



Edible crab (*Cancer pagurus*)

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: Edible crab (*Cancer pagurus*)

Background

Cefas has published reports describing the status of the edible crab (*Cancer pagurus*) stocks around the UK since 2012. It is planned to re-run the assessment every 2 years. 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

Edible crab can be found from Scandinavia to Portugal. Stock boundaries for edible crab remain poorly understood and both sexes move quite widely at times; females in particular have been shown to travel large distances in relation to spawning activity. Egg carrying females are largely inactive over the winter brooding period but the eggs hatch in the spring and summer. After around five weeks in the plankton, the crab larvae settle on the seabed. Growth is dependent on the frequency of moulting as well as the increase in size on each moulting occasion and it typically takes about four or five years for a juvenile crab to grow to commercial size. Mating activity peaks in the summer when the female has moulted with spawning occurring in the late autumn or winter.

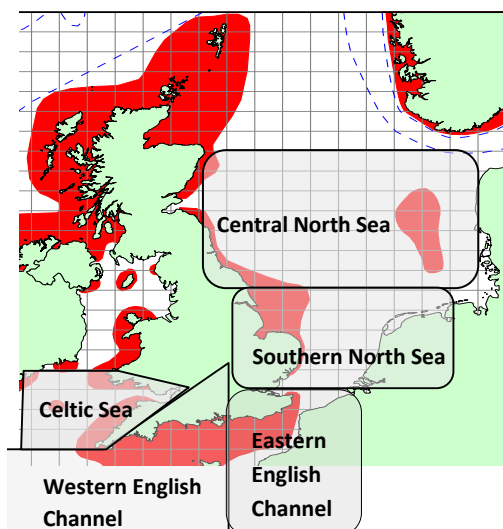


Figure 1. – The CFU's used for the assessment regions.

Fishery Unit Definitions

There are five Crab Fishery Units (CFU) that have been defined for England. These units are based upon the understanding of larval distributions and development, hydrographic conditions and distribution of the fisheries. Each CFU encompasses waters covered by International, National and local legislation which may be different within each region. For this round of assessments Cefas only had sufficient data to successfully cover four of the CFU's. Those CFU's are presented in Figure 1.

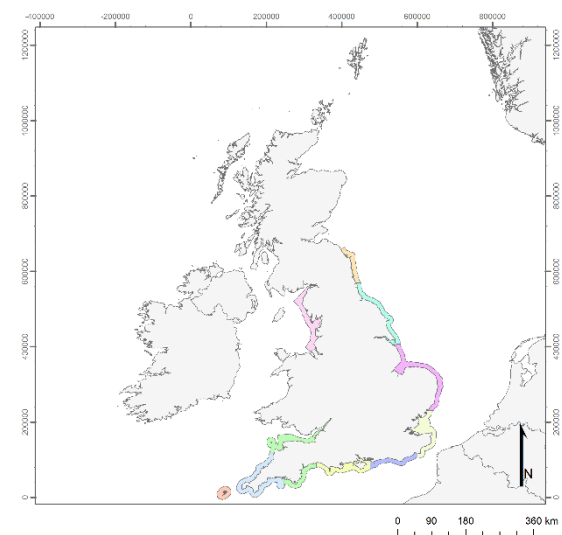


Figure 2. – The IFCA boundaries.

Fishery management jurisdiction is organised on two different scales around England. Beyond 6 nautical miles, Defra and the MMO are responsible for managing crab 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, and their regions extend from the coast out to 6nm (see Figure 2). The CFU and IFCA boundaries do not match, which can make interpretation of the 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 between boundaries are to be expected.

Data sources used

Landings come from the official MMO data records and there have been changes in the way the MMO (and its predecessors) have gathered landings data. 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, MMO landings data were also supplemented by self-reported records of landings from the Monthly Shellfish Activity Return (MSAR) forms. In the 2017 assessment Cefas combined MSAR data and MMO landings for the <10m fleet.

Fishing effort is derived from MSARs for <=10m vessels and 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 mean that landings and effort series cannot 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 crabs.

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 GB registered vessels. The overall landings appear relatively consistent between 2006 until 2011, but have been increasing thereafter.

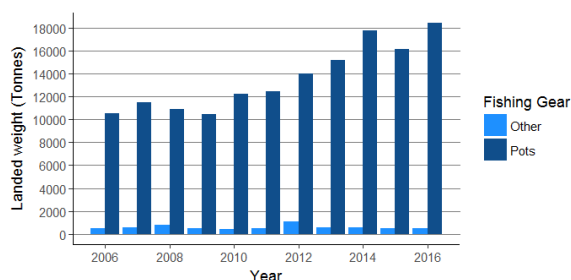


Figure 3 – The official landings for UKE&W.

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.

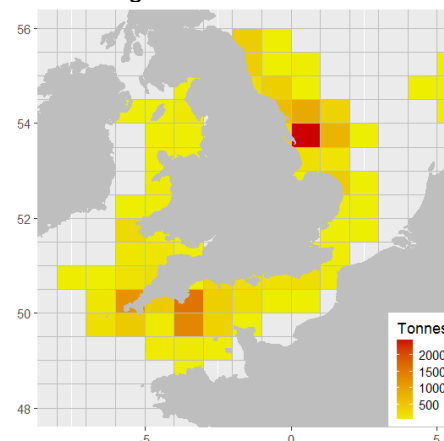


Figure 4 – The landings per ICES rectangle for 2016.

