing of new fisheries regulations in 1901. These were met with resistance from fishers and the naturalist Joseph Sinel (Hornell's father-in-law) who campaigned to have the 1901 law reversed. This occurred in 1907 and from then until the early 1970s the entire Jersey fishery was subject to a regime of light regulation.

Between 1900 and 1940 there was a gradual decline in local fisheries which included the dismantling of a once pervasive communal fishing tradition based around small sailing vessels operating from outlying harbours. In its place arose a centralised fishing fleet of small motorised vessels which became increasingly based at the port of St Helier. Competition with larger and more powerful French vessels affected lobster fishing offshore including at Les Minquiers and Les Écréhous and by the 1950s the Jersey professional fishing industry had become the preserve of a small number of seasonal lobster fishers.

A revival of commercial fishing started in the 1960s with the development of an export trade to France, the organisers of which offered a guaranteed market and financial security for fishers. From this, the fishery went from a few seasonal vessels using homemade chicken wire pots to a more professionalised, full-time fleet that, by the mid-70s, included large vessels fishing for lobster and crab in the wider English Channel.

The EU Common Fisheries Policy and other developments caused a decline in the 'Channel Fleet' and focused fishing activity into the seas around Jersey. With a whelk fishery yet to develop and few other species being available in sufficient quantities, the Jersey fishery became dominated by potting for crab and lobster.

The Sea Fisheries (Jersey) Law of 1994 represented a major watershed in management and included a minimum size for lobster and restrictions on certain types of pots, fishing techniques, etc. These rules were applicable across Jersey waters with other measures coming through conditions associated with a professional fishing licence.

The majority of lobster landings in the 1980s were exported (between 76 and 89 tonnes annually). The complexities of European fisheries management and politics impacted on Jersey in several ways and eventually resulted in the island (via the UK) signing a fisheries agreement (The Bay of Granville Agreement) with France in 2004. The Agreement derived from having established Jersey's territorial seas in 1997 as prior to this it was uncertain as to whose laws (French or Jersey) applied in which sea areas.

[20] Chambers, Binney and Jeffreys, 2016. Les Minquiers – A Natural History. Charonia Media. Book 538pp.

In the years following the signing of the Bay of Granville Agreement, fishing effort for lobster began to expand placing pressure on the stock. In 2016 lobster landings were 254 tonnes after which landings declined rapidly to 155 tonnes in 2019. This decline was not due to reduced fishing effort and, with Jersey reliant on fishing for lobster, the trend is of considerable concern. The 2020 pandemic did see a drop in fishing effort and, while landings were low at 114 and 111 tonnes (2020 and 2021), they were proportionate to fishing effort.

The UK's decision to leave the EU in 2016 also removed the Channel Islands' unrestricted access to the single European market. The negotiation of a post-Brexit Trade and Cooperation Agreement (TCA) between Jersey and the EU required the termination of the Bay of Granville Agreement which ceased on 1 January 2021. The TCA places Jersey in charge of its fisheries management and licencing and removes much of the latent fishing effort associated with the former agreement. However, it also introduced hurdles and barriers to the export of fisheries products to the EU including for direct landings. Within Jersey waters the lobster fishery that is dominated by Jersey vessels which, together with its economic importance, makes returning the stock to sustainability a priority for the Government of Jersey.

1.2.2 The modern Jersey lobster fleet

The years following World War II mark a low point in Jersey's fishing industry, so much so that by the late 1940s the fleet was formed of six fishing boats. Since then, there has been expansion in the lobster potting industry so that by 1982 there were 15 dedicated lobster potters rising to 88 in 2019 (Marine Resources Annual Report, 2019).

A government commissioned report from 1979 states that 'the fishing industry of Jersey depends primarily on the health of one resource: the lobster' (Culley, 1979)[21]. This statement remains true today although during the past two decades there has been an increase in spider crab (*Maja brachydactyla)* landings and, in the 1990s, whelk began to be fished. Nonetheless, the economic reliance on lobster remains high with a majority of vessels and their income deriving from this one species.

In 1982 the 15 full time lobster fishing boats varied in length from 4 to 12 metres and between 0.8 to 10.93 tonnes. The favoured design was for stern wheelhouses to provide forward deck space. Although there are more vessels today and their design is more varied, the range in length and tonnage remains similar to forty years ago.

The main difference with modern lobster fishing boats is the speed at which they travel. In the early 1980s vessels would travel between 4 to 8 knots to fishing grounds whereas current cruising speeds can average 18 knots for 8 to 10 metre vessels. This technological creep has made distant fishing grounds easier to fish in a single day.

The quantity of pots fished by today's vessels is similar to the early 1980s but whereas the historical fishery used open single-chambered pots, since the 1990s there has been a reliance on the two-chambered parlour pot. The parlour pot has bait in the entrance chamber and a one-way passage to a second chamber ('the parlour'). Once the lobster finds its way into the parlour chamber it is prevented from eating all the bait, allowing more animals to be attracted into the entrance pot.

[21] Culley, M, 1979. An investigation into some aspects of the fisheries of Jersey. Report presented to the SoJ. Portsmouth Polytechnic.

Escape from a parlour pot is difficult except for smaller lobsters through purposefully designed 'escape gaps'.

The parlour pot design means that bait lasts longer allowing fishers to work individual strings less frequently (once or twice a week rather than every day) without affecting the catch. In turn this means an active boat can work two or even three sets of gear on successive days rather than having to return to check the same pots each day.

In 2022 Jersey has a commercial fishing fleet consisting of 114 vessels with most being <10 metres in length. Jersey's fleet uses a range of fishing methods but static potting is the dominant metier and is practiced by 90% vessels. A variety of pot types are used by these vessels but parlour pots account for almost 90% of the total fishing effort. Parlour pots are highly efficient and their use is restricted in many parts of Europe. In Jersey waters No Parlour Pot Zones (NPPZs) are currently in place at Les Minquiers, established in 2007, and Les Écréhous, established in 2017, (see Fig. 1).

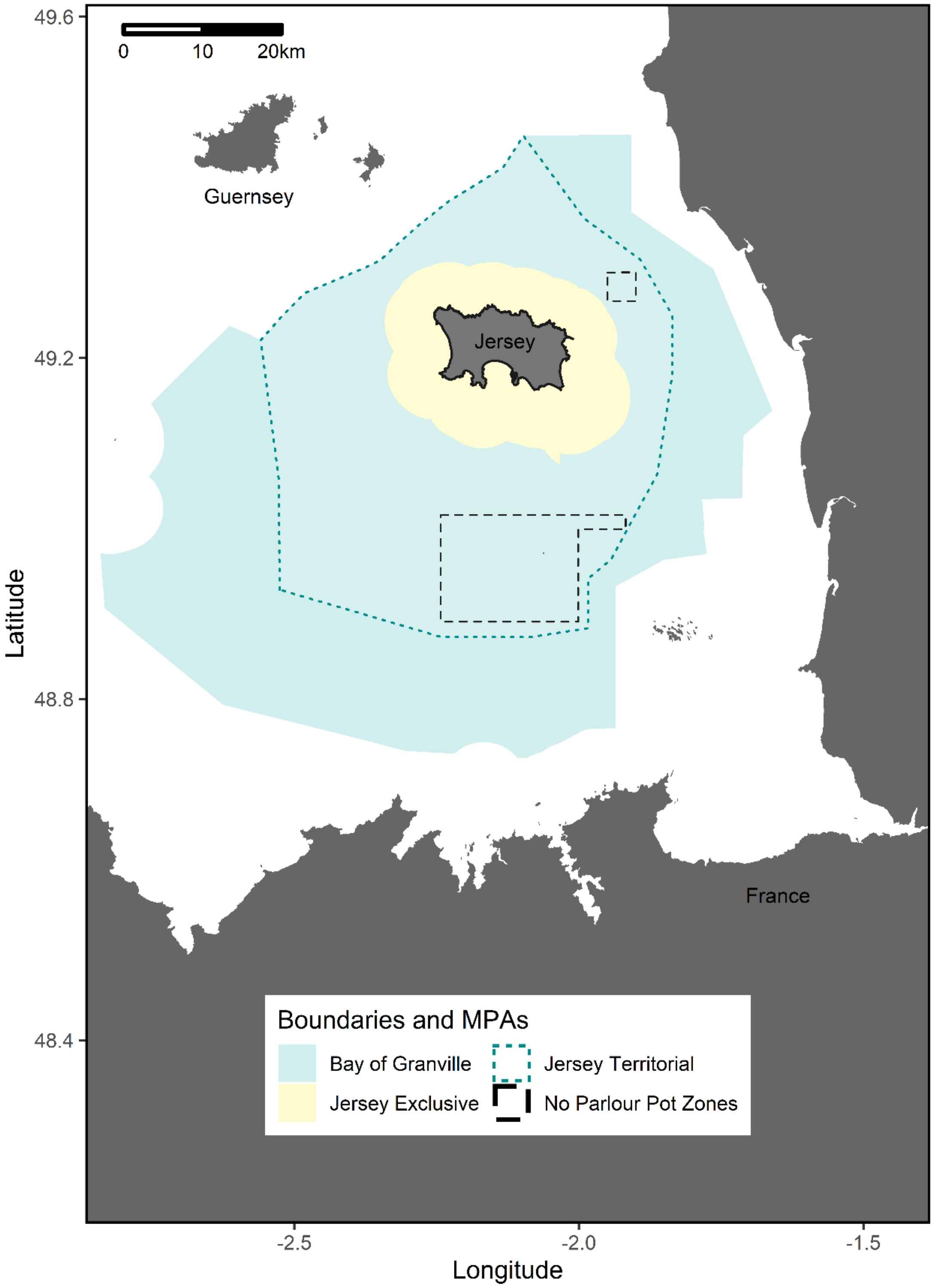

Fig. 1. Location of No Parlour Pot Zones (NPPZs) in relation to Jersey and France.

1.2.3 The current lobster fishery

For the Jersey fleet, lobster catches peaked in 2011 at 262 tonnes and remained above 230 tonnes until 2017 after which was a steady decline to 109 tonnes in 2022 (Fig 2.). Lobster is also fished recreationally (on shore and potting) but the scale of this fishery is not known. In addition to its commercial value, the lobster is an important component of the ecology and food webs that operate within Jersey's coastal seas acting both as scavenger, predator and prey to several species.

The economic, cultural and biological value of lobsters to the island Jersey cannot be overstated and this report will examine fishing pressures and stock sustainability, considering what measures are available to restore the health of the lobster population while also sustaining a local fishing industry and recreational sector.

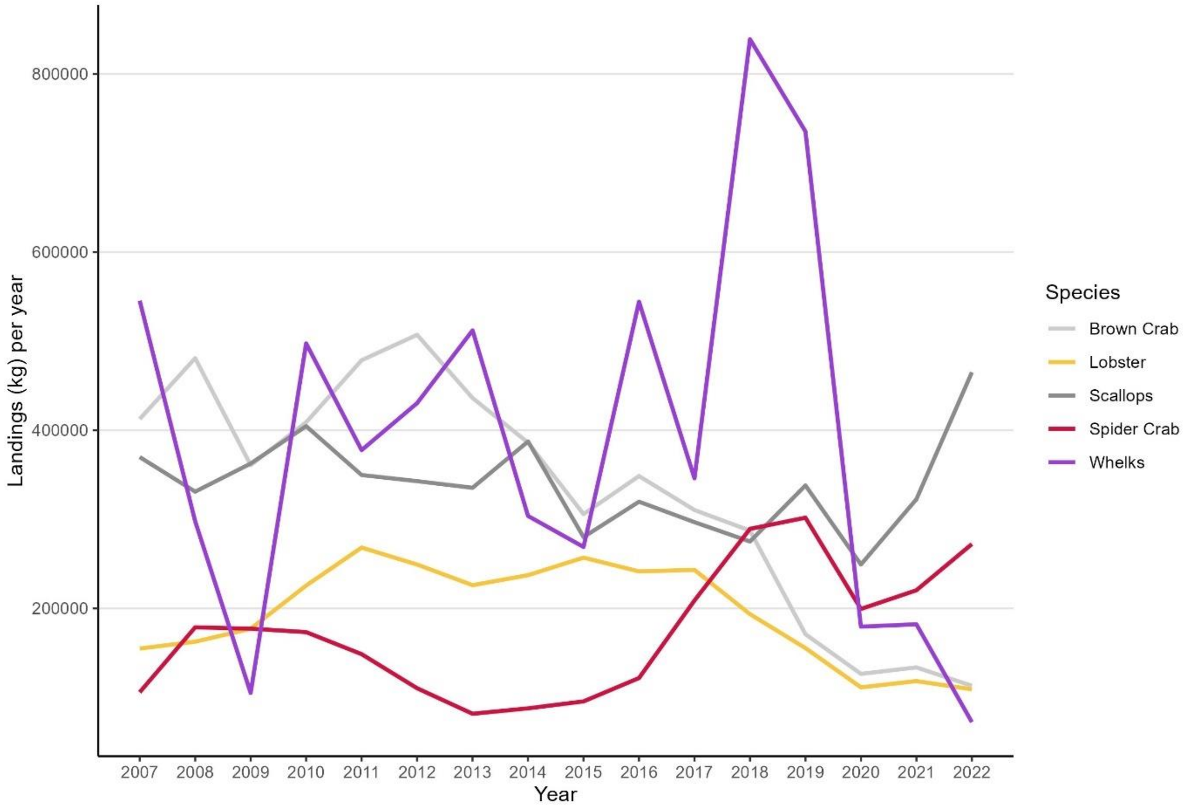

Fig. 2. Landings (kg) per year for the five key fisheries between 2007 and 2022.

1.2.3.1 The value of the current lobster fishery

Despite being far from the main catch component for the Jersey fleet (Figure 2) the lobster represents the largest economic value of all fisheries in the island (Figure 3). Lobsters are almost exclusively caught in pots with a minority caught as bycatch in nets or whelk pots. Around 85% of caught lobsters are exported to Europe via France either as direct landings from Jersey fishing vessels or via fish merchants. Lobster landings generate a consistently higher value than all other fishery species, and based on vendor buying prices, was estimated to be worth £3.2 million (2019), which was about 39% of the fishing economy, but previously reached £4.6 million in 2017, equating to 60% of the fishing economy. All fisheries values declined in 2020 and 2021 due to issues related to Brexit and Covid, resulting in the lobster fishery value declining to little more than £1 million in both 2020 and 2021. Most fishers sell their catch to local vendors, with prices varying throughout the year between £5 and £28 per kg[22], which will primarily be exported to Europe. Other markets include direct sales to restaurants and the public.

