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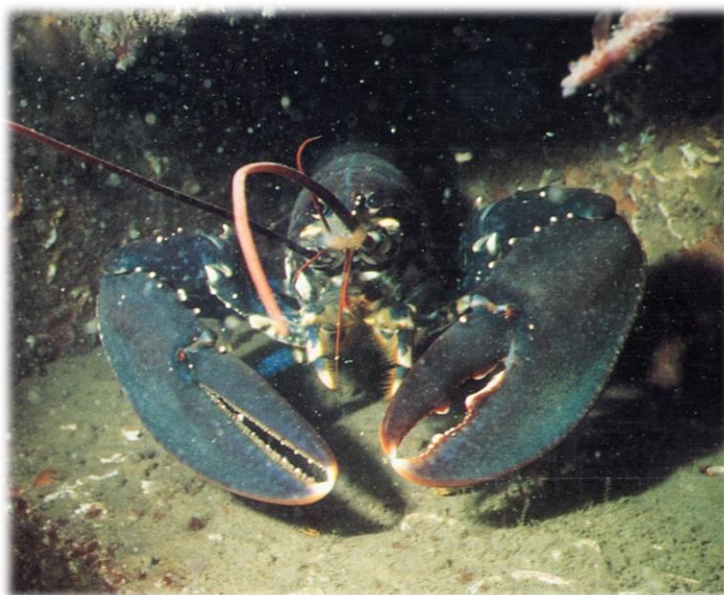


Lobster (*Homarus gammarus*)

Cefas Stock Status Report 2017.

The Shellfish Team
2017

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Cefas Document Control

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Cefas Stock Status report 2017: Lobster (*Homarus gammarus*)

Background

Cefas has published reports describing the status of the lobster (*Homarus gammarus*) stocks around the UK since 2012. It is planned to re-run the assessment periodically on a 2-3 year timescale. This report details the main findings of the assessments and provides background information describing how the assessments are undertaken, the data that are required, and description of the uncertainties associated with these assessments.

Biology

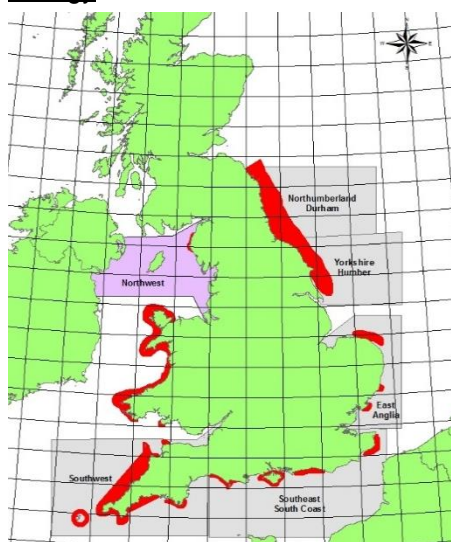


Figure 1. – The LFU's used for the assessment regions. The LFU in purple did not have sufficient data for an assessment this year.

European lobster can be found from Scandinavia to North Africa, where they occupy solitary shelters in rocky substrates. They are opportunistic scavengers, as well as preying on small crustaceans, molluscs and polychaetes (worms). Moulting occurs in summer approximately once a year for adults, becoming less frequent in older animals. Mating occurs soon after the female has moulted, and most females are expected to have a 2-year reproductive cycle. After the eggs hatch the larvae are in the water for 3-4 weeks before the first juvenile stages settle on the seabed. Larval distribution depends on local hydrographical conditions and the behaviour of individuals. With such a lengthy time in the plankton, the probability of individual larvae surviving is low

and consequently recruitment levels are expected to be variable. Both sexes are considered fairly sedentary, although inshore/offshore and longshore migration is known to take place at some locations.

Fishery Unit Definitions

There are six Lobster Fishery Units (LFU) that have been defined for England. These units have been based upon the distribution of the fisheries, hydrographic conditions and what is known of larval distributions and development. Each LFU encompasses waters covered by International, National and local (IFCA) legislation which may be different within each region. The LFU's are presented in Figure 1.

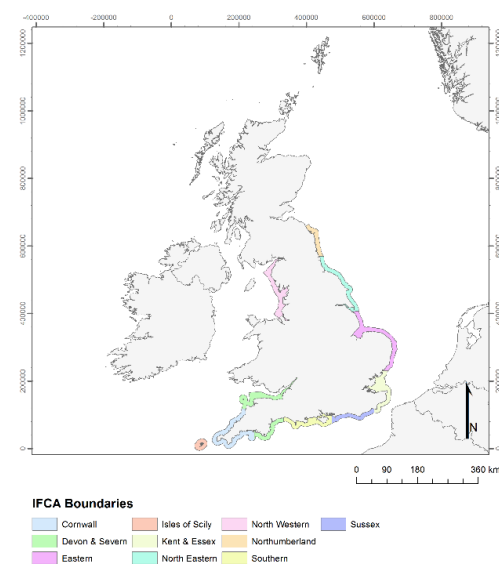


Figure 2. – The IFCA boundaries.

Fishery management jurisdiction is organised on two different scales around England. Beyond 6 nautical miles, Defra and the MMO are responsible for managing lobster fisheries whereas from the coast out to 6 nautical miles, responsibility lies with the Inshore Fisheries and Conservation Authorities (IFCAs). There are 10 IFCAs within England (see Figure 2). It is obvious that the LFU and IFCA boundaries do not match, which can make interpreting results for each management unit challenging, however given that one functional area is based on species biology and the other is based on governmental logistics, differences are to be expected.

Data sources used

Landings come from the official MMO data records. There have been changes in the way the MMO (and its predecessors) have gathered landings data through time. For larger vessels landings and effort are taken from the mandatory EU logbooks. Prior to 2006, records of landings from smaller vessels (<10m) were gathered by local officers. Since a change in legislation in 2006, sales note returns from merchants are used to support the landings declarations. Between 2006 and 2008, official MMO landings data are a combination of sales notes and self-reported records of landings from the Monthly Shellfish Activity Return (MSAR) forms where no sales note had been generated. This practice ceased in 2009 and the MMO reverted to using sales note derived data only. Cefas has used MSAR data to supplement MMO official landings data from 2010 onwards.

Fishing effort is estimated by the MMO from MSARs for ≤10m vessels or EU logbooks for >10m vessels. There is no requirement for potting fisheries to record the number of pots being fished, so in this report effort is measured as days fished.

The changes to reporting systems over time have predominantly improved the data quality but landings and effort series should not be viewed as coherent records through time.