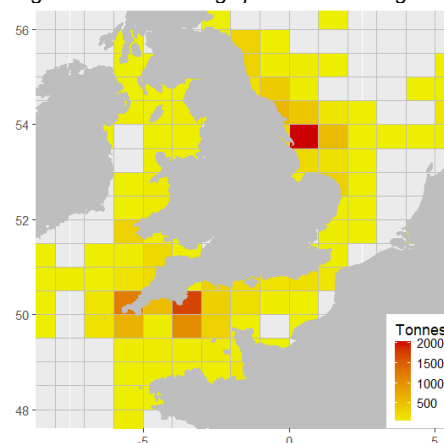


Figure 5 – The average landings per ICES rectangle from 2011 to 2016.

Assessment Methodology

Within European waters, most major 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. As animals get older they grow and die, the interplay of these two vital functions dictating how many animals at a given size there are in the population. Armed with knowledge of the growth rate of animals and the rate of natural death (M) assumed to be 0.2, the shape of the length-frequency curve can be 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.

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 is to achieve fishing rates likely to deliver Maximum Sustainable Yield (MSY) from fisheries. This means the maximum landings that can be regularly taken without causing stock collapse. 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, and 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 and assessment models will never exactly

replicate reality. 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 cannot be exactly correct but should be broadly representative of the population as a whole. Not all landings will be recorded as there are exemptions from reporting requirements for small scale fisheries and recreational catches.

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 these fishery stock assessment do is capture the main processes and data streams so that the final estimate of fishing rate and/or stock size is broadly correct.

For these assessments 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.

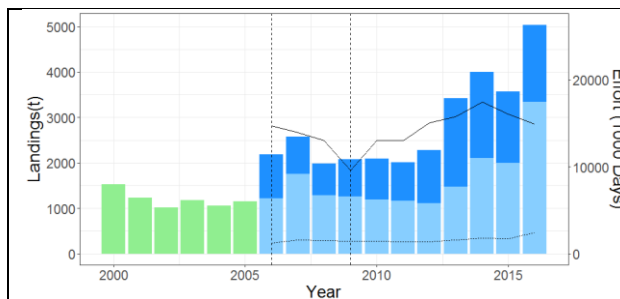
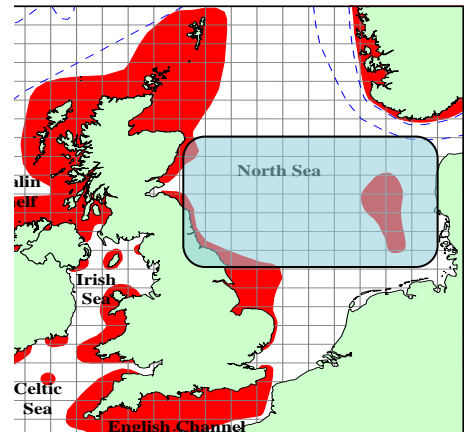
Cefas has a research program which continually searches to improve our understanding of processes governing population dynamics and there are currently projects focussing on growth and mortality rates. We are also working with the MMO to ensure that landings statistics are as complete and accurate as possible, and working with the IFCA's 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.

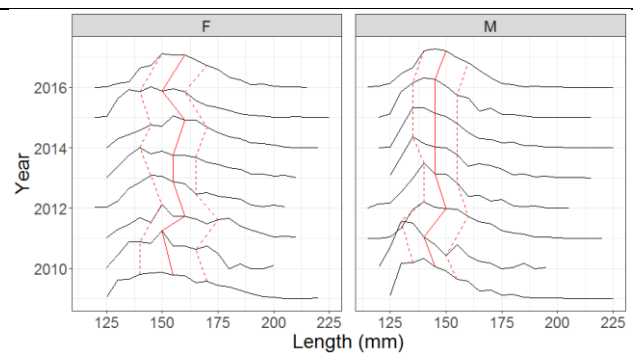
Cefas Stock Status 2017: Edible crab (*Cancer pagurus*) in the Central North Sea

Sustainability Status

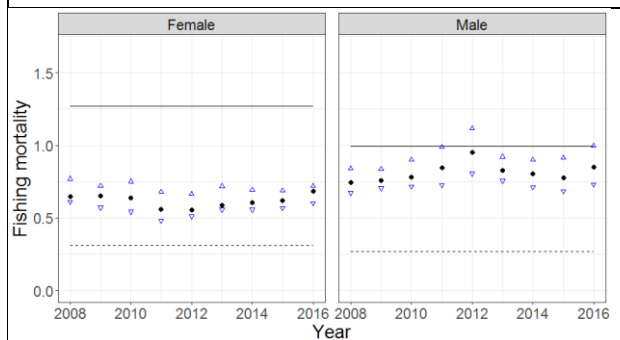
Minimum Landing Size	At the MLS, around 99% of males and 86% of females should be sexually mature.
Discarding	High discard survival assumed to be > 90%.
Stock size	Around minimum reference point limit for males, approaching target for females.
Exploitation rate	Moderate, below maximum reference point limit for females, males close to limit.