[22] Fresh Fish Company

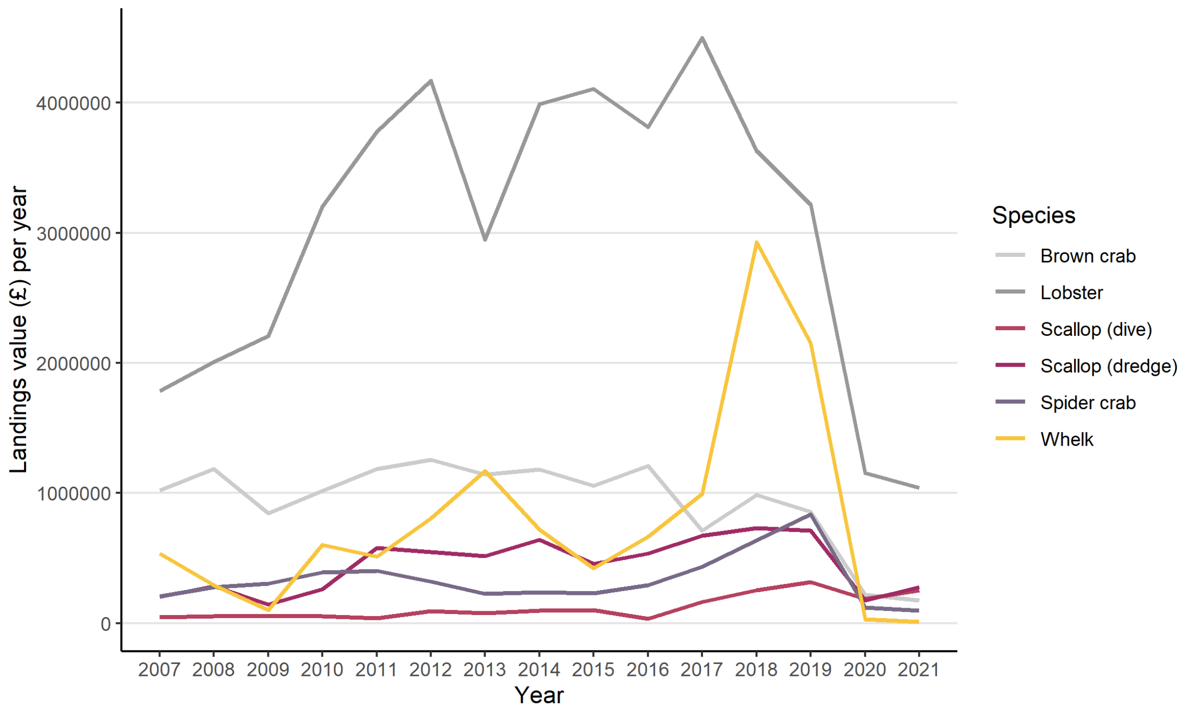

Fig. 3. Landings value (£) per year for the five key fisheries between 2007 and 2021 based on primary sale price per kg for each species (provided by the Fresh Fish Co).

The price of lobster has increased slowly over time, with average prices per kg only increasing by roughly £4 a kilo over the last 18 years (from an average of £14 a kilo between 2005 and 2010 and £18 between 2015 and 2022). Had lobster prices increased with inflation since 2005, in 2022 the price per kg should have increased to £21 (based on the Bank of England inflation calculator) whereas the actual average buying price in 2022 was £18.

2.0 Assessments of the Lobster Stock

Stock assessment methods are being developed with the support of the ICES WG Crab Group and in collaboration with IFRAMER. As the range and length of the data set grow enhanced techniques can be modelled and assessed beyond the initial LPUE assessments.

2.1 Historic Stock assessment

Various ad hoc and research driven studies of the lobster stock were carried out in the second half of the 20th century. These are outlined below to give context to modern research.

2.1.1 Portsmouth Report (1967)

In 1967 Portsmouth Polytechnic surveyed Jersey's fishing industry of Jersey with a view to encouraging its development. They documented an expansion from six fishing vessels in the late 1940s to 15 full time fishing vessels in 1967 using around 2,500 pots with another 2,500 pots used by part time fishers. With no sea border in place, vessels fished up to 17 miles west and 10 miles to the south of Jersey. There were 31 full-time fishers with a boat earning between £200 and £6,000 per annum. Pots were often made by the fishers themselves from wicker or chicken wire at a cost of around £1.

Assessment stock sustainability was difficult due to a lack of catch and other data although LPUE was estimated at 0.24 to 0.33 lobsters per pot in comparison to 0.11 in 2022. The study found up to 12% of lobsters were berried and when a new area was fished, older and larger lobsters were caught first followed later by smaller lobsters and then undersized ones, at which time the fisher would move their gear to a new area. A recommendation was made to increase the MLS of lobsters from eight inches (203 mm) to nine inches (229mm) total animal length to allow for size at maturity and because French importers did not want small lobsters.

2.1.2 The Bossy Review (1986)

During the early 1980s Dr Simon Bossy spent three years studying the Jersey lobster fishery, comparing it with similar fisheries around Europe. His conclusions suggested that the lobster population was overexploited with economic viability being derived from combined income from brown crab, spider crab and lobster.

Of the 5,000+ measured lobsters, 52% were female. Egg production occurred during the early spring and autumn producing a higher overall fecundity than expected. The study concluded that increased fishing effort without an accompanying increase in MLS impacted stock sustainability. In 1985 the MLS was increased from 80 mm (carapace length) to 85 mm. Figures 4 and 5 below are digitized versions of Bossy's data showing catch and population composition at the time.

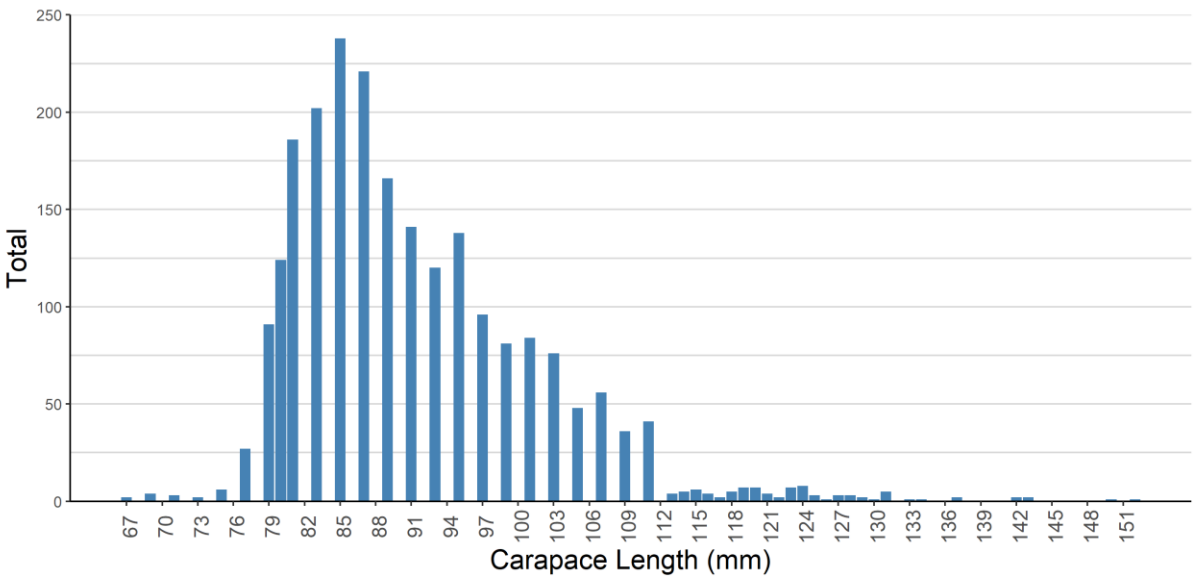

Figure 4. Digitised PhD data from 1981-82 (landings only).

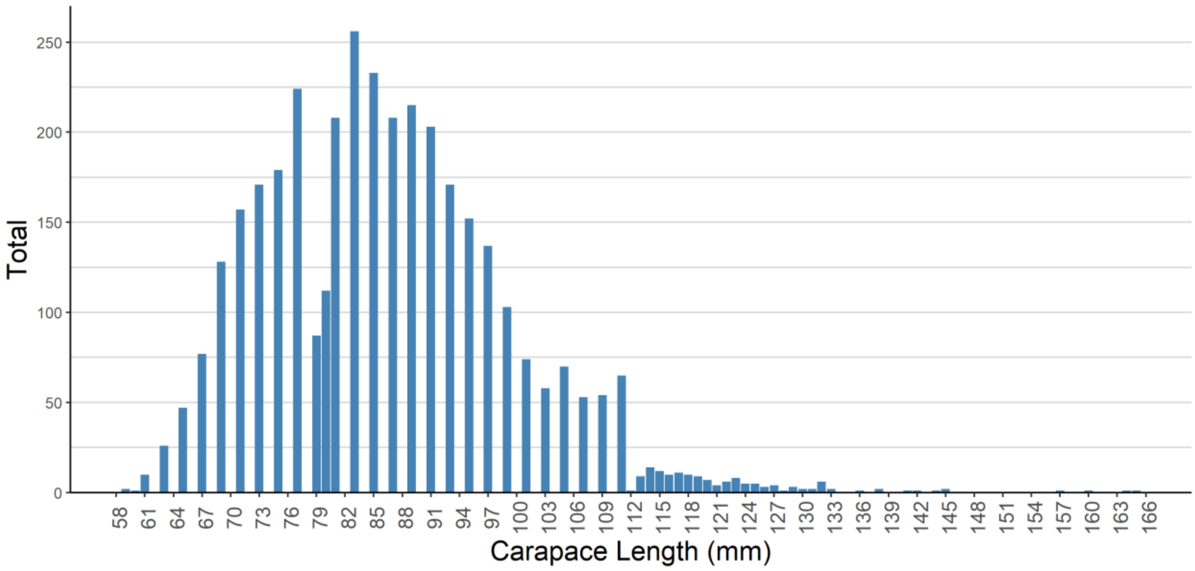

Figure 5. Digitized PhD data from 1981-82 (Total Catch).

2.1.3 Pre-2007 data

Accurate fisheries records have existed since 2007 with reliable daily logbooks giving effort and catch data. Prior to this fishery data are less consistent and reliable but general estimates can still be taken from them, these are presented together with modern data in Figure 6.

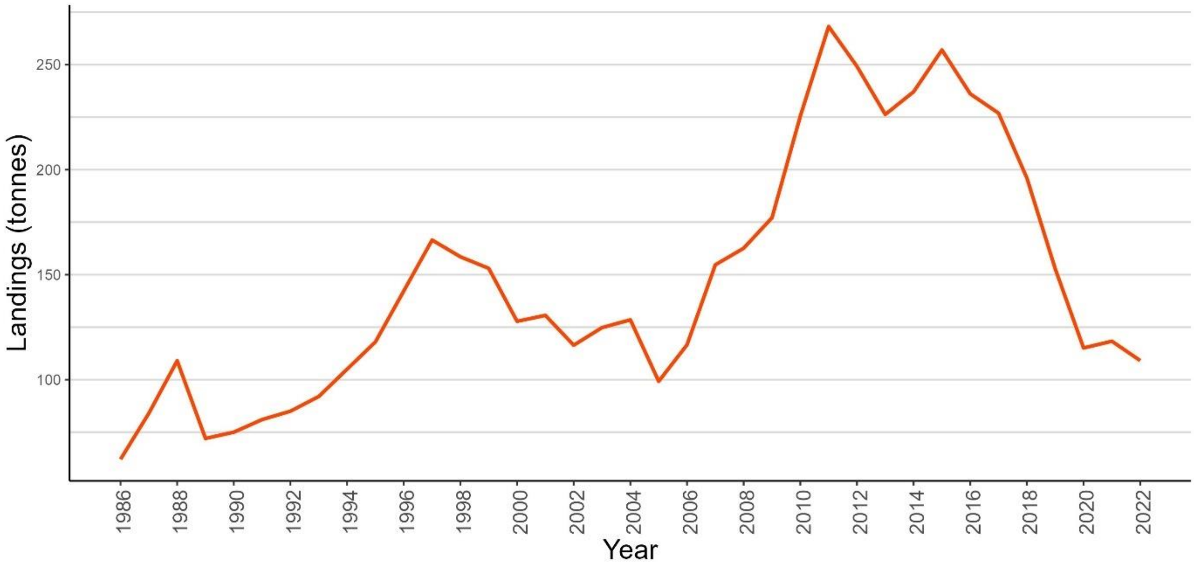

Figure 6. Commercial lobster landing data from 1986-2022. 2007 data onwards is based on fishers logbook entries.

2.2 Modern Data Sources

In recent years a more regular approach has been taken to data gathering with consistent annual trials and log book data collection as well as targeted but independent studies.

2.2.1 Commercial Data

The commercial fleet has submitted daily effort and catch statistics since 2007 in the form of logbooks. These logbooks are received quarterly and are mandatory for all licenced Jersey fishing vessels. Weights are in KG and are recorded for one of six zones. Effort is recorded in the number of pot lifts for each type of pot (inkwell, parlour pot, creel and D pot). Marine Resources hold sporadic annual catch statistics going back to the 1960s and daily catch recording from 2007. This data is used in Section 1.2 and Section 3 to present annual landings data (kg), effort (pot lifts) and LPUE (Landings per Unit Effort).

2.2.2 Annual Potting Trials

Annual trials have been conducted from 2004 to the present day as an annual two-week survey split across April and May. The same three locations are fished using adapted parlour pots without escape gaps. For all caught animals measurements are made of the abdomen width, carapace length and claw dimensions with the sex, berried status, any damage and disease being recorded.

From 2018 an additional potting survey was introduced at Les Écréhous and Les Minquiers as part of a PhD project to assess the commercial crustacean populations at the offshore reefs. Pots were set across three separate management areas: Marine Protected Areas (where mobile gear is excluded); No Parlour Pot Zones, and Open fishing areas. This is an ongoing project where the same areas will be surveyed every autumn to monitor any changes in crustacean abundance following the designation of the MPAs.

2.2.3 Quayside data

Since 2018, quayside measurements have routinely been performed by MR officers. At least 50 lobsters (>MLS) are measured per month either from the local vivier or as vessels land their catch into port. For each lobster a record is made of carapace length, abdomen width, sex and berried status.

2.2.4 Other projects

Marine resources in collaboration with the Société Jersiaise have set up a citizen science project measuring intertidal lobster populations. Measurements include carapace length, abdomen width, sex, berried status and GPS location.

2.3 Potting Trial Results

2.3.1. Annual Spring Potting Trial Results

Since 2004 Jersey has conducted an annual sampling program using adapted parlour pots to capture and record juvenile lobsters each year. Thirty pots are fished five times across May and June each year in three locations considered representative of the fishery (Fig 7). The pots are of the parlour design and do not have escape gaps. The pot mesh is also smaller than current parlour pots. Following a 48 hour soak the pots are recovered and all shellfish are measured, sexed and assessed for maturity based on morphological development (relative crusher size and abdomen width).