Scientific officers visit ports to measure individual animals from catches and determine the ratio of landings by sex. Samples are also received from IFCA's in some regions, and these length samples are combined with Cefas' and scaled up to represent the total landings of lobster.

Overall Landings trends

Figure 3 presents the total official landings data that is used within the assessments. The data pertains to all English and Welsh vessels landing anywhere, and all landings into England and Wales from UK vessels. Due to the various changes in the way landings have been reported, care should be taken when comparing back through time. Data from 2010 to present have been collected in a consistent manner and total removals have risen slightly over this most recent period.

Figure 4 presents the landings per rectangle for 2013, and Figure 5 presents the average landings per rectangle from 2006 to 2012. These plots show that although the overall landings appear to be increasing, the area from which the animals are being caught is decreasing.

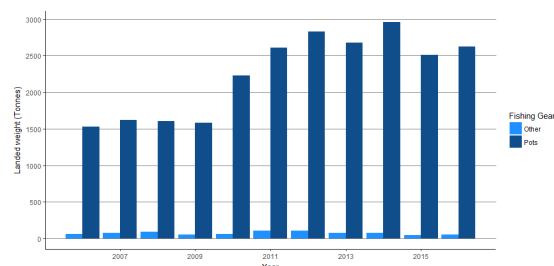


Figure 3 – The official landings for UK E&W.

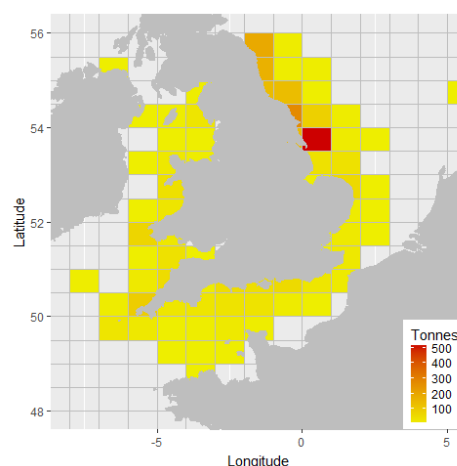


Figure 4 – The landings per ICES rectangle for 2016.

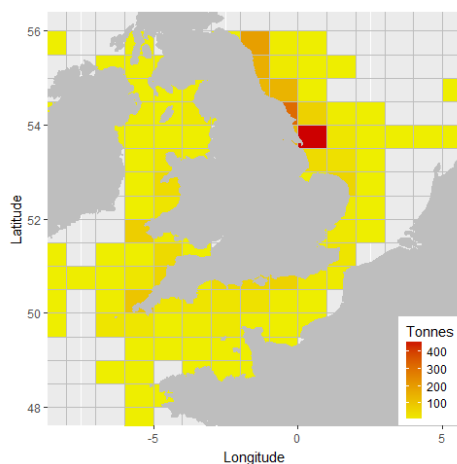


Figure 5 – The average landings per ICES rectangle from 2011 to 2016.

Assessment Methodology

Within European waters, most major fish stocks are assessed using methods which monitor the change in numbers over time for animals born in a particular year. This is possible because most fin-fish have bony structures which retain annual growth rings. Crustaceans shed their shell each time they moult and do not retain structures that can be easily used to determine their age, so an alternative assessment method has to be employed.

The methodology used in this assessment follows the change in shape of the length-frequency (numbers at length) from one year to the next. The rates at which individual lobsters grow and die dictates how many animals at a given size there are in the population. Combined with knowledge of the growth rate of animals and the rate of natural death (M , assumed to be 0.15), the shape of the length-frequency curve is used to infer the rate at which the fishery is removing individuals.

For further details of the Length Cohort Analysis approach see the full stock assessment report which can be obtained from Cefas.

Reference point definition

A stock assessment result can indicate what the exploitation rate might be and how big the stock might be, but this is of limited use to fishery managers as they try to decide whether these rates are appropriate. The production of reference points aims to give managers benchmarks to see whether the management structure is being effective and whether fishing rates are above or below these points.

Reference points can be determined to achieve a number of different management objectives. For instance, managers could simply want to ensure that the fishery was unlikely to collapse the stock, or alternatively managers could want the fishery to derive maximum long-term profit from the stock. Within the European Community framework, the current management objective to achieve fishing rates likely to deliver Maximum Sustainable Yield (MSY) from fisheries. For crustacean fisheries scientists cannot directly calculate this rate and so rely upon alternative ways to estimate it.

This assessment uses 35% of virgin Spawner per Recruit (SpR) as the MSY level proxy. This is commonly used around the world to estimate the fishing rate likely to deliver MSY. A second point termed a limit reference point has also been calculated and having fisheries operating beyond this level is considered to carry higher risk to the production of further generations. This value is defined as 15% of virgin SpR.

Uncertainty

Fishery stock assessments are never perfect because any assessment model will produce estimates rather than absolute values and the accuracy of these estimates is affected by the quality of the input data. Scientific data collection (in this case landed numbers at

length) are taken from a relatively small number of landings and then scaled up to represent the whole landings, a process which doesn't claim to be exactly correct but should be broadly representative. Samples are bootstrapped to provide 5% and 95% confidence limits. Not all landings will be recorded as there are exemptions from reporting requirements for some small scale fisheries and recreational landings.

An assessment model is an attempt to simplify the real world into a few key structures and functions, so the assumptions made in the process will cause the modelled system to depart from reality. What fishery stock assessment does attempt to do is to capture the main processes and data streams so that the final estimate of fishing rate and/or stock size is broadly correct.

For this assessment the key uncertainties come from:

- the scientific understanding of growth and natural death rates
- the representativeness of the landings used to collect length samples
- the assumptions within the assessment model of
 - a) the population being at equilibrium (constant recruitment)
 - b) the spatial coverage of the population is constant and all size ranges are equally available to the fishery
 - c) fishery statistics are complete and accurate.