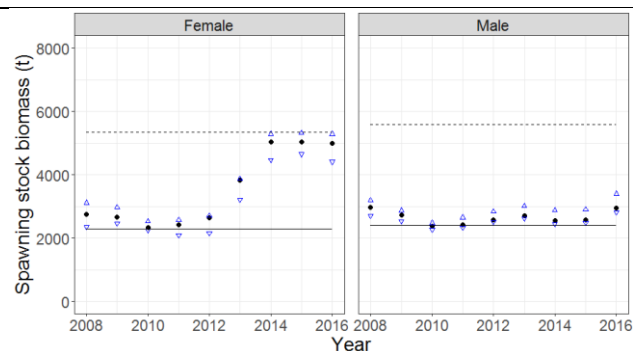
a) Landings (bars) and effort (lines) for the $\leq 10\text{m}$ fleet (dark blue/solid line) and the $> 10\text{m}$ fleet (light blue/dashed line). Landings data for 2000 to 2005 have been combined for both fleets due changes in data reporting (green): Note: Changes in recording levels in 2006 and 2009



b) Size distributions of landings for the last 8 years. Solid red line represents the annual median and the dashed lines represent 25th and 75th percentiles



c) Fishing mortality time series with FMSY target (dashed) and maximum reference point limit (solid).



d) Time series of biomass estimates and MSY target (dashed) and minimum reference point limit (solid).

The spawning stock biomass of Edible Crab in the Central North Sea is approaching the recommended level for females but remains low and around the minimum recommended level for males. Exploitation level is moderate on females and, although likely to be sustainable is above the level required for Maximum Sustainable Yield. There had been a trend of increasing exploitation rate on males but this may have dropped slightly in recent years. The status of the stock has not changed since the last assessment in 2014.

Sampling levels

Table 2. Sample numbers used in the CNS assessment for the last three years collected by Cefas, numbers in parenthesis are extra samples supplied by IFCAs.

Year	Number of crabs	Number of samples	Sampled wt. (kg)
2014	3670 (960)	45 (18)	1707 (628)
2015	3154 (2208)	53 (19)	1585 (1261)
2016	4283 (4152)	54 (49)	1935 (2623)

Fishery overview and developments

	2014	2015	2016
Fleet size < =10m / 10+ m	223 / 27	219 / 30	210 / 38

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.

The exploitation rate on males has declined over the past 4 years, this will be caused by an increase of larger individuals in the landings.

As well as the more traditional fisheries off Yorkshire and Northumberland a fishery off the Danish coast prosecuted by large nomadic English vessels has developed over the last decade. The fishery in this area has increased in range with the decline of trawling, as operators target grounds beyond 6nm. Increased landings and animal sizes have been noted on the quayside within the NEIFCA district. Some technology creep has occurred as either vessels or hauling equipment has been upgraded to improve efficiency. There has also been some transition to higher capacity vessels operating significant pot numbers. The inshore fishery has seen an increase in pots hauled and pots set across the NEIFCA range. Market systems can influence the landings composition with seasonal restrictions on landing males, females and specific size ranges, in periods associated with poor meat yield.

Fishery Management measures

- EC legislation sets a minimum landing size of 130mm for crabs in the North Sea south of 56°N and 140mm North of 56°N. It also restricts the proportion of the crab landings which is detached claws caught by pots or creels to less than 1% by weight of total catch. A by-catch limit of no more than 75kg per day of crab claws taken by other gear types can be landed.
- National legislation restricts the number of shellfish licences available (in England and Wales) and also prohibits landing of berried and soft crabs.
- Local IFCA legislation varies and is detailed in the table below.

Table 1. Regional byelaws on Central North Sea crab fisheries.

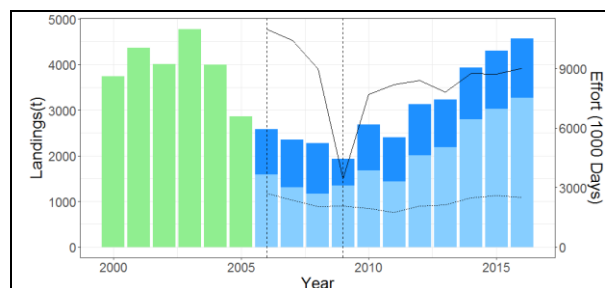
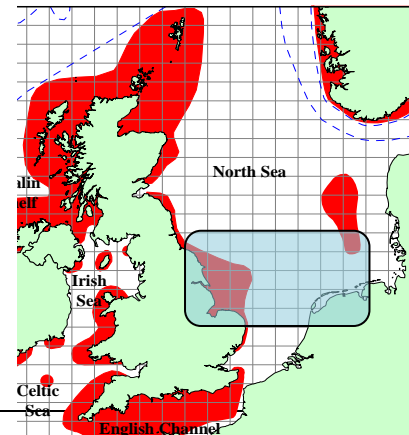
Type of Byelaw	Northumberland IFCA	North Eastern IFCA
Shellfish permits	Yes	Yes*
Minimum Landing Size	No	Yes – 140mm
Maximum Pot Limit	Yes - 800	No
Escape Gaps	No	Yes*
Maximum Vessel Length	Yes -12m	Yes - 16m
Towed Gear Restrictions	No	No
Prohibits the Use of Crab for Bait	Yes	Yes
Prohibits the Removal of Parts of Crabs	Yes	Yes