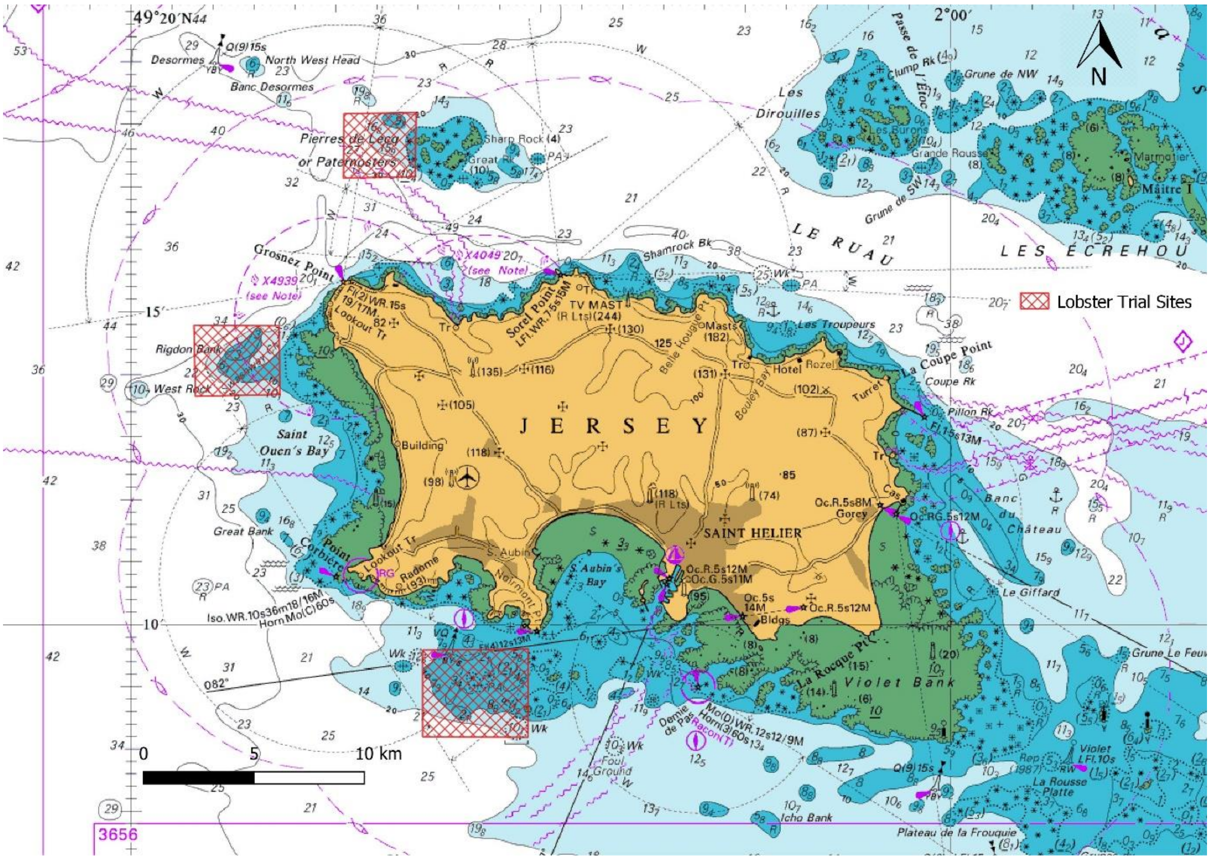

Figure 7. Locations of potting trial survey areas (red hatched boxes) in relation to Jersey

2.3.1.1 Catch and size distribution

Lobsters caught in the annual surveys were assessed separately for 'sized' (above Minimum Landing Size (MLS)) and 'undersized' (below MLS) as it is only those above MLS that are subject to fishing mortality. Lobster MLS for the time period of this study was 87 mm. The mean number of lobsters caught per pot steadily increased until 2011 for sized (>MLS) lobsters and until 2019 (2017 is considered to be an anomalous year) for undersized (<MLS) lobsters, after which both have been in decline, with the rate of decline much steeper for undersized until 2022 where an increase is observed (Fig. 8). In all years mean number of undersized lobsters was greater than sized. Fig. 6 shows the size distribution of lobster <MLS is stable (87mm) whilst the size distribution of lobster >MLS are decreasing.

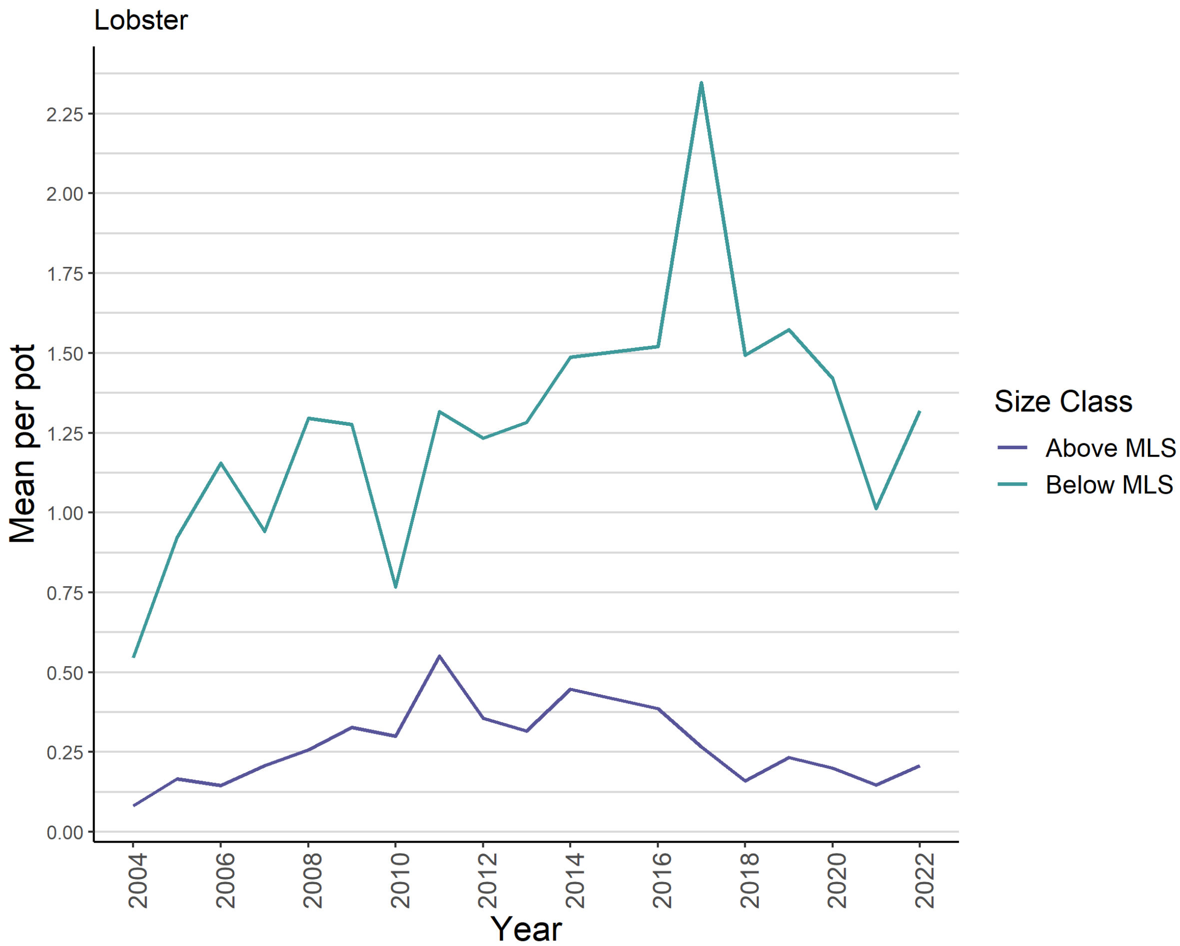

Figure 8. The mean number of lobster individuals caught per pot between 2004 and 2022, split for sized (>MLS, blue) and undersized (<MLS, green).

Size distributions from potting survey data is presented by year in Figure 9. These distributions indicate that the number of lobsters <MLS are relatively stable (87mm) whilst the number of lobsters caught >MLS have been decreasing overtime. The average size can also be seen to decrease over time. This indicates the need for enhanced management to rebalance the population structure by increasing the number of >MLS lobsters.

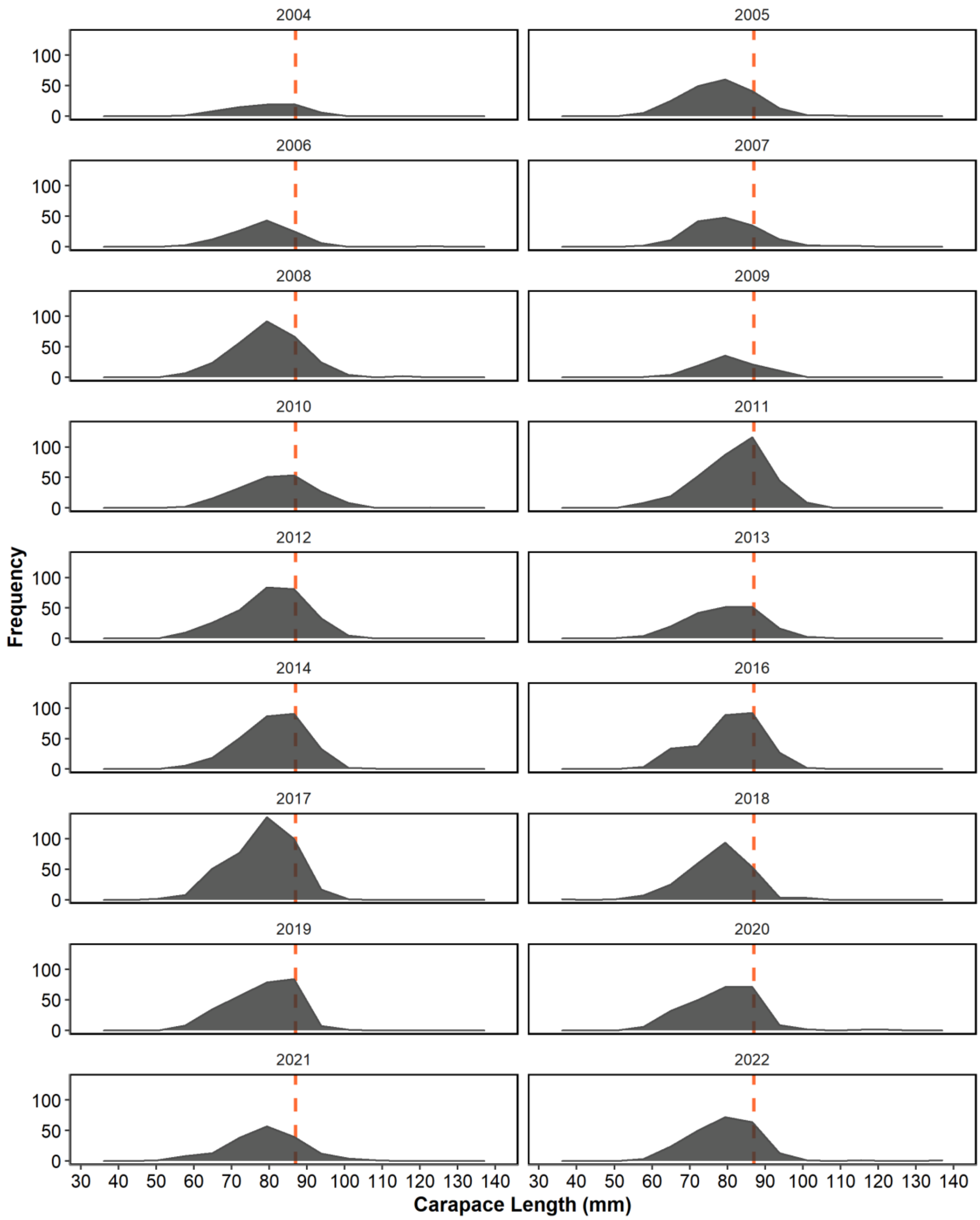

Figure 9. Presents the size distribution of lobsters caught in the annual trials between 2004 and 2022. Note that the number of pots used each year vary so the frequency does not reflect abundance, it is used to show the distribution of carapace lengths caught each year.

2.3.1.2 Annual trials sex ratio

The lobster sex ratio quantified during the annual trials and quayside measurements varied around 50% with males being more common between 2010 and 2014. This is followed by a significant drop in males for 2019 down to 36% (Figure 10). In 2022, 63% of lobsters measured during quayside measurements and from the annual trials were female.

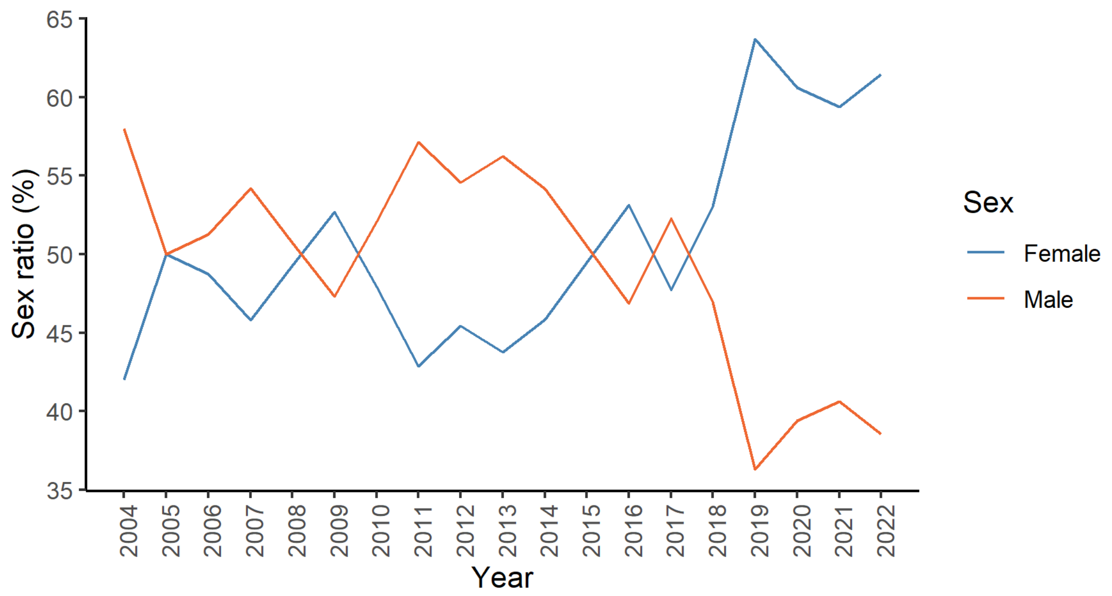

Figure 10. Lobster sex ratios from combined lobster trial data and quayside data between 2004 and 2022.

2.3.2 Autumn potting surveys

Between 2018 and 2020 further potting studies and economic analysis were carried out as part of a PhD study with the University of Plymouth. This included a second set of potting data taken each September focusing on the offshore reefs (Figure 11).