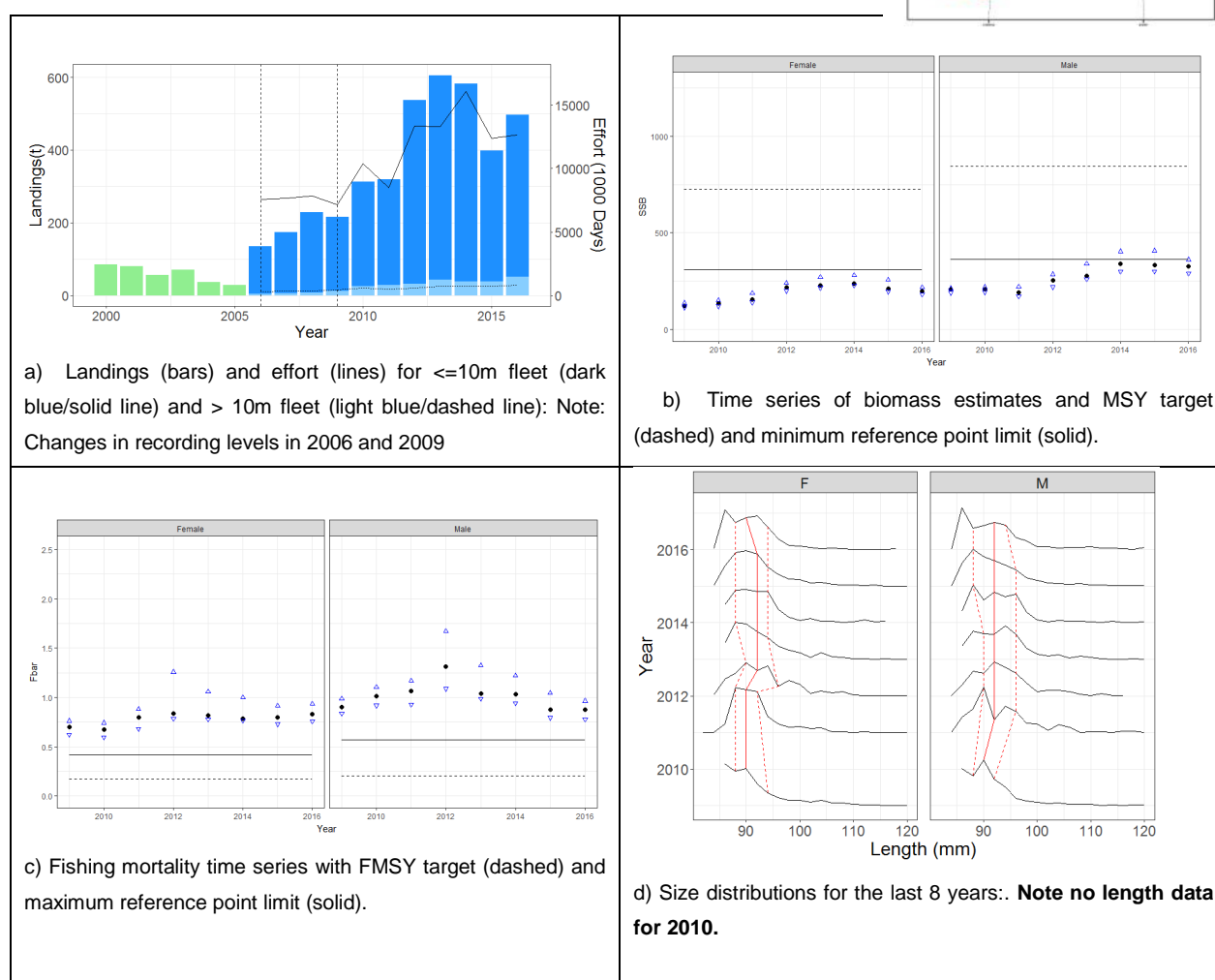
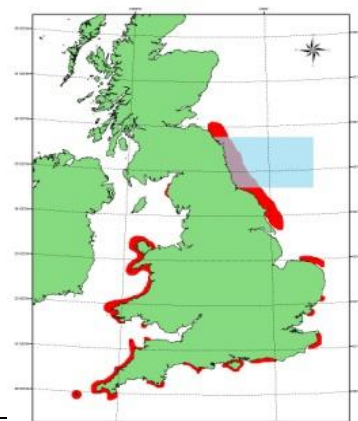
Cefas has a research program which continually searches to improve our understanding of processes governing population dynamics and there are currently projects focussing on growth and mortality rates. We are also working with the MMO to ensure that landings statistics are as complete and accurate as possible, and working with the IFCAs to ensure maximum efficiency and best practice in data collection.

Given the uncertainty in the input data and assessment model it is acknowledged that the precise value of any estimate of fishing mortality of stock size is uncertain but has sufficient reliability to indicate rates on a high-medium-low scale.

Cefas Stock Status 2016: European lobster (*Homarus gammarus*) in Northumberland & Durham.

Sustainability Status

Minimum Landing Size	<i>At the MLS applied in this region around 100% males and 80% of females should be mature</i>
Discarding	<i>High discard survival assumed to be > 90%</i>
Stock size	<i>Below minimum reference point limit but stable</i>
Exploitation rate	<i>Very high, beyond maximum reference point limit</i>



The status of the stock of lobster in the Northumberland & Durham area is low, male and female biomasses are below the minimum reference point limit. The exploitation level is very high, above the limit reference point, although it has decreased since 2012. Fishing pressure is above the maximum reference point limit and is particularly high around the Minimum Landing Size. The status of the stock in relation to the reference points is unchanged from the previous assessment in 2014.

Sampling levels

Table 2. Total sample numbers collected for Northumberland and Durham during the last three years (samples provided by IFCA in parenthesis).

Year	Samples used	No. animals sampled
2014	63 (28)	2389
2015	57 (17)	2972
2016	52 (5)	3241

Fishery overview and developments

	2014	2015	2016
Fleet size <= 10m / >10 m	126/7	123/6	126/8

Reported landings and fishing effort increased substantially following the introduction of Buyers and Sellers legislation and the Restrictive Shellfish License Scheme in 2006. Since this period fishing activity data are thought to be generally more reliable but the integrity of the time series, especially fishing effort, is uncertain.

Fishing mortality (F) has fluctuated slightly for the last four years for females and decreased steadily for males since 2012. F is currently above target and limit levels for both sexes. Landings and effort have been increasing since 2010, although this could be an artefact from the inclusion of MSAR data from 2010. F for males is similar to that for females. Spawning stock biomass (SSB) is close to the limit level and has decreased slightly since 2014.

There is a seasonal pattern to fishing activity with an inshore focus on lobster through the summer-autumn with a more offshore (4-30 miles) focus on crab during winter-spring. Boats will fish 5-6 days per week in summer, dropping to 2-3 in winter.

Within the Northumberland IFCA there are around 115 permit holders, of which ~80% are active during the summer and ~65% during the winter. The number of available licences has not changed recently and the ban on vessels >12m within the district has excluded larger nomadic operations. There is a pot limit within the District waters of 800 per vessel. Those fishing outside beyond the 6 mile limit typically deploy a further 200-1000 additional pots per vessel. There is little gear conflict reported between mobile and potting outfits within the Northumberland IFCA district. Within this district there is a spatial gradient in reported size distributions with smaller individuals dominating in the south (North Shields – Newbiggin-by-the-Sea) compared to the northerly Amble-Berwick section.