*Only applicable within the previous North Eastern Sea Fisheries Committee District

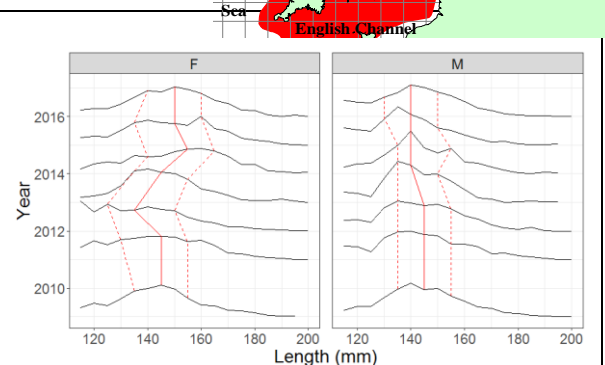
Cefas Stock Status 2017: Edible crab (*Cancer pagurus*) in the Southern North Sea

Sustainability Status

Minimum Landing Size	<i>At the MLS's applied in this region around 96-99% of males and 60-86% of females should be sexually mature.</i>
Discarding	<i>High discard survival assumed to be > 90%.</i>
Stock size	<i>Around minimum reference point limit for males, approaching target for females</i>
Exploitation rate	<i>High. Around the maximum reference point limit for both females and males.</i>



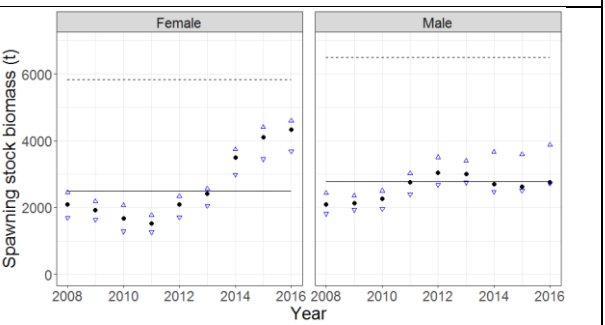
a) Landings (bars) and effort (lines) for the $\leq 10\text{m}$ fleet (dark blue/solid line) and the $>10\text{m}$ fleet (light blue/dashed line). Landings for 2000 to 2005 have been combined; **Changes in recording of landings occurred in 2006 and 2009. The series are inconsistent.**



b) Size distributions of landings for the last 8 years. Note, no data for 2010. Solid red line represents the annual median and the dashed lines represent 25th and 75th percentiles



c) Fishing mortality time series with FMSY target (dashed) and maximum reference point limit (solid).



d) Absolute biomass calculations unreliable due to changes in landings data recording.

The spawning stock biomass of Edible Crab in the Southern North Sea is approaching the recommended level for females but remains low and around the minimum recommended level for males. Changes in the way landings have been recorded in 2006 and 2009 mean the data are inconsistent and unsuitable for assessment. Calculations of fishing mortalities are unaffected by the issues with landings and mortality rates are high, around the maximum reference point limit for both females and males.

Sampling levels

Table 2. Sample numbers collected for SNS during the last three years by Cefas, numbers in parenthesis are additional samples supplied by IFCAs.

Year	Number of crabs	Number of samples	Sampled wt. (kg)
2014	3761 (459)	42 (5)	1310 (263)
2015	5984 (3553)	60 (18)	1766 (1511)
2016	8046 (3950)	72 (25)	2474 (1761)

Fishery overview and developments

	2014	2015	2016
Fleet size < 10m / 10+ m	139 / 28	142 / 28	151 / 30

Marked variability in annual reported fishing effort and changes to procedures for acquiring fishing effort have changed over time and integrity of the fishing effort time series is highly uncertain. Landings data since 2009 are missing those landings which did not generate sales notes (as each sale was <25kg). As such data from Monthly Shellfish Activity Returns (MSARS, required as part of the Shellfish Restrictive Licence Scheme) have been used in conjunction with official landings data to fill in the gaps.

This stock supports three distinct fisheries, the Holderness fishery off Yorkshire, and two Norfolk fisheries. There are strong seasonal fluctuations in the fisheries with the spring fishery (March – May) seeing the highest catch rates.

The components of the Norfolk fishery are typified by small beach-launched vessels and larger harbour based vessels, the former being more restricted in their activity by weather. There is a difference in the preferred size of crab by processing division. Big processors preferring larger crab (>125mm) during late winter whereas the smaller processors will take all sizes. In spring- early summer there is more demand for MLS (115mm) crab for tourist/day-tripper market (bite size crab). Through the summer, processors tend to take all sizes as the availability of crab reduces (owing to the biology of the animals).

Within the NEIFCA district a large size distribution has been recorded on the quayside with animals over 200mm carapace width not uncommon. Some technology creep has occurred as either vessels or hauling equipment has been upgraded to improve efficiency. There has been considerable upgrading within the fleet with some operators moving towards higher capacity vessels, operating in the more lightly exploited grounds further offshore. Market systems can influence the landings composition with seasonal restrictions on landing males, females and specific size ranges, in periods associated with poor meat yield.