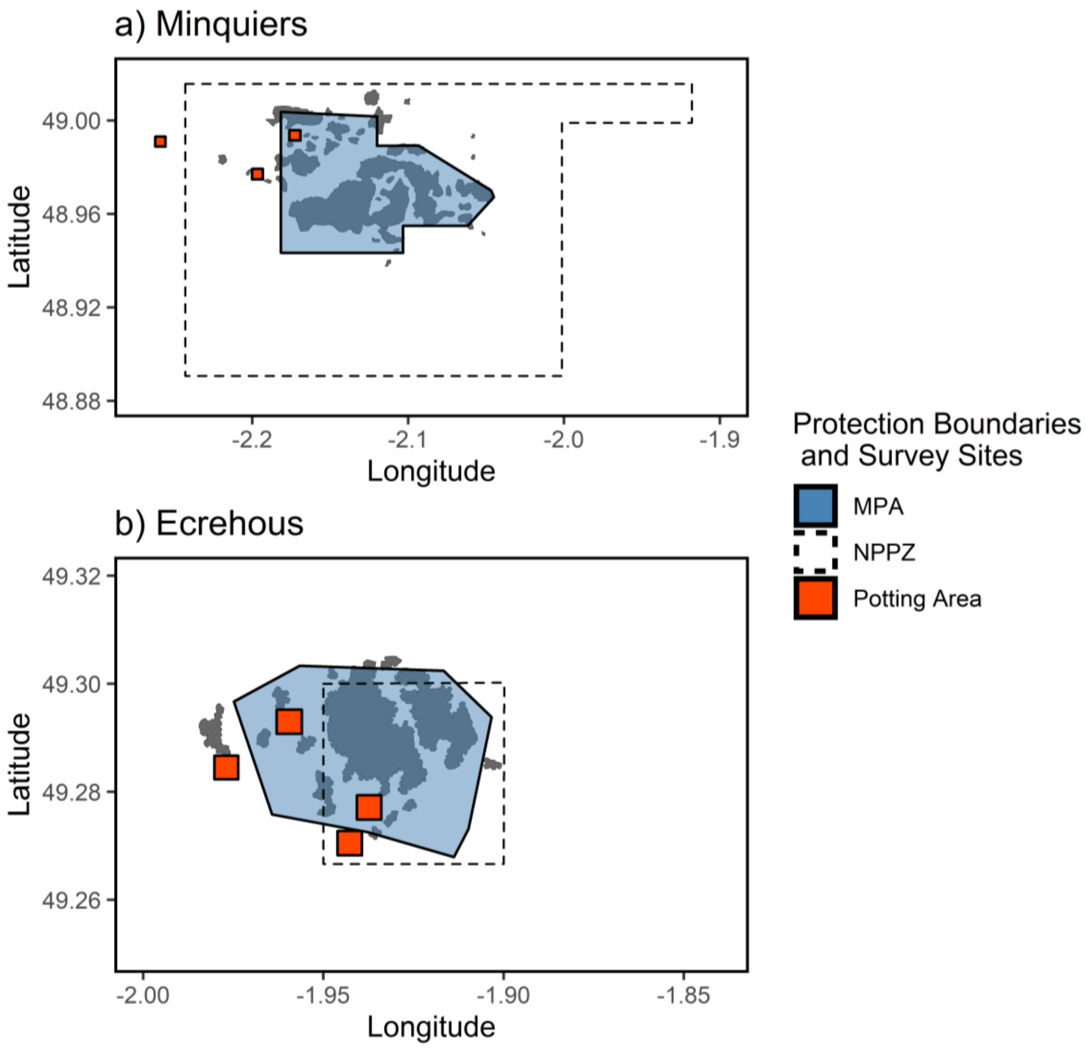

Figure 11a) Les Ecrehous and b) Les Minquiers offshore reefs with survey areas highlighted in red.

Three strings consisting of 10 pots were fished to survey 500 x 500 m^2 areas of rocky reef in different treatment types at both the Ecrehous and Minquiers offshore reefs. Strings were soaked for approximately 24 hours and all strings were deployed in the month of September. Shellfish (lobster, brown crab and spider crab) and bycatch were recorded for each string.

At the Ecrehous, the treatments surveyed were, Marine Protected Area (MPA), Marine Protected Area and No Parlour Pot Zone (MPA + NPPZ), and areas with no protection measures (Open). Similar treatments were surveyed at the Minquiers except with a No Parlour Pot Zone (NPPZ) treatment instead of an MPA treatment. This is due to the MPA at the Minquiers being contained within the NPPZ. The NPPZ at the Ecrehous was not sampled due to time constraints.

2.3.2.1 Size distribution

The size composition of the lobster stock varied spatially and temporally with decreasing numbers of individuals in all size classes at the Minquiers (Fig. 12a) over time while the size distribution at the Ecrehous over time was relatively stable (Fig. 12b). At both the Ecrehous and Minquiers, there were considerably more individuals caught that were below MLS than above, with a distinct drop in size class frequencies after individuals reach MLS (87 mm CL). This trend was observed across all treatments in all locations and years. The range of sizes at the Ecrehous was less than that of the Minquiers, with the minimum and maximum size classes missing from most years at the Ecrehous.

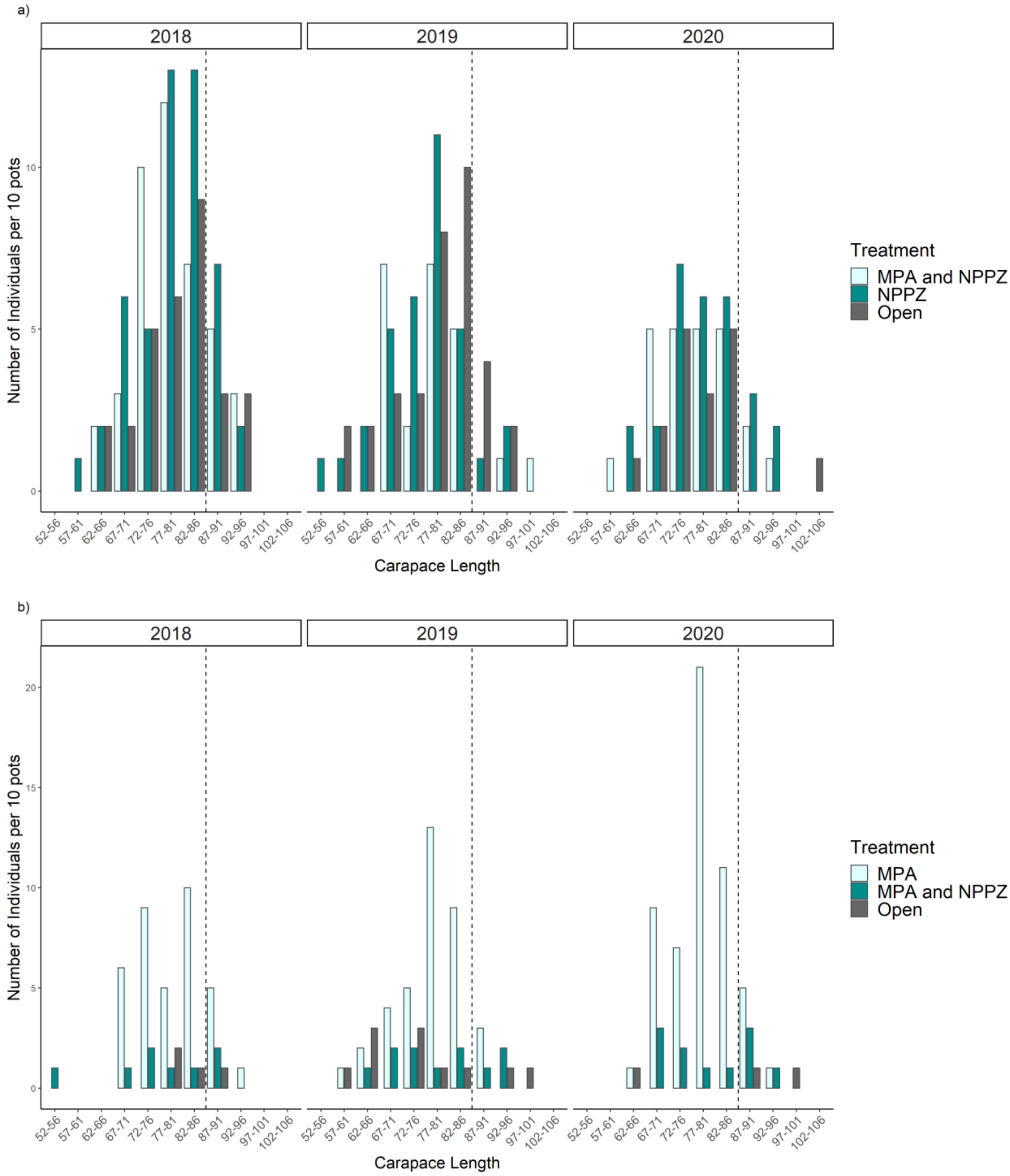

Fig. 12. Carapace length frequency distribution of lobster for 2018 to 2020 in 5 mm classes for a) the Minquiers and b) the Ecrehous. The dashed line indicates the minimum landing size of 87 mm.

2.3.2.2 Abundance - Minquiers

Abundance of Undersized lobsters was significantly greater than Sized lobsters, with greater abundance in the NPPZ compared to the Open Control, but not compared to the MPA and NPPZ combined treatment (Figure 13). For both Sized and Undersized lobsters there was an observed decrease in abundance over time, and this was reflected in the yearly LPUE data (Chapter 3) and yearly potting trial data (Fig. 6), which have decreased over time. The number of Sized lobsters per 10 pots decreased from 1.67 ± 1.52 in the MPA and NPPZ, 3 ± 1 in the NPPZ and 2 ± 2.65 in the Open Control in 2018 to 1 ± 0 in the MPA and NPPZ, 1.33 ± 1.15 in the NPPZ and 0.33 ± 0.57 in the Open Control in 2020, while Undersized lobsters decreased from 12.33 ± 2.08 in the MPA and NPPZ, 13.33 ± 4.04 in the NPPZ and 8 ± 4 in the Open Control in 2018 to 7 ± 3.46 in the MPA and NPPZ, 8 ± 2.65 in the NPPZ and 5.33 ± 4.16 in the Open Control in 2020.

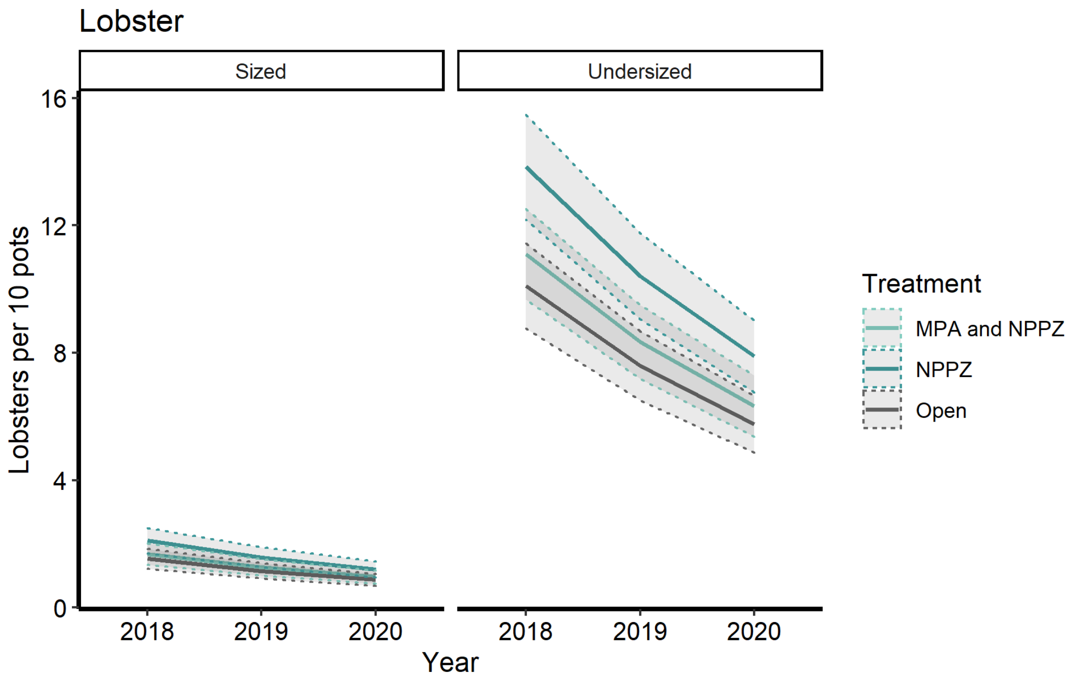

Figure 13. Mean number of lobsters per 10 pots (string) per year and treatment at the Minquiers. Grouped by Sized catch (above MLS) and Undersized catch (below MLS).

2.3.2.3 Abundance - Ecrehous

Neither size group showed a change with Year, at the Ecrehous and so was not included in the model, but there was a significant interaction of size group with treatment (Figure 14). The abundance of Undersized individuals was greater than Sized in all treatments and the abundance of Sized individuals did not differ with treatment. There was significantly greater abundance of Undersized individuals in the MPA (6.26 ± 6.67) compared to both the MPA and NPPZ combined treatment (1.55 ± 2.50) and Open Control (1.29 ± 1.72) (Figure 15).

	LR Chisq	Df	p
Minquiers			
Year	14.50	2	**<0.0001*****
Treatment	5.06	2	0.08
Sized	171.00	1	**<0.0001*****
Ecrehous			
Treatment	103.00	2	**<0.0001*****
Sized	115.00	1	**<0.0001*****
Treatment:Sized	9.68	2	**0.0079****

Figure 14. General linear model outputs for Lobster abundance at the Minquiers as a function of year, treatment and size group and the Ecrehous as a function of treatment and size group, Bold Denotes a significant result.