Within the NEIFCA district improved landings have been noted since the mandatory inclusion of escape gaps, accompanied by anecdotal reports of increased pre-recruit density on the grounds from 2013 onwards. Active vessel numbers have remained stable, as have pots hauled and pot numbers. Animal sizes are still highly constrained, although a more prominent new shelling period was noted on the main fishing grounds.

Fishery Management measures.

- EC legislation sets a minimum landing size of 87mm for lobster in the UK and prohibits the landing of parts of lobsters.
- National legislation restricts the number of shellfish licences available in the UK and also prohibits the landing of lobsters with a v-notch in their tail fan.
- Local IFCA legislation varies and is detailed in the table below.

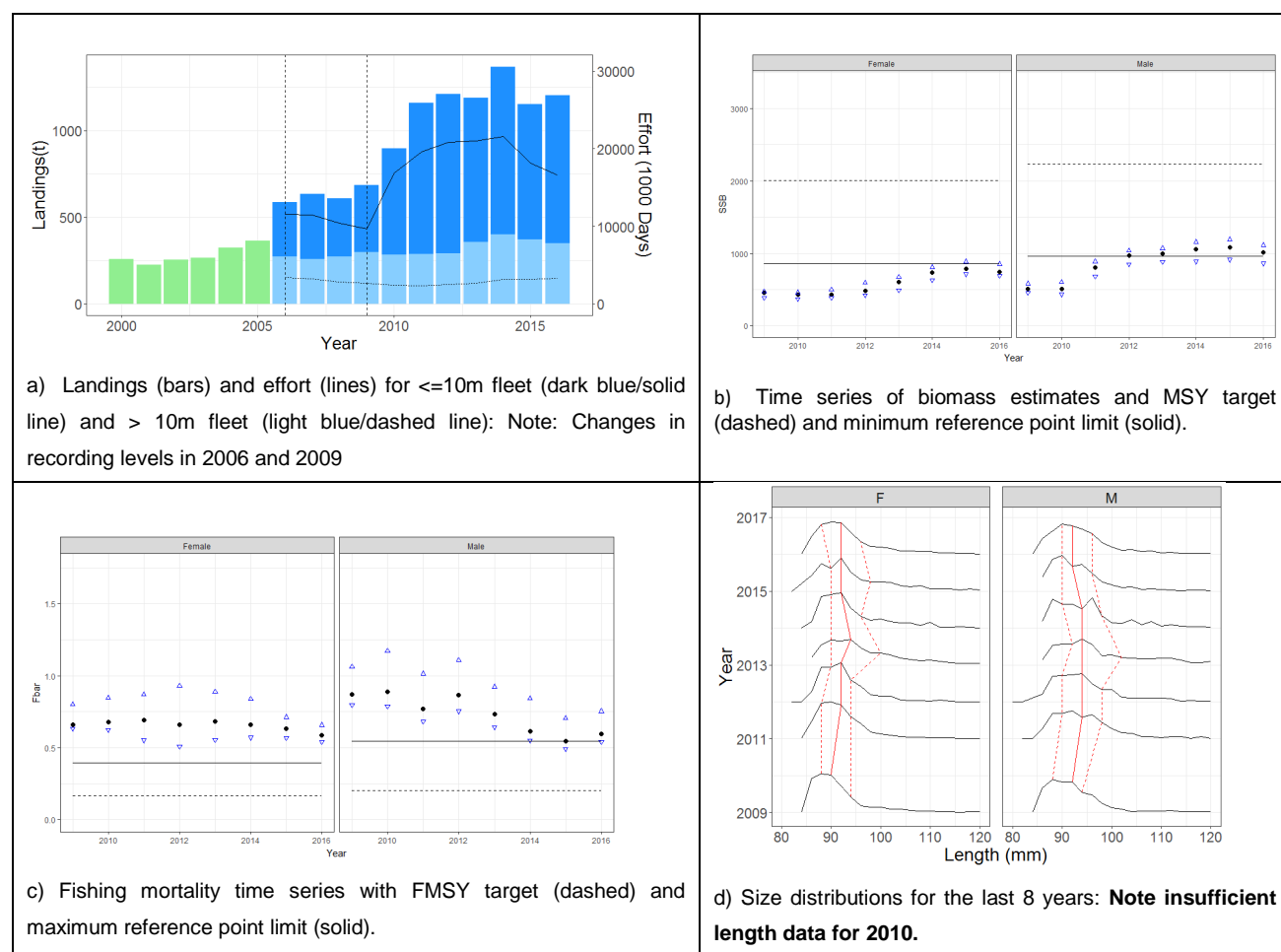
Table 1. Regional byelaws on Northumberland & Durham lobster fisheries.

Title of Byelaw	Northumberland	North Eastern
Shellfish Permits	Yes	Yes
Minimum Landing Size	As EU	As EU
Maximum Pot Limit	Yes - 800	No
Escape Gaps	No	Yes
Maximum Vessel Length	Yes - 12m	Yes – 12.5/14m (some areas)
Towed Gear Restrictions	No	No
Protection of Egg-Bearing Lobsters	No	No
Prohibits the Removal of Parts of Lobsters	Yes	Yes

Cefas Stock Status 2016: European lobster (*Homarus gammarus*) in Yorkshire Humber

Sustainability Status

Minimum Size	Landing	<i>At the MLS applied in this region around 99% of males and 86% of females should be mature.</i>
Discarding		<i>High discard survival assumed to be > 90%.</i>
Stock size		<i>Around minimum reference point.</i>
Exploitation rate		<i>Very high, beyond maximum reference point limit</i>



The status of the stock of lobster in Yorkshire is fairly low, female biomass is below the minimum reference point limit but the male biomass is slightly above. The exploitation level is very high, above the maximum reference point limit but has decreased in recent years. The fishing pressure is particularly high around the Minimum Landing Size. The status of the stock in relation to the reference points is unchanged from the previous assessment in 2014.

Sampling levels

Table 2. Sample numbers collected Yorkshire Humber during the last three years (samples provided by IFCA's in parenthesis).

Year	Samples used	No. animals sampled
2014	138 (47)	10,517
2015	131 (57)	9,975
2016	160 (58)	14,427

Fishery overview and developments

	2014	2015	2016
Fleet size < =10m / >10 m	166/27	164/27	155/30

Reported landings and fishing effort increased substantially following the introduction of Buyers and Sellers legislation and the Restrictive Shellfish License Scheme in 2006. Since this period fishing activity data are thought to be generally more reliable but the integrity of the time series, especially fishing effort, is uncertain.