Fishery Management measures

- EC legislation sets a minimum landing size of 130mm for crabs in the North Sea south of 56°N. It also restricts the proportion of the crab landings which is detached claws caught by pots or creels to less than 1% by weight of total catch. A by-catch limit of no more than 75kg per day of crab claws taken by other gear types can be landed.
- National legislation restricts the number of shellfish licences available (in England and Wales) and also prohibits landing of berried and soft crabs.
- A derogation to the EC legislation sets an MLS of 115mm in the Eastern IFCA area. Local IFCA legislation varies and is detailed in the table below.

Table 1. Regional byelaws on Southern North Sea crab fisheries.

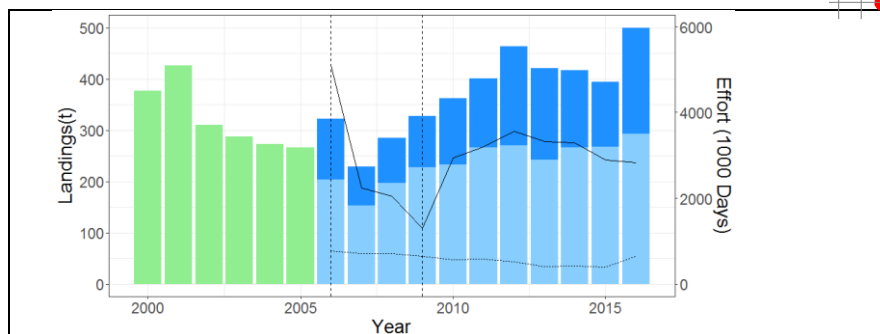
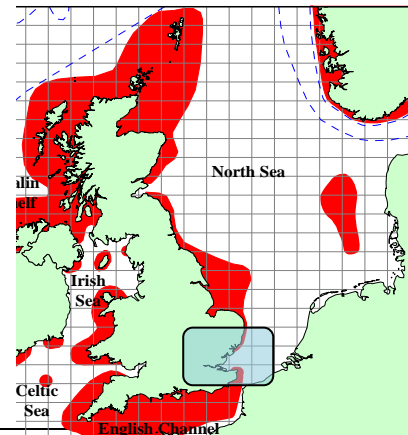
Title of Byelaw	North Eastern	Eastern	Kent & Essex
Shellfish permits	Yes*	Yes*	No
Minimum Landing Size	Yes – 140mm	Yes – 115mm	No
Maximum Pot Limit	No	No	No
Escape Gaps	Yes*	Yes*	Yes
Maximum Vessel Length	Yes - 16m	No	Yes - 17M
Towed Gear Restrictions	No	Yes	No
Prohibits the Use of Crab for Bait	Yes	Yes	Yes
Prohibits the Removal of Parts of Crabs	Yes	Yes	Yes

*Only applicable within the previous North Eastern Sea Fisheries Committee District

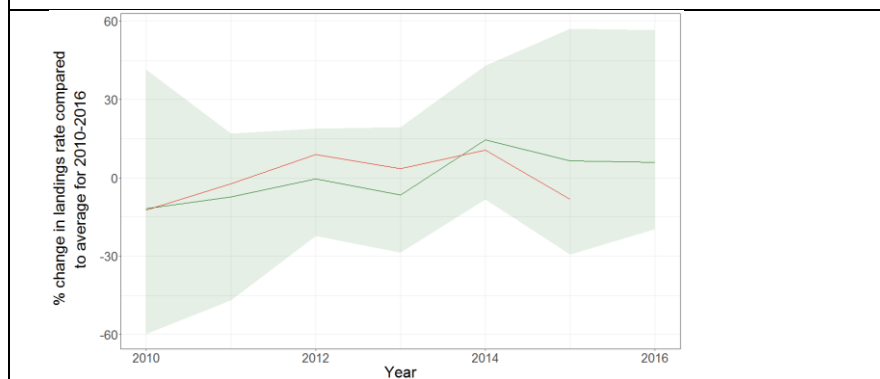
Cefas Stock Status 2017: Edible crab (*Cancer pagurus*) in the Eastern English Channel

Sustainability Status

Minimum Landing Size	<i>At the MLS's applied in this region around 96-99% of males and 60-86% of females should be sexually mature.</i>
Discarding	<i>High discard survival assumed to be > 90%.</i>
Stock size	<i>Unknown</i>
Exploitation rate	<i>Unknown</i>



a) Landings (bars) and effort (lines) for the ≤10m fleet (dark blue/solid line) and the >10m fleet (light blue/dashed line). Landings for 2000 to 2005 have been combined over fleets. Note: Changes in recording levels in 2006 and 2009



b) Time series of mean standardised landings rate, calculated as the change in annual landings per unit effort (LPUE, effort is pot hauls) from the mean LPUE of the time series. Red is the personal logbook data of a single over 15m vessel, green is aggregated monthly shellfish activity return (MSAR) data for ≤10m vessels reporting landings for all years in the East English Channel (coloured area represents 25th and 75th percentiles for ≤10m fleet).