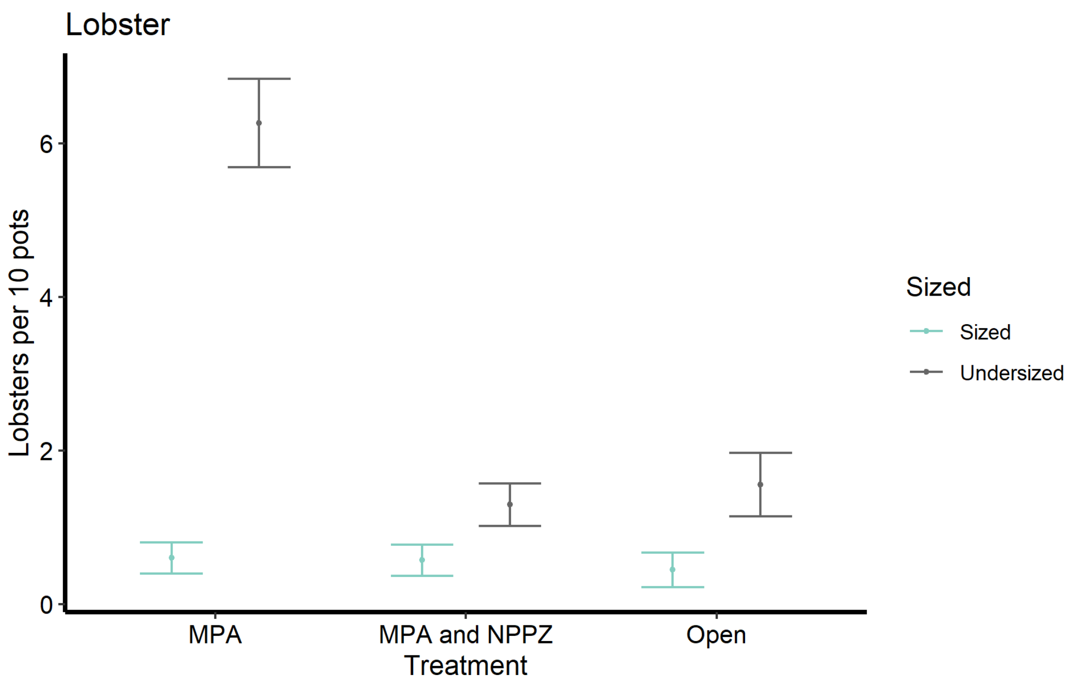

Figure 15. Mean number of lobsters per 10 pots (string) per treatment at the Ecrehous. Grouped by Sized catch (above MLS) and Undersized catch (below MLS). There was no effect of Year on the number of lobsters caught at the Ecrehous.

2.3.2.4 Length to weight relationship

Using autumn potting survey data from 2018-2020, the relationship between carapace length (CL) and weight of lobsters was investigated using Linear Models (LMs) in R (Wickham et al., 2019)

(Figures 16 & 17). The response variable of weight was modelled separately for Male and Female lobsters as a function of CL. Data manipulation and visualisation was carried out in the statistical program R (R Core Team 2018) using the packages in the tidyverse (Wickham et al. 2019).

There was a positive linear relationship between weight and carapace length for both female and male lobsters ($p < 0.0001$, Table 1, Fig. CW-W). Carapace length explained the variation in weight to a greater extent for females (R squared=0.68) than males (R squared=0.71), suggesting the relationship is more stable for females. Berried females showed a least stable relationship (R squared=0.51) but this is most likely a result of a small sample size. The range of sizes of berried females was also smaller, with the smallest having a carapace length of 78 mm, and the largest 96 mm.

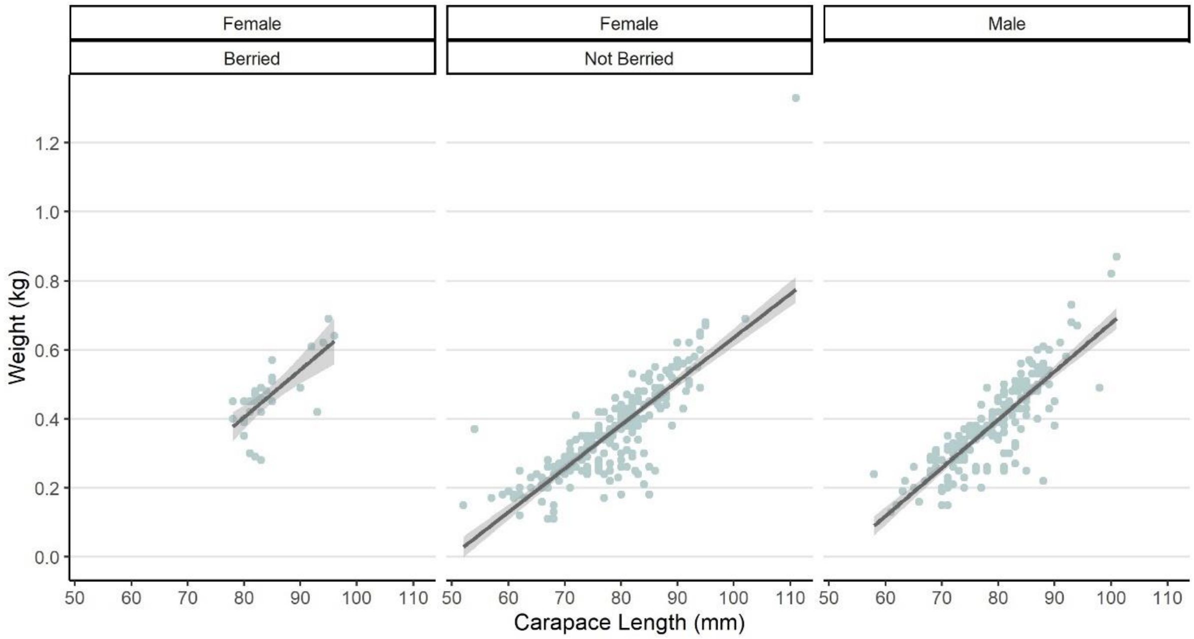

Figure 16. CL-W. Regression plots using the linear model method showing a positive relationship between lobster carapace length (mm) and weight (kg). Split for male, females and females with eggs (berried).

	Estimate	Std. Error	t value	p
Female Berried				
Intercept	67.3	3.260	20.70	**<0.0001*****
Weight	36.8	6.870	5.36	**<0.0001*****
Female				
Intercept	58.7	0.908	64.70	**<0.0001*****
Weight	54.0	2.370	22.70	**<0.0001*****
Male				
Intercept	59.5	0.942	63.20	**<0.0001*****
Weight	50.6	2.360	21.50	**<0.0001*****

Figure 17. Linear model outputs for lobster weight as a response of carapace length, for female with eggs (berried), female and male lobsters. Bold denotes a significant result.

2.6 Quayside Measurement Results

In total, 3324 landed lobsters were measured between 2019 and 2021 (Figure 18). Quayside measurements show a high level of conformity with 16 lobsters under MLS, seven of which were within 1 mm of it. The mode lobster size was 87 mm (n=306) and 76% of all lobsters measured were under 100 mm CL. The largest lobster was female with a carapace length of 155 mm caught in September 2019.

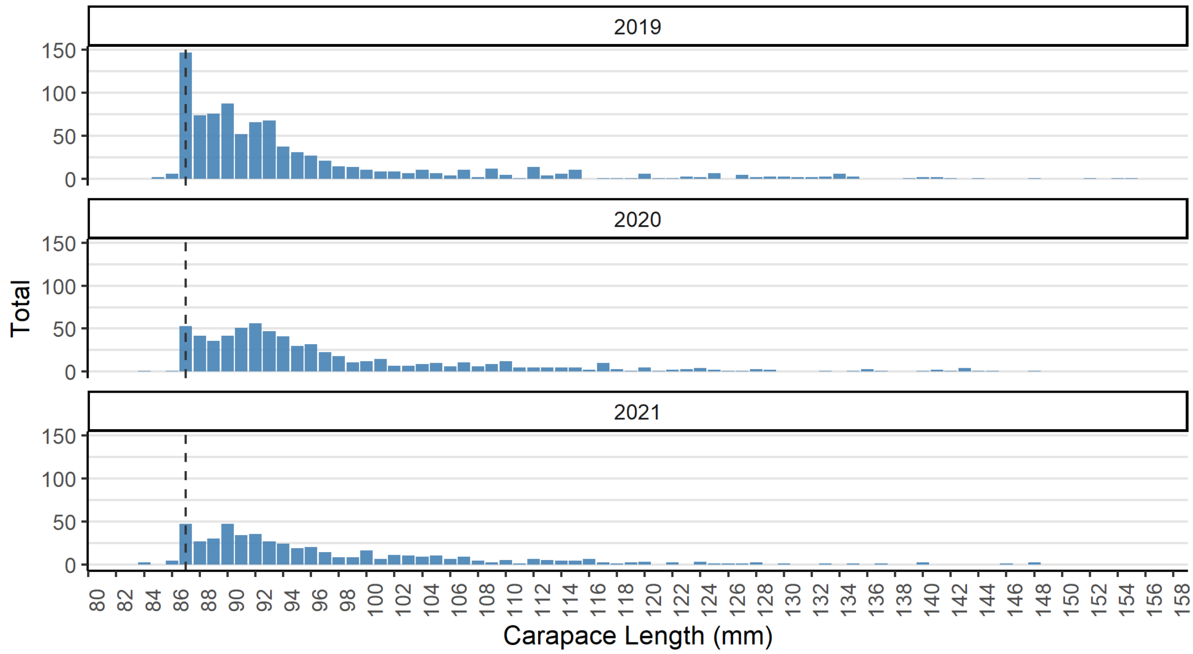

Figure 18. 2019 to 2021 quayside measurement results in 1 mm size brackets. Dashed vertical line shows MLS (87 mm). Lower frequencies in 2020 and 2021 relate to less frequent quayside measurements due to covid restrictions.

For 2018 to 2021, December shows the highest ratio of berried lobsters where 82% of all female lobsters landed were berried. This is compared to the lowest month (August) where 3.3% of female lobsters were berried. Although if all data is analysed dating back to 2004, Decembers berried lobster ratio drops to 62% (Figure 19).

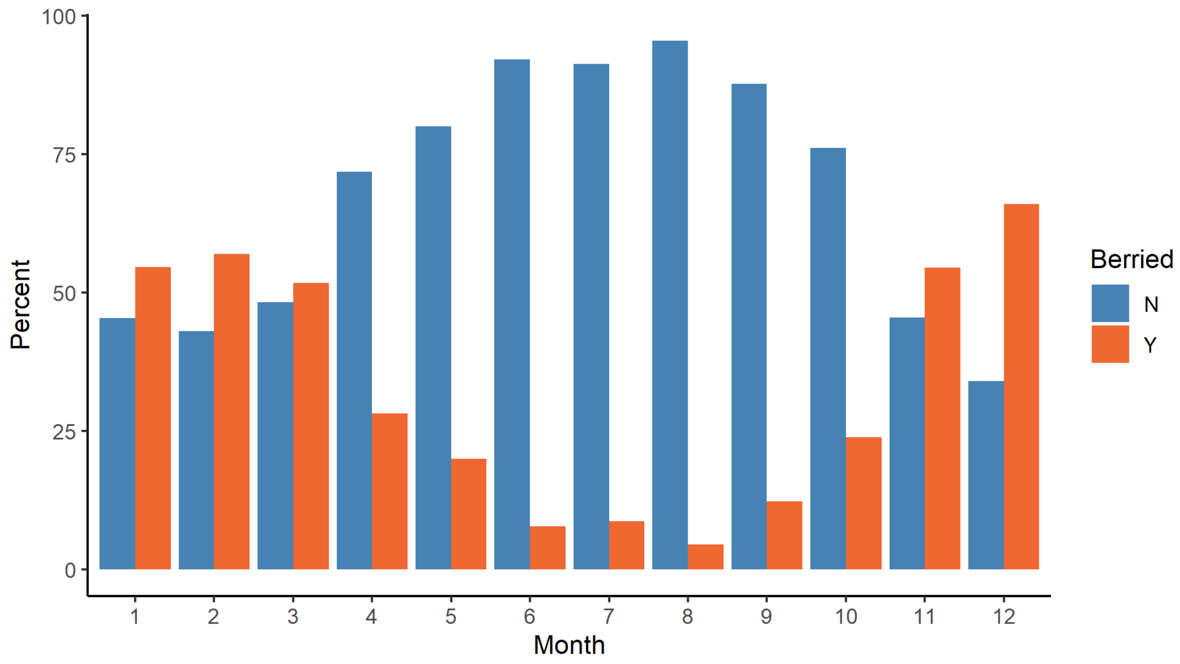

Figure 19. Percentage of berried (Y) and non-berried (N) lobsters measured between 2018 and 2021 (n=1517). This chart only includes female lobsters. 1 = January and 12 = December.

2.7 Crustacean WG & Marine Stewardship Council Audits

Through the Bay of Granville Agreement (2000-2020) a Crustacean working group was established in 2017 to work on joint Jersey / Normandy / Brittany issues relating to crab and lobster. This group met each autumn in St Malo as a breakout from the Joint Advisory Committee (JAC) meetings to which it reported. The meetings facilitated discussion on stock health, current and planned research and management options that were then presented back to the JAC for consideration and recommendation of management measures. The group met in 2017, 2018 and 2019 but was unable to meet in 2020 due to Covid restrictions. The group considered issues around declining crab stocks implementing a change to the minimum landing size and a closure on soft shell crab.

For lobster the group worked in line with the recommendations and needs of the Marine Stewardship Council (MSC) certification and off the back of shared fisheries data. Following Brexit and the dissolution of the Granville Bay Agreement in 2020 the WG group became dormant but the collaboration of the Jersey-Normandy lobster MSC continued.

The MSC certification for lobster has been held jointly by Jersey and Normandy since 2011. Scientists and fishers from the two parties meet with auditors in February each year to consider the state of the joint fishery and determine any amendments to management required to keep the stocks within the sustainability parameters of the certification. Since 2018 warning signs have been showing that the stock status is declining towards the MSC limits and action plans have been called for to combat this. Every 4 years there is a full review and reassessment is required against the most modern MSC standards where the sustainability of the fishery is fully assessed before recertification can be recommended. The next full review should have initiated in June 2021 but was given a one-year extension due to the ongoing work to settle fisheries matters post Brexit. MSC meetings between Jersey and Normandy were re-established in Autumn 2021 with a view to supporting the 2022-23 recertification.

3.0 Commercial Fishery

As detailed earlier in the report the commercial lobster fishery is of primary importance to both the commercial and recreational fishing sectors as well as to the hospitality and retail industry. Lobster fishing witnessed a boom between 2009 and 2015 when LPUE increased by as much as 50% (Figure 20). Since 2016 a downturn in the lobster fishery has been seen but data for 2019 onwards needs also to factor for the impacts of both Covid-19 restrictions and limitations to EU market access as the Brexit / EU-Exit process came to maturity. Total landings dropped in 2020 to 111 tonnes, the lowest point since logbook's were brought into place as a licence condition for Jersey fishing vessels in 2007 (Figure 6, above). Effort was also reduced resulting in an LPUE drop to 8.9 kg of lobster caught per 100 pots hauled (Figure 21).