Fishing mortality (F) has decreased since 2010 for both males and females. F is currently above target and limit levels for both sexes but spawning stock biomass (SSB) is just above the limit for males and has been improving since 2010.

Since 2010 the fishery has expanded to offshore grounds. An increase in offshore vivier vessels has been seen and a lot of vessels have increased their pot numbers (North Eastern IFCA, *pers. comm.*). This expansion of the fishery and change in fishing habits may be exploiting previously unfished populations with larger animals, which could explain the apparent decrease in F and increase in biomass, and the wider spread in length distributions for 2013/14.

NEIFCA data sources indicate that landings have continued to increase, following a trend established in the fishery since the early 1990's. The number of pots hauled has remained stable across the fishery, although accompanied by a reported increase in pot number. Displacement of gear has occurred within the Holderness fishery due to 2 offshore wind farm developments, pipeline works and associated surveys. Additionally oil & gas exploration also caused temporary displacement of some offshore operators. Vessel upgrades have also allowed for some operators to expand their fishing grounds into some areas that were previously lightly exploited.

Fishery Management Measures

North Eastern IFCA byelaws apply between the River Tyne and the River Tees (part of their area) and extend to 6nm out from coastal baselines.

- EC legislation sets a minimum landing size of 87mm for lobster in the UK and prohibits the landing of parts of lobsters.
- National legislation restricts the number of shellfish licences available in the UK and also prohibits the landing of lobsters with a v-notch in their tail fan.
- Local IFCA legislation varies and is detailed in the table below.

Table 1. Regional byelaws on Yorkshire Humber lobster fisheries.

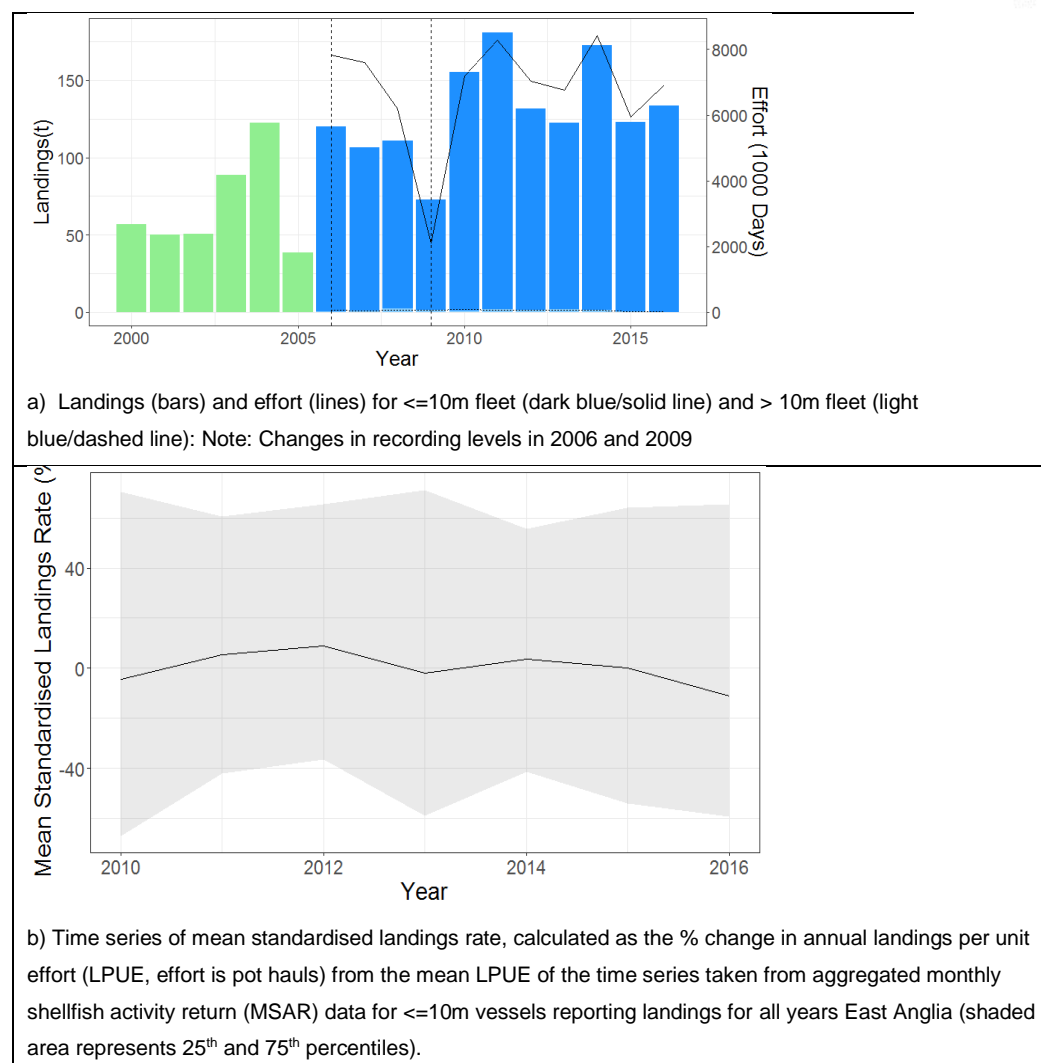
Title of Byelaw	North Eastern
Shellfish Permits	Yes*
Minimum Landing Size	As EU
Maximum Pot Limit	No
Escape Gaps	Yes
Maximum Vessel Length	Yes - 16m
Towed Gear Restrictions	No
Protection of Egg-Bearing Lobsters	No
Prohibits the Removal of Parts of Lobsters	Yes

Cefas Stock Status 2016: European lobster

(Homarus gammarus) in East Anglia

Sustainability Status

Minimum Landing Size	<i>At the MLS's applied in this region between 99-100% of the males and 86-92% of the females should be mature</i>
Discarding	<i>High discard survival assumed to be > 90%</i>
Stock size	<i>Unknown, catch rates are fairly stable.</i>
Exploitation rate	<i>Unknown</i>



The status of the stock of lobster in East Anglia is unknown. Data are insufficient for a full length-based assessment. Landings per unit effort for under 10 metre vessels are relatively stable, with a slight decrease in 2015/2016.

Sampling levels

Table 2. Sample numbers collected for East Anglia during the last three years (samples provided by IFCA in parenthesis).