The status of the stock of Edible Crab in the Eastern English Channel is currently unknown. A length based assessment was not feasible due to insufficient data. Landings per fishing day have large uncertainty boundaries but appear stable for the years 2010 – 2016 for both fleets presented. No Reference points have been calculated

	2014	2015	2016
Fleet size < 10m / 10+ m	81 / 6	116 / 9	91 / 9

Recorded landings have fluctuated widely generally in line with recorded effort. A peak of 544 t in 1984 was followed by a decline to the lowest value in the time period of only 4 tonnes in 1990. From 1990 recorded landings increased to the highest level of 757t in 1994 followed by a further decline over the next four years. Since 1998 recorded landings have fluctuated between 266t and 500t. Improved reporting following the introduction of RSLs (Restrictive shellfish licencing scheme), requiring submission of monthly shellfish returns by fishers (MSAR) in 2006 is likely and may give an artificially optimistic view of the fishery in 2006, as the implication is that in previous years landings were under reported. However, this is not particularly apparent. By combining the official landings data with the MSAR data for the present assessment, for the years 2010-2016, the magnitude of the landings and effort are likely to be more accurate.

The potting fleet is mainly made up of vessels =<10m length in the Eastern English Channel stock (91 vessels reported landings in 2016), with only 9 vessels over 10m length with reported landings in 2016. However, these 9 vessels landed over two thirds of the total crab landings into EEC ports in 2016. A large fishery occurs during late summer to autumn, when fishers target mature female crabs as they carry out their ontogenic migration westward through the channel towards spawning grounds.

Fishery Management measures

- European Commission (EC) and UK Minimum Landing Sizes (MLS) of 130mm carapace width (CW) apply north of 51° N. South of this latitude an EC and UK MLS of 140mm CW is enforced.
- Sussex IFCA have a shellfish permit scheme in place. This stipulates that no vessels larger than 14m in length can fish in the district and limits potting effort by restricting the number of pots (specifically crab or lobster pots) at 300 within 3nm from the coast and 600 pots from 3-6nm.

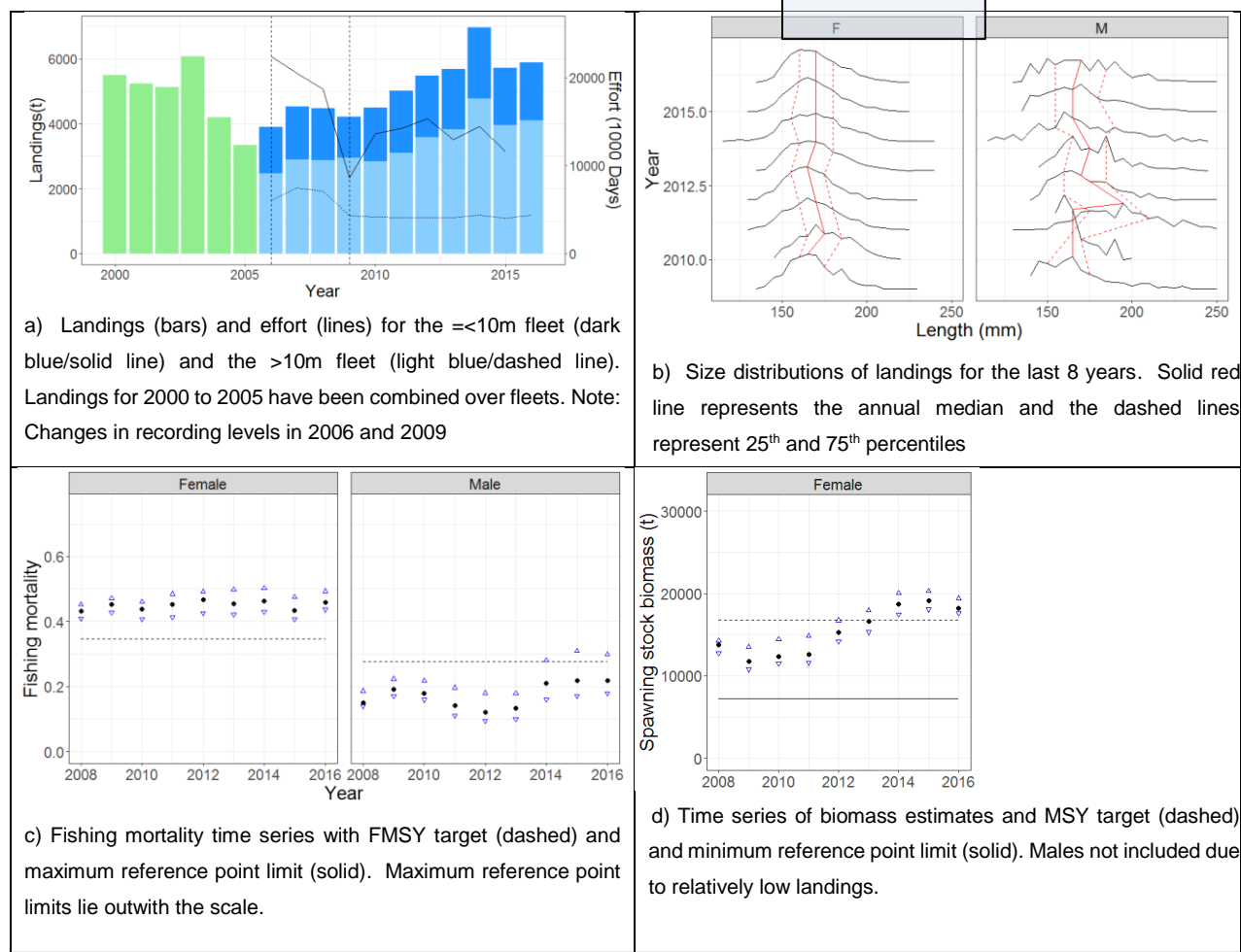
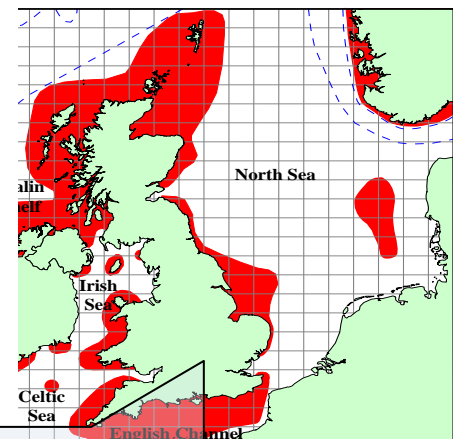
Table 1. Regional byelaws on Western English Channel crab fisheries.