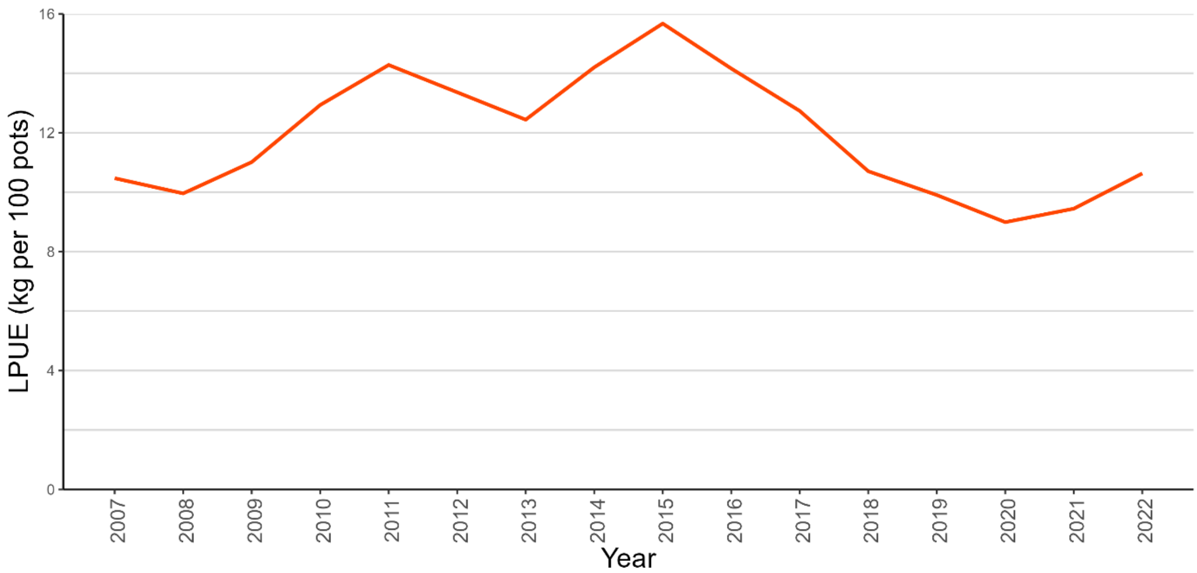

Figure 20. Landings per unit effort (kg/100 pots) for the Jersey commercial lobster fishery between 2007 and 2022.

The use of creels, D-pots and ink-wells have remained relatively stable over the time period presented (2007-2022) but are used in far fewer numbers than parlour pots. While parlour pots are still the most used pot, their use has been decreasing since their peak in 2017 where almost 1.5 million pot lifts were attributed to parlour pots. In 2022 the number of parlour pot lifts was close to 700,000, less than half that of the 2017 peak. Overall this reduction in fishing effort must be factored together with the reducing catch and overall fall in LPUE over this period. Despite their being less effort going into fishing there is less return for the effort that is expended showing that, as of 2020, the fishery is still in decline and not depressed due to a reduction in fishing. The slight increase in LPUE seen from 2020 to 2022 may be explained by the loss of part-time fishing vessels from the fleet that may not fish as professionally as the full time vessels, and therefore may have been contributing to lower LPUE values.

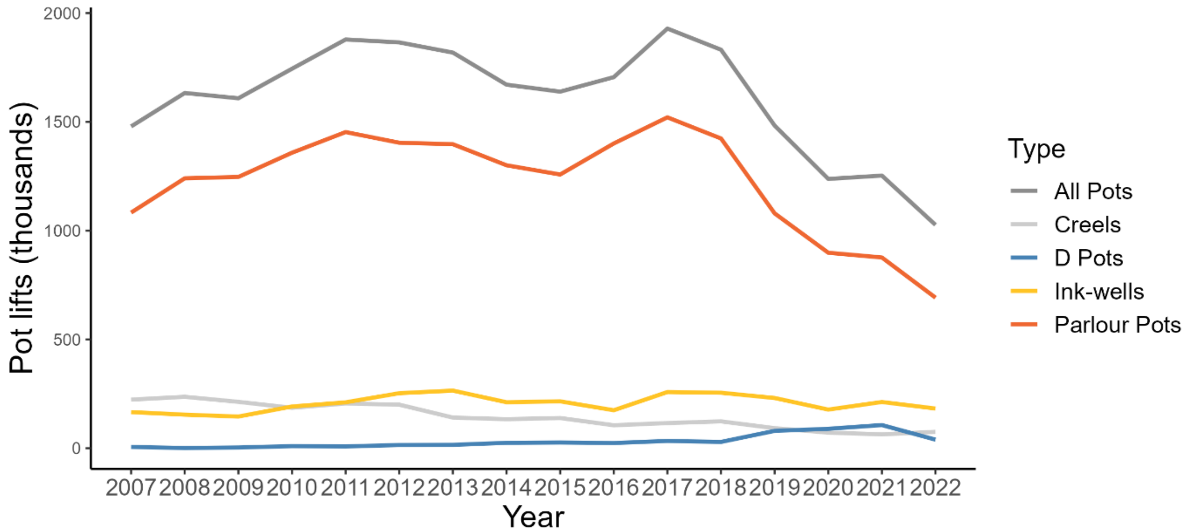

Figure 21. Number of thousand pot lifts for different pot types used per year in the Jersey commercial lobster fishery between 2007 and 2022.

3.1 Factors impacting fishing success

Soak times vary due to both weather conditions and type of pot used. Different bait will also alter desired soak times with some baits lasting longer prolonging the fishing time of the pot. Bait bags have been utilised by many fishers as a way to prolong the life of the bait. Weather conditions, especially in autumn and winter limit the ability for fishers to regularly service their static gear. Weather conditions have also been shown to influence catch rates with higher catch rates seen during neap tides, low swell and settled weather.

3.2 Bycatch and other target species

Bycatch is common when targeting lobsters with the use of pots. Bycatch species include lesserspotted catshark (*Scyliorhinus canicula*), bull huss (*Scyliorhinus stellaris*), black bream (*Spondyliosoma cantharus*), three bearded rockling (*Gaidropsarus vulgaris*), and ballan wrasse (*Labrus bergylta*). Other species of shellfish such as brown crab and spider crab are also caught during lobster pot fishing and is seen by fishers as a multi species fishery. Fishing techniques change throughout the year by targeting specific habitats or changing the types of pot used as different target species are in higher abundances and as species move over different habitats throughout the seasons.

Some bycatch species such as ballan wrasse and bull huss are retained for use as bait in the potting industry. 4,321 kg of ballan wrasse was caught during 2020 with nearly all coming from the potting industry.

3.3 Gear selectivity

Crab and lobster are caught using a mixture of open pots (inkwells, creels and D-pots) and closed pots (parlour pots). Unlike with open pots, once an individual has entered a parlour pot via a one-way entrance, they are unable to exit (Figure 22). Parlour pots are a more efficient method of catching crab and lobster and do not need to be fished as often as open pots, as catch is retained after the bait is finished. While parlour pots may be more efficient, they also have a higher mortality associated with them, especially in terms of potential 'ghost fishing'[23]. Additionally, larger individuals may cause mortality of smaller individuals once trapped, and it is for this reason that it is mandatory for all parlour pots in Jersey to be fitted with escapes gaps that smaller individuals may exit by.

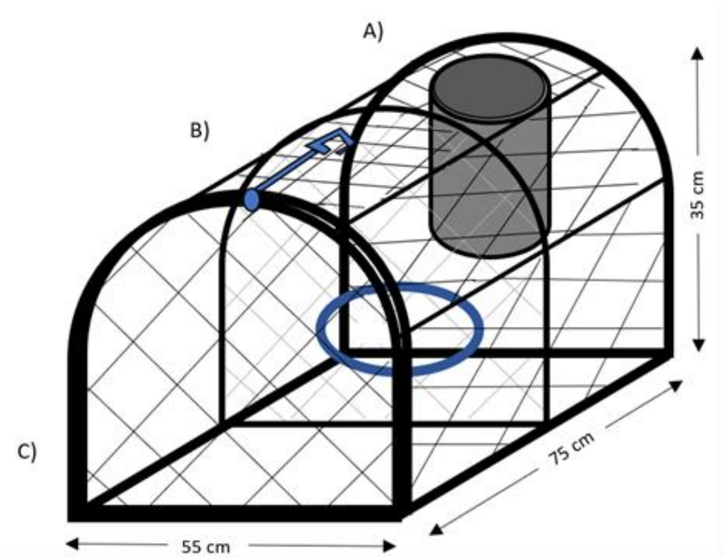

Figure 22. Diagram of a Parlour Pot showing A) the first chamber with the mouth entrance at the top, this is also the chamber which holds the bait, B) the second chamber, which is linked to chamber one via an opening (illustrated by a blue oval), and C) the hinged released door, which is secured by a hook on a bungee cord.

4.0 Environmental

The marine environment is the support system of fisheries, and lobster in particular as it is a benthic species that, after its planktonic phase, spends most of its life on the seafloor. To improve management of the lobster fishery, an understanding of its lifecycle and the habitats that support the development of lobster is needed.

4.1 Habitat associations

Jersey's habitats can be grouped into broad categories based on benthic substrates classified using EUNIS habitat nomenclature (Table 1 taken from Blampied et al. 2022[24]). Based on the literature, lobsters are known to utilise subtidal hard substrate, subtidal sediment and seagrass for foraging in their adult stage, and intertidal habitat, subtidal hard substrate and subtidal sediment in their juvenile stages [25, 26, 27, 28]. While lobster have been observed on maerl in Jersey's waters, there is no

[23] Bullimore, Blaise A., Philip B. Newman, Michel J. Kaiser, Susanne E. Gilbert, and Kate M. Lock. 2001. "A Study of Catches in a Fleet of 'Ghost-Fishing' Pots." *Fisheries Bulletin* 99:247–53.

[24] Blampied, S. R., Sheehan, E. V, Binney, F. C. T., Attrill, M. J. & Rees, S. E. Value of coastal habitats to commercial fisheries in Jersey, English Channel, and the role of marine protected areas. *Fish. Manag. Ecol. Ecol.* 1–11 (2022) doi:10.1111/fme.12571.

[25] Howard, A. E., and D. B. Bennett. 1979. The Substrate Preference and Burrowing Behaviour of Juvenile Lobsters (Homarus Gammarus (L.)). Journal of Natural History 13(4).

[26] Linnane, Adrian, Brendan Ball, Brian Munday, and John P. Mercer. 2000. On the Occurrence of Juvenile Lobster Homarus Gammarus in Intertidal Habitat. Journal of the Marine Biological Association of the United Kingdom 80(2):375–76.

literature to associate lobster with maerl habitat. Nursery habitats are characterised by high densities of juveniles[29] and may be a demographic bottleneck for many species[30] making them a high priority for management.

Table 1. Habitat table detailing the EUNIS code habitats that have been grouped together.

Habitat Group	EUNIS Codes	Description
Intertidal sand and rock	A1, A2	All hard and soft substrates in the intertidal zone.
Subtidal hard substrate	A3.12, A3.214, A4.13	Bedrock and boulders below the low water mark.
Subtidal sediment	A5.133, A5.135, A5.137, A5.141, A5.142, A5.145, A5.231, A5.431, A5.451	Coarse and mixed sediments below the low water mark.
Maerl beds	A5.51	Coralline red algae.
Seagrass meadows	A5.53	*Zostera marina* and *Zostera noltei*.

5.0 Threats to the Lobster Fishery

5.1 Unsustainable exploitation

Jersey has seen an ongoing evolution in its fishing fleet from early focuses on oyster dredging through to offshore and channel fisheries in the mid 20th century through to the current local waters pot focused fishery. Jersey has in recent years perhaps over focused on potting, partially as a result of a run of good years for potting and reduced access to other stocks including whelk, crawfish and seabass either as a result of depletion or changing markets. In the last few years the lobster fishery has seen a downturn, with declines in licence from all boat size classes and a decrease in the number of shellfish licences from 87 in 2018 to 73 in 2022 (figure 24).

[27] Seitz, R. D. et al. (2014) 'Ecological value of coastal habitats for commercially and ecologically important species', ICES Journal of Marine Science, 71(3), pp. 648–665.
[28] Unsworth, Richard K. F., and Leanne C. Cullen-Unsworth. 2015. Pen Llŷn a'r Sarnau Special Area of Conservation (SAC) Porthdinllaen Seagrass Project : A Review of Current Knowledge. 2–19.
[29] Beck, M. W. et al. (2001) 'The identification, conservation, and management of estuarine and marine nurseries for fish and invertebrates', Bioscience, 51(8), pp. 633–641.
[30] Nagelkerken, I. et al. (2015) 'The seascape nursery: a novel spatial approach to identify and manage nurseries for coastal marine fauna', Fish and Fisheries, 16(2), pp. 362–371.

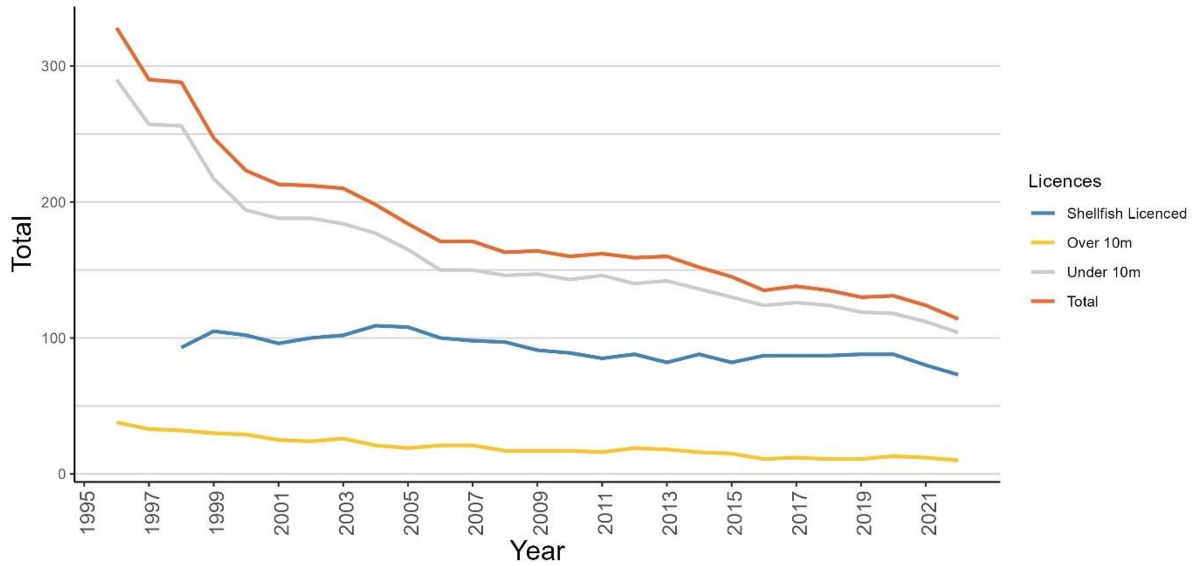

Figure 24. The number of licences in each category per year from 1995 to 2022.

5.2 Gear design

Since the introduction of parlour pots in the 1980's, this style of pot has become favourable amongst fishers with 70% of pot lifts in 2022 being parlour pots (Figure 21). The parlour pot uses two chambers to entrap shellfish and has proven to be efficient especially during longer soak times. This is beneficial to fishers over periods of bad weather where the pot will entrap the shellfish for longer periods of time with lower levels of escape compared to traditional open style fishing pots. Problems arise with parlour pots through ghost fishing when the gear is lost or if the gear is not worked regularly[31]. Due to the effectiveness of parlour pots, the Jersey fishing industry has invested heavily and has allowed fishers to increase pot numbers without losing efficiencies through loss of catches due to not being able to fish the gear on regular occurrences. This has resulted in many Jersey vessels fishing two sets of gear in different areas with a maximum of 1000 pots for the larger vessels.