Year	Samples used	No. animals sampled
2014	7	174
2015	17 (5)	605
2016	13 (3)	276

Fishery overview and developments

	2014	2015	2016
Fleet size < =10m / >10 m	114/4	110/2	120/2

Reported landings and fishing effort increased substantially following the introduction of Buyers and Sellers legislation and the Restrictive Shellfish License Scheme in 2006. Since this period fishing activity data are thought to be generally more reliable but the integrity of the time series, especially fishing effort, is uncertain.

Fishing mortality (F) is above the maximum reference point limit for both sexes and has increased since 2015 for females and since 2013 for males. Biomass has fluctuated slightly since 2009 but is below the minimum reference point limit for both sexes. Length samples were not taken in 2010 and were more sparse in 2011 than in previous years, consequently no assessment was presented for 2011 and 2012, as the assessment is based on the latest 3 years of length data.

Fishery Management measures.

Eastern IFCA byelaws apply between the Wash and the River Stour (part of their area) and extend to 6nm out from coastal baselines. Kent & Essex IFCA byelaws apply between the River Stour and the eastern end of Rye Bay and extend to 6nm out from coastal baselines, which, due to drying sandbanks, extends up to 15 miles offshore in some places.

- EC legislation sets a minimum landing size of 87mm for lobster in the UK and prohibits the landing of parts of lobsters.
- National legislation restricts the number of shellfish licences available in the UK and also prohibits the landing of lobsters with a v-notch in their tail fan.
- Local IFCA legislation varies and is detailed in the table below.

Table 1. Regional byelaws on East Anglia lobster fisheries.

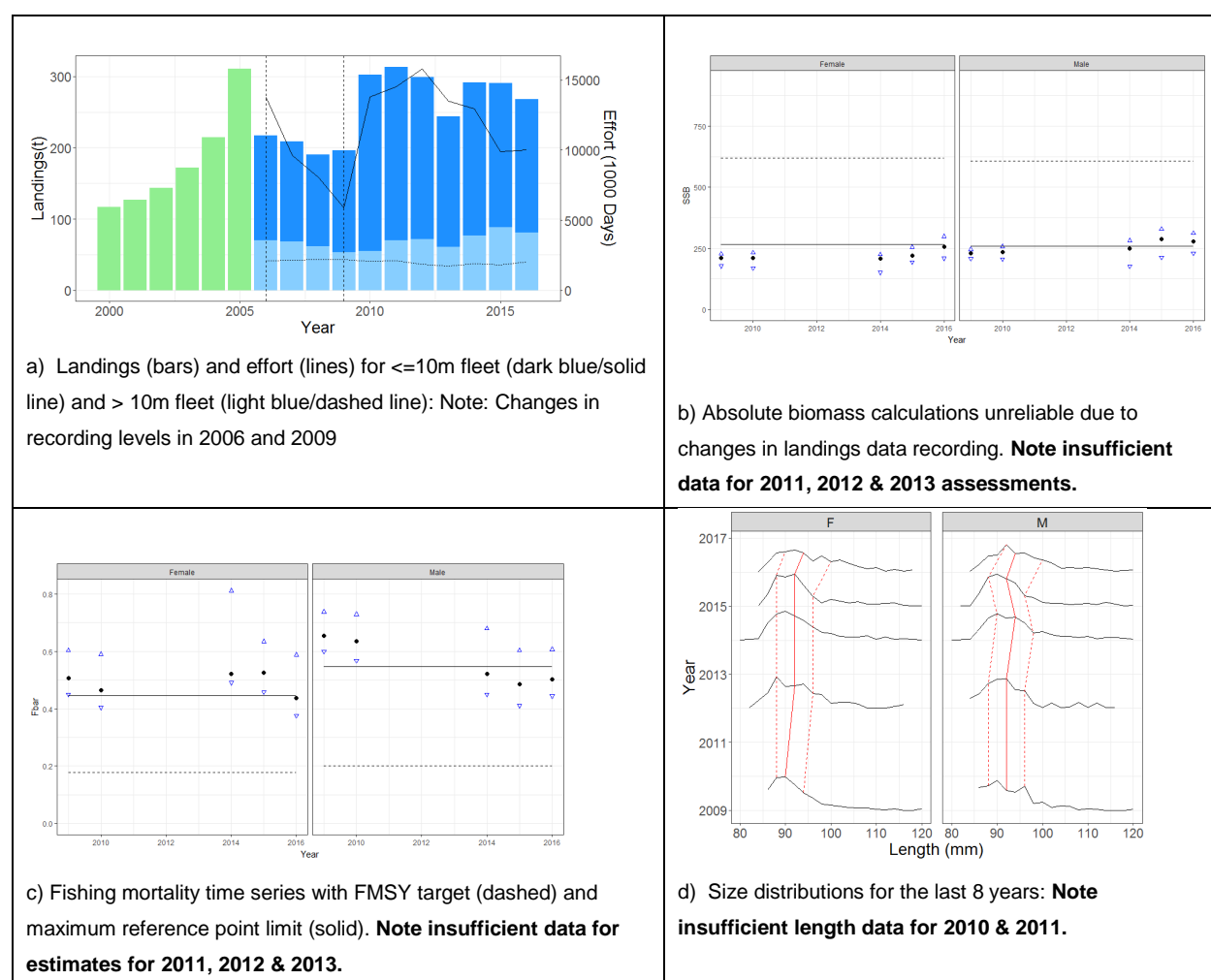
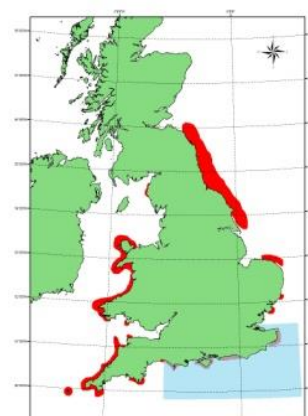
Title of Byelaw	Eastern	Kent & Essex
Shellfish Permits	No	Yes
Minimum Landing Size	As EU	As EU
Maximum Pot Limit	No	No
Escape Gaps	No	Yes
Maximum Vessel Length	No	Yes - 17M
Towed Gear Restrictions	No	No
Protection of Egg-Bearing Lobsters	Yes	Yes
Prohibits the Removal of Parts of Lobsters	Yes	No

Cefas Stock Status 2016: European lobster

(*Homarus gammarus*) in Southeast South Coast

Sustainability Status

Minimum Landing Size	<i>At the MLS's applied in this region between 99-100% of the males and 86-92% of the females should be mature</i>
Discarding	<i>High discard survival assumed to be > 90%</i>
Stock size	<i>Around the minimum reference point limit.</i>
Exploitation rate	<i>High. Above rates consistent with MSY but below maximum reference point limit.</i>



The status of the stock of lobster in Southeast South Coast is low. Biomass for both sexes is around the minimum reference point limit but has increased since 2014. The exploitation level is just below the maximum reference point limit. Data are insufficient for estimating exploitation rates for 2011-2012. The fishing pressure is particularly high around the Minimum Landing Size. The status of the stock in relation to the fishing rate reference points has improved from the previous assessment in 2012.