Title of Byelaw	Southern	Sussex	Kent and Essex
Shellfish Permits	No	Yes	No
Minimum Landing Size	No	No	No
Maximum Pot Limit	No	Yes	No
Escape Gaps	No	No	Yes
Maximum Vessel Length	Yes – 12m	Yes – 14m	Yes – 17m
Towed Gear Restrictions	No	No	No
Prohibits the Use of Crab for Bait	No	No	Yes
Prohibits the Removal of Parts of Crabs	No	No	Yes

Cefas Stock Status 2017: Edible crab (*Cancer pagurus*) in the Western English Channel

Sustainability Status

Minimum Landing Size	<i>At the MLS's applied in this region around 96-99% of males and 60-86% of females should be sexually mature.</i>
Discarding	<i>High discard survival assumed to be > 90%.</i>
Stock size	<i>High, around the level required to achieve MSY for both males and females.</i>
Exploitation rate	<i>Moderate, at a level required to achieve MSY for both males and females.</i>



The status of the stock of Edible Crab in the Western English Channel is good with spawning stocks around the level required to produce Maximum Sustainable Yield. The exploitation levels are close to the levels required to produce Maximum Sustainable Yield (males below, females above). The status of the stock has not changed since the last assessment in 2014.

Sampling levels

Table 2. Sample numbers collected for WEC during the last three years by Cefas, numbers in parenthesis are additional samples supplied by IFCAs.

Year	Number of crabs	Number of samples	Sampled wt. (kg)
2014	6297 (369)	50 (6)	3786 (270)
2015	7234 (607)	55 (4)	4225 (514)
2016	7113 (32)	52 (1)	3525 (21)

Fishery overview and developments

	2014	2015	2016
Fleet size < 10m / 10+ m	252 / 35	257 / 37	278 / 37

Landings have been relatively stable over the time series except very high landings reported in the late 1990's. There is some evidence to suggest an influence of the introduction of the Restrictive Shellfish License Scheme and Buyers and Sellers legislation since which fishing activity data has been generally more reliable. Fishing effort appears to have generally declined over the time series however between 2006 and 2008 there was a change in the way official fishery data were recorded leading to an increase in records, particularly effort. In the current assessment MSAR data have been combined with landings data to improve data quality, these data are combined for 2010 – 2016. For the period of 2006 – 2009 and 2010 – 2016 the landings and effort data are considered to be a more accurate magnitude and therefore the integrity of the time series is potentially compromised.

The EU Western Waters Regime places a limit upon the number of kilowatt days that the >15m potting fleet can use within ICES area VII. From 2013 active management has been introduced leading to reductions in the number of days fished within this stock area. There may have also been a loss in effort (and therefore also catch) towards the end of 2013 because of the very bad weather in the run up to Christmas which is traditionally an important fishery.

Since 2008 there has been an increase in the vessel numbers and pots used in the Lyme Bay area since the Lyme Bay Statutory Instrument came into being however it is not clear if this represents new activity or a relocation of activity from neighbouring areas.

In large areas of the Devon and Severn IFCA district there is little opportunity to increase the area covered or number of pots on the ground due to the potential for gear conflicts with the mobile fishing.

Fishery Management measures

- EC and UK minimum landing size of 140mm applies, but off Devon and Cornwall UK law stipulates an MLS of 160mm for males. It also restricts the proportion of the crab landings which is detached claws caught by pots or creels to less than 1% by weight of total catch. A by-catch limit of no more than 75kg per day of crab claws taken by other gear types can be landed.
- National legislation restricts the number of shellfish licences available (in England and Wales) and also prohibits landing of berried and soft crabs.
- Cornwall IFCA applies an MLS of 150mm for females. Local IFCA legislation varies and is detailed in the table below.
- There are mid-channel potting agreements in place in this region.