5.3 Technology creep

Advances in fishing boat technology has allowed the local commercial fishing fleet to increase capacity and efficiency. With increases in power output and speed of vessels, pot fishers are now able to fish more pots per day and cover distant fishing grounds in a single day. This has increased the overall pot numbers in the system and has focussed the type of ground in which these pots are fished over. Previously, when a fisher found an area of ground that would hold lobsters, they would explore around the area and fish this area 'blind' until catches declined. Now with the use of multi beam sonars and side scan transducers, fishers can efficiently find suitable lobster ground whilst travelling at speed. These sonars paired with accurate GPS' are the main pieces of technology used by modern lobster fishing fleets.

Advances in boat design has allowed fishers to work throughout the year and fish through more extreme weather. This has increased overall effort in the system and dependency for those fishers

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[31] Bullimore, Blaise A., Philip B. Newman, Michel J. Kaiser, Susanne E. Gilbert, and Kate M. Lock. 2001. "A Study of Catches in a Fleet of 'Ghost-Fishing' Pots." *Fisheries Bulletin* 99:247–53.

on the fishing industry as many will not have second jobs where previously this was mandatory due to not being able to go to sea in the winter months.

5.4 Recreational fishing

Management measures for recreational fishing have recently been introduced in 2020 with the implementation of recreational bag limits. These limits have been set at 5 lobsters per boat/shore gatherer per day. Further measures looking at pot numbers are being considered including pot tagging schemes.

With no current licencing scheme in place for recreational figures, current landings and number of pots fished is unknown.

5.5 Lobster Offences

2022 saw a total of 4 lobster offences which were based entirely or involved lobsters. The offences are dominated by the retention of undersize lobster, similar to previous years of offence data (figure 25). Outcomes to these offences varied from written warnings to fines. Note that these figures are not standarised for the number of inspections carried out, the number of inspections carried out in 2021 and 2022 were lower than in previous years due to resourcing issues.

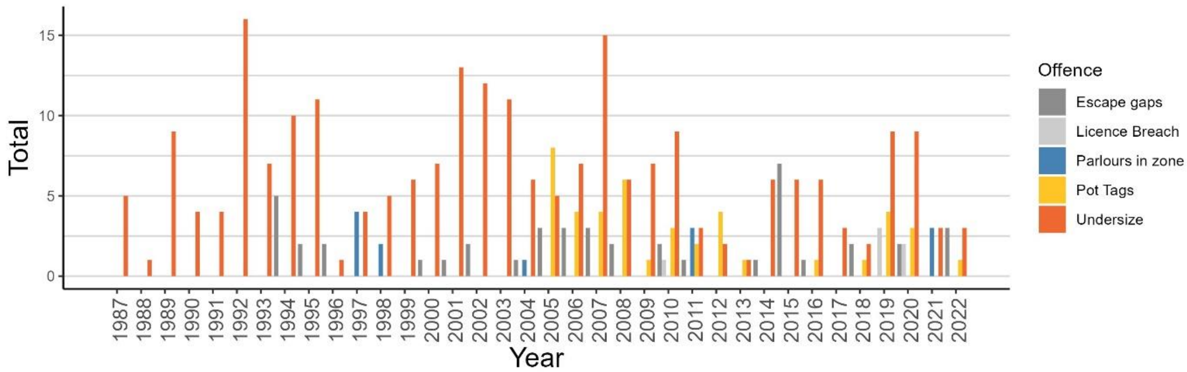


Figure 25. The number of lobster offences separated by type between 1987 and 2022.

5.6 Summary of Stock Status

For several decades, annual landings by the Jersey fleet were consistent at around 100 to 150 tonnes. From 2006 recorded fishing effort started to increase markedly so that by 2010 landings were over 200 tonnes peaking at 262 tonnes in 2012. They remained above 220 tonnes until 2018. LPUE peaked at 15 kg/100 pots in 2015 and from that year both LPUE and the annual landed weight declined. By this time a Normandy JAC proposal had created a parlour pot free zone around Les Minquiers reef had been enacted. A similar much smaller area for Les Écréhous reef came into force in 2018.

Stock assessment work by Jersey in 2017 suggested that the lobster fishery was being heavily exploited and that this was impacting the stock biomass. Government concerns about the long-term sustainability of the fishery were expressed to the JFA and MRP in 2017 and then to the MSC lobster audit, GBA Crustacean Working Group, WGCRAB and at JAC meetings from 2018 onwards.

In response to these concerns, the MRP requested the formation of a lobster management group composed of representatives from Jersey's commercial and recreational sectors, shellfish merchants, scientists and managers. The group examined the feasibility, economic impact and effectiveness of a wide range of potential management measures which ranged from creating a lobster hatchery to increasing the minimum landing size. A shortlist of viable options was presented to the MRP in 2019 with it being agreed that these would be presented at the JAC with a recommendation.

Suggested key measures are: a staged increase in minimum size from 87 to 90 mm; a maximum landing size of 135 mm; a reduction in maximum pot allocations to Jersey vessels; mandatory escape gaps for all pots; a limit on recreational pots and catches and the expansion of no parlour pot area coverage. Measures considered desirable but not yet practicable included a ban on landing berried females and a phased reduction in overall parlour pots use. The measures were presented to the February 2019 JAC and MSC lobster audit but without agreement to implement them in the GBA area. Jersey's proposed management measures were again discussed at the 2019 Crustacean Working Group from which there was an outline agreement to look at mandatory escape gaps for pots and the expansion of parlour pot areas.

Continued concern over the health of lobster stocks led to the creation of new research and monitoring protocols in 2018. This included quayside measurements of landed lobsters (minimum of 50 per month), the establishment of a second scientific field assessment in the autumn (the first having been held during the spring for many years), a citizen science intertidal lobster study and the recruitment of a PhD student to study marine ecology in relation to the conservation, biology and socioeconomics of commercial mollusc and crustacean stocks. Research projects that will come online during 2022 include research into the association of sea temperature, stocks and catchability and a proposed study into the possible role that local oceanographic conditions (especially residual tidal currents) may play in the biology and recruitment of local lobsters.

In 2015 the annual landed weight of lobster was 254 tonnes but has since declined by 62% to the 2021 figure of 97 tonnes. In the same period LPUE declined from 15.6 kg/100 pots to 9.7 kg/100 pots. Data provided by Ifremer in 2020 suggest that between 2015 and 2018 French vessels landed 21 and 41 tonnes from Jersey waters.

Since 2011 lobster stocks in Normandy and Jersey have been subject to ecolabel certification by the MSC. This includes an annual audit of evidence in relation to sustainability criteria with the stock having always been certified as sustainably fished. Jersey first raised concerns about the health of local lobster stocks to the MSC in 2018 and in 2019 a decline in LPUE to near its 2007 level produced a warning that 'any further decline would trigger the implementation of management measures'. The decline was explained as being 'likely to be a reflection of reduced abundance of lobsters on the ground but may also be linked to lower catchability due to poor weather'. A continued decline in LPUE was acknowledged in the 2020 audit with the comment that: 'while stock biomass has clearly decreased, part of the significant decline in LPUE in 2019 may be attributed to catchability rather than solely due to declines in stock biomass'. It is Jersey's contention that the decrease in lobster biomass is linked to a sustained period of fishing effort that occurred after about 2007.

A surplus production analysis (SPiCT) on the joint lobster stock for the 2019 MSC audit suggested that stocks had been exploited at levels considerably above Maximum Sustainable Yield (MSY) between 2011 and 2017 impacting the stock biomass. It was noted from the analysis that the annual catch had been below MSY since 2018 although, in the view of Jersey, this is not a reflection of improving stock health but of a stock issue as indications from this assessment and other monitoring data suggest that the relative biomass was declining.

In 2021 Jersey performed a surplus production analysis (CMSY) on the commercial lobster dataset. The results were similar to the SPiCT analysis of 2019 and suggested that a sustained period of fishing above MSY between 2010 and 2017 had been followed by a sharp decline in annual landings and a decline in stock size to a B/Bmsy level of 0.78 against a target of 1.0 (Figure 26).

Additional to this, the quayside lobster measurements collected since 2018 were used to perform a length-based Virtual Population Analysis (VPA). The results, which are currently tentative, support the conclusions of the SPiCT and CMSY analyses, suggesting that while the current catch weight is below MSY, the spawning stock biomass is below the 35% threshold indicative of a healthy stock but above the lower limit of 15% SSB.

Other indications of stock issues include an increase in the abundance of undersized lobsters caught during annual trials. This was accompanied by a steady decrease in the size of landed lobsters (currently the mode class is 87 mm CL for a minimum landing size of 87 mm). Other data indicate that the minimum size may be out of sync with the species' size at sexual maturity. These issues (and others) have been raised at MSC audits, JAC and Crustacean Working Group meetings.

During the autumn of 2019 the ongoing decline in lobster landings and a lack of progress through the JAC/JMC led to members of the MRP voting to begin implementing those management measures that could be applied to the Jersey fleet (i.e. those not requiring GBA approval). Legislation relating to recreational bag limits was passed and preparations were made for a revised pot tagging scheme. However, the arrival of Covid and Brexit postponed the imposition of new measures until more normal conditions returned. Discussions around a new timetable for the Jersey lobster measures have recently restarted and a new side project is looking at the impact (if any) of Covid on local lobster stocks.

As with Brown Crab, Jersey believes that its robust data collection and monitoring allowed the island to identify and raise concerns about a stock issue with lobsters at an early stage. Lobster landings continue to decline and the health of the lobster stock (from a biological and economic viewpoint) is still considered to be poor but it is Jersey's view that with appropriate and timely management it can return to catch levels are economically and biologically sustainable.

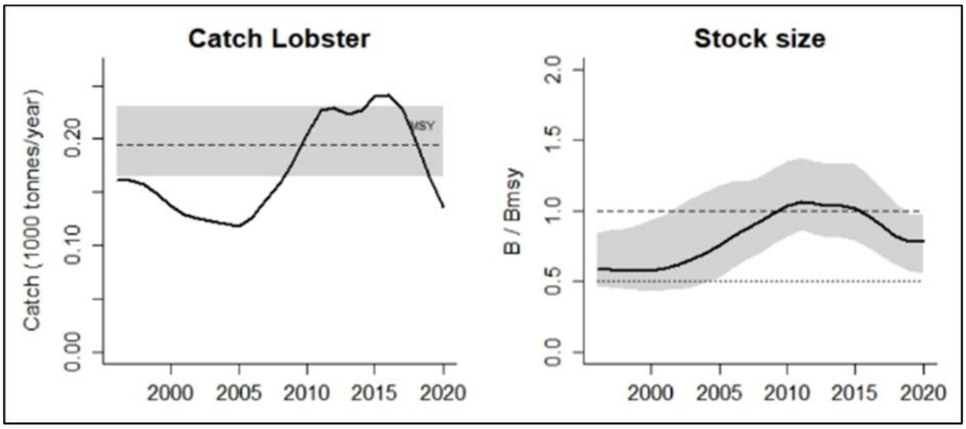


Figure 26. The results of a surplus production analysis (CMSY) for lobster based on Jersey commercial landings between 1996 and 2020. (Source: Government of Jersey).

6.0 Lobster Management

6.1 The Historical Management of Lobster

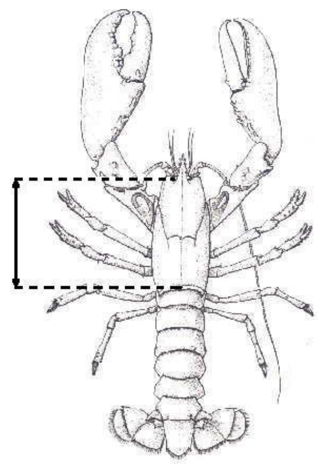
The early evolution of lobster management has been explored in the introduction to this report with increasing and decreasing regulation at various points in the Island's history. With the increase in

MLS to a CL of 87 and the introduction of No Parlour Pot Zones and escape gaps in Parlour pots the fishery was, by the beginning of the last decade seen to be reasonably modern in its approach to fishery management and did indeed see some good years for the fishery between 2010-2015. However with the recognition of falling stocks in 2018 it was agreed renewed action was needed to enhance the sustainability of the fishery.

6.2 Marine Resources Panel

The Minister for the Environment's Marine Resources Panel (MRP) is an advisory body whose duty is to consider management issues relating to the island's seas. The group consists of representatives from Aquaculture, Commercial and recreational fishing sectors, Fish merchants, Marine conservationists / scientists, and the Ports authority. The panel meets 3-4 times a year to consider issues brought either by Marine Resources or the represented organisations to advise the Minister on marine management and conservation issues. In 2018 the panel requested the creation of a lobster working group in response to the signs of declining stocks – see section 3.3.

6.3 Current Regulation and Management



The minimum landing size for lobster is 87mm when measured from the base of the eye socket to the back of the carapace. Open pots, known as D pots or inkwells may be fished anywhere around Jersey's waters. Creel and Parlour pots which are designed to make it hard for the lobster to escape after entering – are banned in Les Ecrehous and Les Minquiers offshore reefs. Furthermore, these pots must be fitted with an escape gap of 79mm wide x 44mm high to allow juvenile shellfish to escape. Commercial fishermen are limited by their license. Currently a maximum of 15 lobsters may be retained on a Shellfish restricted (non-shellfish) license while an unlimited catch of lobster may be retained on a Unrestricted (shellfish) license. The number of pots that may be used by a commercial fishing vessel is also limited based on boat length or, in the case of older boats, historic track record. The industry cap is 1000 pots per vessel. All commercial lobster pots must carry a valid pot tag, these are issued under the permission of the vessel's licensing authority.

Unlike the UK there is no ban on the landing of berried lobsters. Should France incorporate this in the future it is likely Jersey will be forced to follow suit due to the likely collapse in market demand for berried lobsters.

6.4 Lobster Management Working Group

Following the recognition of the ongoing decline in landings and LPUE after the 2015 peak, the local fleet asked the Marine Resources team to assist them in establishing a working group to look at updating lobster management for the purpose of stabilising the fishery.

6.4.1 Background

To this end the Marine Resources team together with representatives from the Marine Resources Panel set up a Lobster Working Group (LWG) in 2019. The LWG consists of representatives from; the Jersey Fishermen's Association (JFA), the Jersey Inshore Fishermen's Association (JIFA), the Jersey Recreational Fisherman's Association (JRFA), local fish merchants and Marine Resources (MR).

The LWG worked through various stock conservation options considering them for viability in terms of rate and scale of impact on catches, biological value, social acceptability. The measures considered were a mix of traditional and innovative measures that have been used in shellfish fisheries within the UK, Europe and as far away as American and Australia as well as some novel ideas generated by the group.