Sampling levels

Table 2. Sample numbers collected for Southeast South Coast during the last three years (samples provided by IFCA in parenthesis).

Year	Samples used	No. animals sampled
2014	42 (8)	1804
2015	31 (4)	1921
2016	26 (5)	1236

Fishery overview and developments

	2014	2015	2016
Fleet size < =10m / >10 m	232/17	253/19	244/20

Reported landings and fishing effort increased substantially following the introduction of Buyers and Sellers legislation and the Restrictive Shellfish License Scheme in 2006. Since this period fishing activity data are thought to be generally more reliable but the integrity of the time series, especially fishing effort, is uncertain.

Fishing effort and biomass are around the limit for both sexes. Biomass has been increasing since 2014. Length samples were not taken in 2010 and were more sparse in 2011 than in previous years, consequently no assessment was presented for 2011 and 2012, as the assessment is based on the latest 3 years of length data. Landings have remained stable since 2010 whilst effort has fluctuated.

Fishery Management measures.

Kent & Essex IFCA byelaws apply between the River Stour and the eastern end of Rye Bay and extend to 6nm out from coastal baselines, which, due to drying sandbanks, extends up to 15 miles offshore in some places.

Sussex IFCA byelaws apply between the eastern end of Rye Bay and Hayling Island and extend to 6nm out from coastal baselines.

Southern IFCA byelaws apply between the Devon/Dorset border to the west and the Hampshire/Sussex border to the east including Portland and the Isle of Wight.

- EC legislation sets a minimum landing size of 87mm for lobster in the UK.
- National legislation restricts the number of shellfish licences available in the UK and also prohibits the landing of soft lobsters, parts of lobsters or lobsters with a v-notch in their tail fan.
- Local IFCA legislation varies and is detailed in the table below.

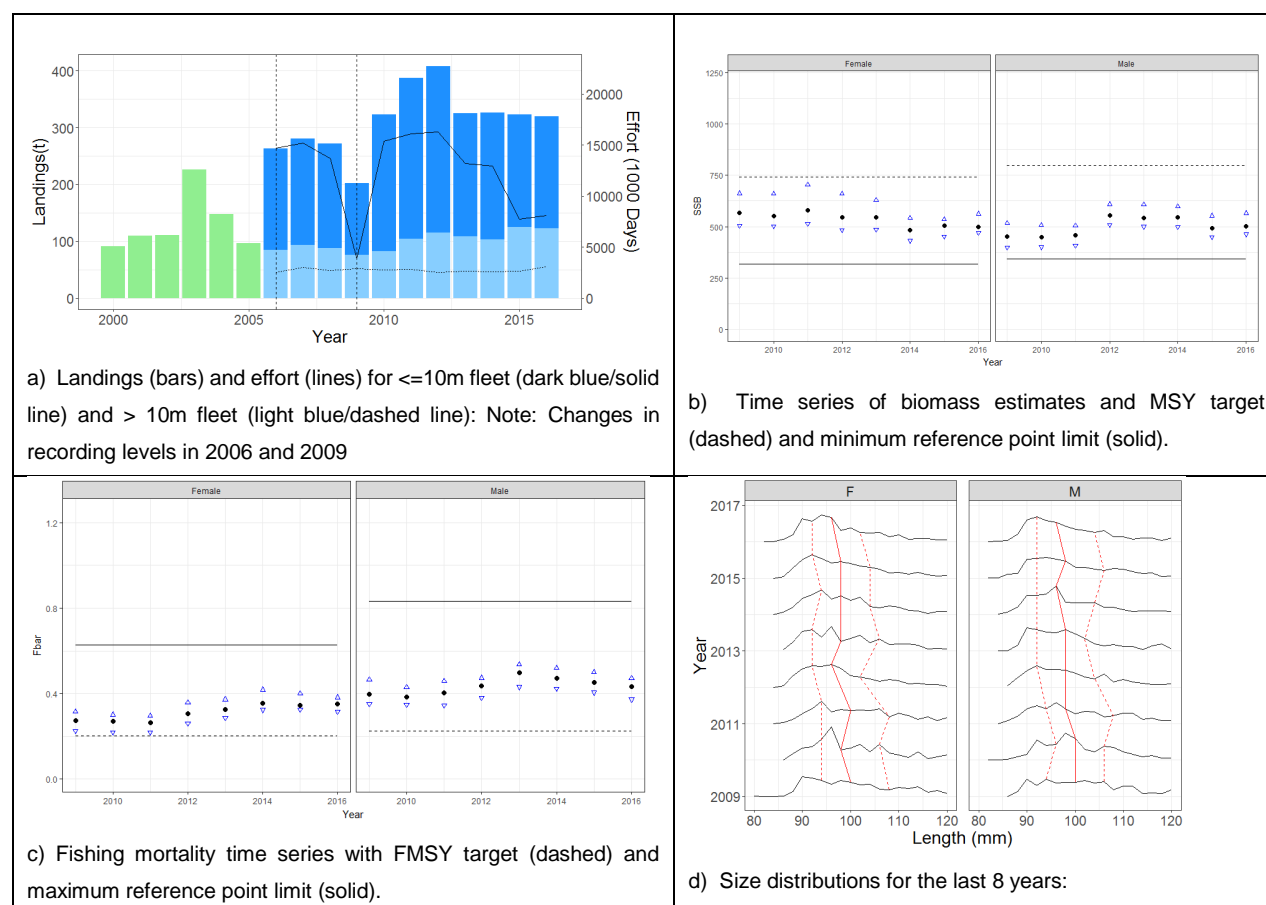
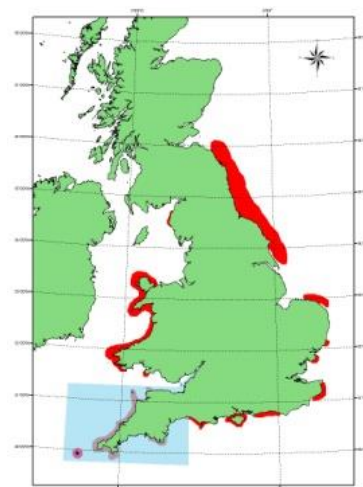
Table 1. Regional byelaws on South East South Coast lobster fisheries.