From these a shortlist was produced of potentially viable measures for the Jersey lobster fishery (commercial and recreational). These measures were grouped into three broad categories:

(1) Measures that seek to enhance the biological productivity of the stock;

(2) Measures that are designed to manage fishing effort;

(3) Measures that could add economic value to a landed catch.

6.4.2 Measures considered

6.4.2.1 Increased minimum landing size (MLS)

Increasing the MLS gives more lobsters a greater opportunity to breed. It is a well-used tactic for enhancing a species' potential to reproduce before harvesting. The fleet has accepted proposals for an initial 1 mm increase in MLS ideally timed for mid-summer when catches and prices are lower.

An increase in MLS does not exclude lobsters from the fishery as they will become available for market after their next moult. Therefore this measure, while increasing breeding potential, only grants a temporary reprieve on the growing animals.

Annual trial measurements suggests that Jersey lobsters start to mature around 75 mm (indicated by the divergence in abdomen width between males and females) but that breeding itself does not generally begin until individuals are above 80 mm (indicated by the presence of eggs).

In terms of the economic effect that an increase in MLS could have, the percentage of the overall catch for each mm band has been calculated from landing measurements. Please note that these figures are based on an analysis undertaken pre-Covid, since which time the fishery has contracted. However, using 2018 figures, a move to 88 mm would mean approximately a 12% decrease in landed weight for that year which would cost around £409,000 in total.

A sudden move from 87 to 90mm MLS would mean an immediate 34% (£1.1 million) loss. A lobster of 90 mm is approximately 50 grams (male) or 30 grams (female) heavier than a lobster of 87 mm which is about another 75 to 85p per lobster in price (@ £16.5 per kg). The accrued market price benefit of a one mm increase for lobsters would appear slight in the short-term but could be counterbalanced over time by an improvement in stock sustainability.

6.4.2.2 Reduction in pot allocations

This management measure is an important prerequisite to reducing actual and potential fishing effort. It will also be a challenging measure for some Jersey fishers to adopt as it could require a reduction in the number of pots they currently fish. This measure seeks to cap and reduce fishing effort in the waters around Jersey. The measure consists for three elements:

- Commercial vessels holding a full (shellfish) licence will see a reduction of approximately 15% through a new system that allocates each boat 200 pots for the first five metres' length and then 130 pots per metre after this. The maximum number of pots per vessel would be 850 (=10 metres' length). [Provision for 10-12m vessels currently being considered]

- Vessels holding a restricted (non-shellfish) license would be limited to a maximum of 60 pots. This is to reflect the restrictions on the quantity of shellfish that they may land (15 individuals per day).

- Recreational vessels will be limited to 15 pots. This is a reflection of the non-commercial nature of the fishery and the bag limit of five lobsters per vessel.

Based on the current commercial fleet, this would produce a total pot allocation of 50,000 which, while less than the current potential (74,000), is above the 44,600 pot tags issued in 2019. A limit at this level would require additional measures, such as a parlour pot reduction and global cap (see below), in order to lower fishing effort sufficiently to have a measurable impact on stock health.

6.4.2.3 Reduction of parlour pots

When looking at lobster and crab fisheries, the introduction of parlour pots (followed by their near ubiquitous use) has been identified as a factor in increased fishing effort. This has been identified as an issue in Jersey, Normandy and Brittany waters and has led to the recent move by Normandy fishers to ban parlour pots from a large proportion of their waters. A similar ban operates in west Brittany. Jersey has two no parlour pot areas and early trial data (and anecdotal reports) from Les Minquiers suggests that the lobster fishery there is in a better state than other parts of Jersey waters.

Although the adoption of parlour pots by the industry has been relatively recent, most commercial fishing patterns are largely based around their use which means that management decisions requiring their reduction may be unpopular, may require phasing in and will also need to work in conjunction with other measures (such as increasing no parlour pot areas) to prevent unexpected consequences.

One possibility is the phasing in of a parlour pot reduction through the use of specific parlour tags, the issuing of which would be reduced over time. It has been acknowledged that a reduction in parlour pots could represent a step change for some commercial fishers and that without additional measures it might (ironically) present a threat to the no parlour pot zones around the offshore reefs through increased pressure on these areas.

Any reduction in the percentage of parlour pots available to vessels should be the same for restricted and unrestricted licenses, an initial reduction in the region of 20% with a gradual reduction occurring regularly every 2 years until the level reached an acceptable level is proposed.

In terms of the effect a 20% reduction in parlour pots would mean the following:

- Restricted licence (max 60 pots) would be allowed up to 48 parlour pots.

- 5m unrestricted (max 200 pots) would be allowed up to 160 parlour pots.

- 7.5m unrestricted (max 525 pots) would be allowed up to 420 parlour pots.

- 10m unrestricted (max 850 pots) would be allowed up to 680 parlour pots.

6.4.2.4 A global pot cap

A total (i.e. global) cap on the number of pots being used by commercially licenced Jersey vessels is required to make measures 1 and 2 effective. Once fixed, this global cap would prevent an expansion of fishing effort through the acquisition of new licences and would mean that if the ceiling has been reached, then vessels could only acquire new pots through the relinquishing of existing ones. For example, new entrants (or those wishing to upgrade their vessel) would have to join a waiting list to get further allocation of pots.

At present there is a knowledge gap which means that the industry and regulators do not know what percentage of the issued pots are actually being fished at any one time. The current pot tag scheme has no global cap and so will expand or contract with the size of the fleet. As of August 2018 (the date of the last pot tag issue), there is the potential for 74,000 pots to be fished of which pot tags have been issued for 44,600 pots. This means that in a time of declining landings, there remains the possibility of a further 29,000 pots being fished. The issuing of additional licences could see these numbers rise.

The imposition of a global pot cap is relatively simple and its primary functions would be to place an absolute limit on potential fishing effort and to offer logistical support to other management measures relating to pots. A global pot cap has been in use in Normandy for some years and, given the similarity of the regional fisheries, it is probable that lessons can be learned from the way in which this has worked in practice. The existence of global pot caps in Normandy and Jersey would place a limit on the majority of fishing effort in local waters and could place pressure on Brittany to adopt a similar measure.

6.4.2.5 Expansion of no parlour pot zones (NPPZs)

It was identified that a reduction parlour pots would mean an increased reliance on open gear and that this in turn would require a greater area in which parlour pots are prohibited to prevent the existing NPPZs becoming overrun. This could be achieved either through the expansion of the two current zones or through the introduction of new NPPZs.

It was agreed that if new NPPZs were introduced they should cover areas inside and beyond Jersey's exclusive three mile limit, be focused on shallow sites, and be spread evenly around the coast so that all harbours have access to both types of zone.

6.4.2.6 Maximum landing size (MaxLS)

Larger female lobsters are typically more fecund than their smaller counterparts[32]. A maximum landing size for lobster may be of value and the benefit of this measure comes from preserving larger lobsters, especially females that have a greater egg capacity due to a wider abdomen. There is also evidence that eggs from larger lobsters are more viable than for smaller individuals, with larger eggs from larger females resulting in larger larval size at hatching[33]. Pelagic larval survival may also be increased for offspring from larger females. This has implications for recruitment and highlights the importance of retaining large, fecund individuals within the local marine system.

A MaxLS of 135mm was proposed at the meeting and received general support. Although this figure is higher than in other fisheries, it was felt that 135 mm would receive industry support and, as stocks recover, become more relevant. It was also pointed out that having a MaxLS will probably be popular with customers at the fish market.

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[32] Berkeley SA, Chapman C, Sogard SM (2004) Maternal age as a determinant of larval growth and survival in a marine fish, Sebastes melanops. Ecology 85:1258–1264

[33] Moland, E., Olsen, E. M. and Stenseth, N. C. (2010) 'Maternal influences on offspring size variation and viability in wild European lobster Homarus gammarus', Marine Ecology Progress Series, 400, pp. 165–173.

In terms of economic effect, for 2018/2019 from a sample of 320 landed lobsters, 1.7% of catch was above 135mm (all were female). This equates to about 2,500 kg annually which at average market price (£16.81) represents £41,500.

6.4.2.7 Lobster buyback scheme

It was proposed that landed lobsters (or perhaps just female ones) over the MaxLS could be subject to a buyback scheme.

Above 135 mm catch accounts for approx. 1.7% of the catch which weighs around 2.5 tonnes. At a suggest flat rate of £10/kg, it would cost £24,700 to buyback >MaxLS lobsters annually. The Marine Resources dataset records only female lobsters being caught above 135 mm and yet there must be male lobsters in this size range. However, with just females recorded we cannot estimate what the effect would be if just female lobsters were bought.

Marine Resources said that such a scheme is unlikely to be directly funded by government. It was suggested that scheme could be funded through an annual charge, possibly through licencing. As noted above, the buyback scheme would require above MaxLS lobsters to be landed to merchants at £10/kg. They would then be V-notched and returned to the sea although by whom was not decided.

A further suggestion was that >MaxLS lobster buyback scheme could operate in conjunction with a hatchery project although the likely benefits of this need to be assessed using pre-existing schemes elsewhere. It is also probable that a project of this kind will need to be funded independently of government.

6.4.2.8 Closure on berried lobster in June or July

The possibility of a ban on the landing of berried females was discussed. This measure already operates in England and is being discussed within the EU. A ban would probably have widespread public support but remains controversial amongst the fishing fleet. Recent feedback from CEFAS also suggests that the UK ban on berried females may not have contributed much to sustainability. This subject needs further investigation.

A seasonal closure for berried females was suggested for the summer months as they are less numerous and therefore less economically important at this time. The limited data available suggests that May to August is a low season for berried females at around 5 to 10% of the landed population. For the year overall the figure is 13% which, for 2018 landings, equates to around 25 tonnes of berried females or £400,000. However, it should be stressed that these figures are based on a dataset that had little information for the autumn months and a reanalysis is needed.

Several potential issues were raised with this measure:

- Banning berried females at a time when there are few about may look odd/nonsensical in the eyes of consumers.
- If the principle of a summer berried hen ban is established, it may lead to calls for it to be extended or made year-round.
- Enforcement of such a ban could have enforcement resource implications both for patrol work and testing for scrubbed lobsters.

6.4.3.9 Escape gaps for all pots

Marine Resources proposed expanding the existing escape gap requirement for parlour pots to all lobster and crab pots in Jersey waters. The measure is supported by commercial and recreational fishing representatives as a simple and sensible step. A derogation for green/ lady crabs was discussed but it was agreed that this was not required.

The use of escape gaps has a proven benefit for stock as it allows juvenile specimens and small crab species to exit pots before they get predated upon by larger animals. It may also assist in ghost fishing situations by allowing smaller individuals to escape lost pots. The only credible argument against mandatory escape gaps comes from the small number of people that fish green/velvet crabs as even adults will be able to escape from pots. This measure has already been agreed in principle.

6.4.2.10 Marking of recreational lobsters

Generally notching/marking is done for stock protection purposes and is sometimes used only on females. A notch will last for a single moult which, with European lobsters, means it will be visible for one to two years. In terms of stock enhancement, the beneficial effects of notching have not been conclusively demonstrated and it is generally believed that the practice needs to occur on a massive and widespread scale to have any measurable effect on the stock.

One method that has proven successful in the Australian rock lobster fishery was suggested to the lobster working group. This requires recreational fishers to cut out a tail section from all retained lobsters. It would be illegal to sell or buy marked lobsters, thus ensuring that those taken are for non-commercial purposes. This is a simple measure which would be enforceable by Marine Resources but which would probably be unpopular with recreational fishers. It has, however, proved to be effective in Australia.

6.4.2.11 Lobster fishing species permit and pot tag fees

In addition to managing fishing effort and stocks, it was proposed that an annual fee could be raised on either the existing fishing licence or by charging more for pot tags. This money could be used to support management measures, marketing or other initiatives.

The fees that were discussed included:

- A recreational fishing permit for JY Boats fixed @ £25 a year (inclusive of their pot tag allocation). The amount of money this would raise is unknown but possibly around £3,000 to £5,000.
-
- A commercial licence fee for J boats @ £10 to 30 per meter of boat length. Based on the current fleet, a fee of £30 per metre would raise approximately £100,000.

- Charging £2.50 for a parlour pot fee and £1.00 for a basic pot. Using the pot cap, vessel limit and 20% parlour pot reduction discussed above, this would raise £98,000 but would reduce as the percentage of parlour pots was brought down.

The option of including commercial pot tags with the license fee was considered but the administrative advantage this would bring for Marine Resources would be outweighed by all boats being automatically given their max allocation of tags which, in turn, would encourage the use of more pots.

However, charging per pot tag offers an incentive to order only the number of pots needed. Similarly, charging an annual fee for a commercial licence may encourage some people who do not use their licence to return it.

6.2.3 Outcomes

These measures were presented to the MRP for consideration and endorsement for recommendation to the minister with an intention to implement from June 2020 onwards. The disruption of the fishing industry due to the Covid pandemic put a hold on the deployment of new fisheries legislation so the management strategy is still to be implemented as of the time of writing.

7.0 Future Lobster Stock Analysis and Management

The coincidental timing of the Covid-19 pandemic and the Trade and Cooperation Agreement (TCA) has left Jersey's lobster fishery management in temporary stasis. Plans to review Jersey laws and regulation were suspended early in 2020, initially due to adverse winter weather and then by the economic impact of the Covid lockdowns. In 2021 the TCA saw Jersey exit the EU common market which made exporting shellfish into France problematic. Consequently, fishing effort and landings fell rapidly during 2020 and 2021.

Lengthy fisheries negotiations between Jersey, UK and EU occupied much of 2020 and 2021 with, at the time of writing, the management framework within the TCA still not fully resolved. In the meantime, Jersey and French vessels have continued to fish under existing laws and licence/permit conditions. However, as the impact of Covid subsides, thought is being given as to what measures could be used to help return the lobster stock to sustainability.

The Jersey authorities are utilising landing and field data gathered since 2018 to undertake standard statistical analyses into the biological and socioeconomic health of the fishery. This will include recognised stock surplus analyses (CMSY/SPiCT), cohort analyses (VPA) and standard measures/indices such as LPUE, length at maturity, etc. The same datasets, in combination with socioeconomic and environmental data, will be used to better understand any links between ecology, lobster behaviour and the local fishery. For example, environmental niche modelling, catchability and sea temperature plus seasonal events/trends. It is proposed that results from this work will be subject to independent peer review by Bangor University. Covid, Brexit and other recent factors has markedly reduced fishing effort for lobsters since early 2020 which may have had a positive effect on the stock. Future landings will be monitored to identify any signals in the data that might suggest an increase in stock size that can be related to the lowered fishing activity in 2020 and 2021.

Short-term lobster management will focus on restoring those measures which ceased to operate during the Covid period, such as the issuing of pot tags. A re-assessment and update of the Lobster Working Group analyses and conclusions will produce a list of options which could be used to incrementally build the stock but while maintaining an economically viable fishery.