Title of Byelaw	Sussex	Southern	Kent & Essex
Shellfish Permits	Yes	No	Yes
Minimum Landing Size	As EU	As EU	As EU
Maximum Pot Limit	Yes-300<3m, 600<6m	No	No
Escape Gaps	Yes	No	Yes
Maximum Vessel Length	Yes -14m	Yes- 12m	Yes - 17M
Towed Gear Restrictions	No	No	No
Protection of Egg-Bearing Lobsters	Yes	Yes	Yes
Prohibits the Removal of Parts of Lobsters	No	No	No

Cefas Stock Status 2016: European lobster (*Homarus gammarus*) in the Southwest

Sustainability Status

Minimum Landing Size	<i>At the MLS's applied in this region between 99-100% of the males and 86-92% of the females should be mature</i>
Discarding	<i>High discard survival assumed to be > 90%</i>
Stock size	<i>Above minimum reference point limit but below MSY target</i>
Exploitation rate	<i>Moderate. Above rates consistent with MSY but below maximum reference point limit. Stable or decreasing over the past 3 years</i>



The status of the stock of lobster in the Southwest area is moderate; Spawning biomass levels are between the minimum reference point limit and the level associated with MSY and are reasonably stable. The exploitation level is between MSY target level and the maximum reference point limit for both sexes and has decreased for males since 2013. The status of the stock in relation to the fishing rate reference points has not changed since the last assessment in 2014.

Sampling levels

Table 2. Sample numbers collected for the southwest during the last three years (samples provided by IFCA in parenthesis).

Year	Samples used	No. animals sampled
2014	65 (38)	5771
2015	119 (71)	6851
2016	90 (28)	4450

Fishery overview and developments

	2014	2015	2016
Fleet size <= 10m / >10 m	296/38	299/36	318/40

Reported landings and fishing effort increased substantially following the introduction of Buyers and Sellers legislation and the Restrictive Shellfish License Scheme in 2006. Since this period fishing activity data are thought to be generally more reliable but the integrity of the time series, especially fishing effort, is uncertain

Fishing mortality (F) is consistently higher for males than females, but has been decreasing for the last few years. F is currently above target levels for both sexes, but below the limit reference point. Officially reported landings have remained consistent in the past 4 years whilst effort has decreased. Spawning stock biomass (SSB) has fluctuated slightly for both males and females in recent years.

Devon and Severn IFCA estimate the number of <10m vessels actively fishing in their district during 2013 was unchanged from previous years but the official data indicate a change in practice (fewer vessels generating sales notes). D&S IFCA also report no significant change in fishing effort (pots fished).

There is a distinct split in fishery practice with the larger (often vivier) boats operating outside the IFCA districts and therefore able to land berried females. The proportion of berried females in some landings is reported to be in excess of 60%. Those vessels operating predominantly within the IFCA areas will therefore have markedly different exploitation patterns designed to offer greater protection particularly to female spawning biomass.

Fishery Management measures.

Devon & Severn IFCA jurisdiction applies between Lyme Regis and the River Tamar on the south coast and between Marsland Mouth and the Welsh border on the north coast and extend to 6nm out from coastal baselines. Cornwall IFCA jurisdiction applies between the River Tamar (including the western shore) and Marsland mouth, and extend to 6nm out from coastal baselines. Isles of Scilly IFCA byelaws apply to the 6nm boundary around the Isles of Scilly.

- EC legislation sets a minimum landing size (MLS) of 87mm for lobster in the UK, however, Devon & Severn, Cornwall, and Isles of Scilly IFCA's all enforce an MLS of 90mm. EC legislation also prohibits the landing of parts of lobsters
- National legislation restricts the number of shellfish licences available in the UK and also prohibits the landing of lobsters with a v-notch in their tail fan.
- Local IFCA legislation varies and is detailed in the table below. Devon & Severn IFCA (D&S) enforce a total fishing ban in the No Take Zone on the east coast of Lundy Island inside the Marine Protected Area (SAC and MCZ designation).

Table 1. Regional byelaws on southwest lobster fisheries.

Title of Byelaw	Devon & Severn	Cornwall	Isles of Scilly
Shellfish Permits	Yes	Yes	No
Minimum Landing Size	Yes – 90mm	Yes – 90mm	Yes – 90mm
Maximum Pot Limit	No	No	No
Escape Gaps	Yes	No	No
Maximum Vessel Length	Yes - 15.24M	Yes - 16.46M	Yes - 11M
Towed Gear Restrictions	Inshore Potting Agreement Area	No	No
Protection of Egg-Bearing Lobsters	Yes	Yes	No
Prohibits the Removal of Parts of Lobsters	No	No	No

Glossary

Cefas	Centre for Environment, Fisheries and Aquaculture Science.
IFCA	Inshore Fisheries and Conservation Authority.
F	Fishing Mortality.
FMSY	The fishing effort which will produce Maximum Sustainable Yield.
M	Natural Mortality.
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MSY	Maximum Sustainable Yield, the maximum landings which can be regularly taken while avoiding stock collapse.
SAC	Special Area of Conservation
SpR	Spawner per Recruit



Centre for Environment Fisheries & Aquaculture Science



About us

The Centre for Environment, Fisheries and Aquaculture Science is the UK's leading and most diverse centre for applied marine and freshwater science.

We advise UK government and private sector customers on the environmental impact of their policies, programmes and activities through our scientific evidence and impartial expert advice.

Our environmental monitoring and assessment programmes are fundamental to the sustainable development of marine and freshwater industries.

Through the application of our science and technology, we play a major role in growing the marine and freshwater economy, creating jobs, and safeguarding public health and the health of our seas and aquatic resources

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Customer focus

We offer a range of multidisciplinary bespoke scientific programmes covering a range of sectors, both public and private. Our broad capability covers shelf sea dynamics, climate effects on the aquatic environment, ecosystems and food security. We are growing our business in overseas markets, with a particular emphasis on Kuwait and the Middle East.

Our customer base and partnerships are broad, spanning Government, public and private sectors, academia, non-governmental organisations (NGOs), at home and internationally.

We work with:

- a wide range of UK Government departments and agencies, including Department for the Environment Food and Rural Affairs (Defra) and Department for Energy and Climate Change (DECC), Natural Resources Wales, Scotland, Northern Ireland and governments overseas.
- industries across a range of sectors including offshore renewable energy, oil and gas emergency response, marine surveying, fishing and aquaculture.
- other scientists from research councils, universities and EU research programmes.
- NGOs interested in marine and freshwater.
- local communities and voluntary groups, active in protecting the coastal, marine and freshwater environments.

www.cefasc.co.uk