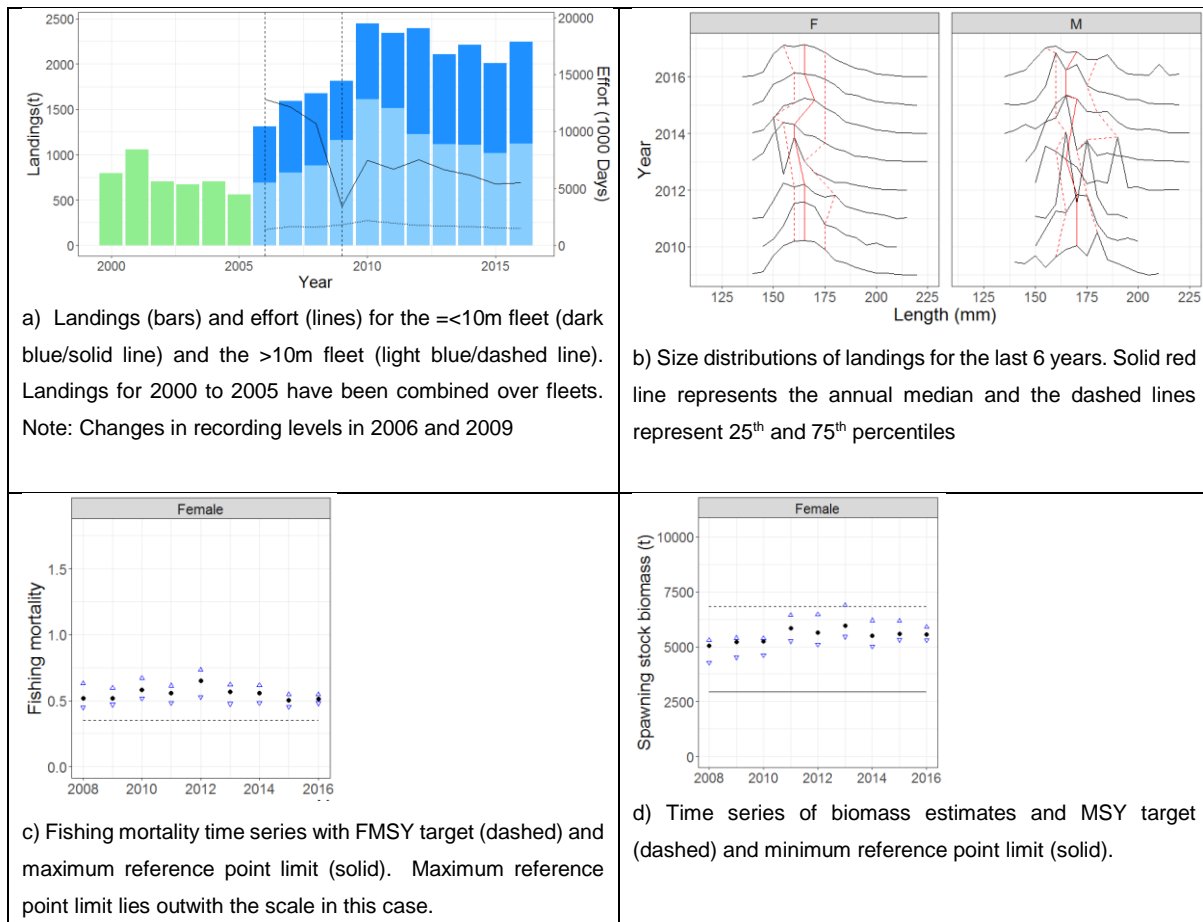
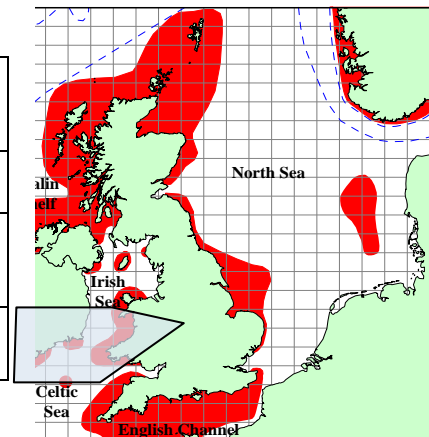
Title of Byelaw	Southern	Devon & Severn	Cornwall	Isles of Scilly
Shellfish Permits	No	Yes	Yes	No
Minimum Landing Size	No	Yes, 160mm for males	Yes, 150mm (females), 160mm (male)	No
Maximum Pot Limit	No	Yes	No	No
Escape Gaps	No	Yes	Yes	No
Maximum Vessel Length	Yes - 12M	Yes - 15.24M	Yes - 16.46M	Yes - 11M
Towed Gear Restrictions	No	Inshore Potting Agreement Area	No	No
Prohibits the Use of Crab for Bait	No	No	No	No
Prohibits the Removal of Parts of Crabs	No	Yes	Yes	No

Table 1. Regional byelaws on Western English Channel crab fisheries.

Cefas Stock Status 2017: Edible crab (*Cancer pagurus*) in the Celtic Sea

Sustainability Status

Minimum Landing Size	At the MLS's used in this region around 100% of males and 94-98% of females should be sexually mature.
Discarding	High discard survival assumed to be > 90%.
Stock size	Below Maximum Sustainable Yield level but above minimum reference point limit.
Exploitation rate	Moderate. Around level generating Maximum Sustainable Yield.



The status of the stock of female Edible Crab in the Celtic Sea is approaching the level associated with Maximum Sustainable Yield. Exploitation levels are moderate for females and likely to be sustainable but above the target MSY level. The status of the stock has not changed since the last assessment in 2014.

Sampling levels

Table 2. Sample numbers collected from the CS during the last three years by Cefas, numbers in parenthesis are additional samples supplied by IFCA's.

Year	Number of crabs	Number of samples	Sampled wt. (kg)
2014	4713 (944)	31 (13)	2666 (735)
2015	5059 (730)	33 (7)	2930 (512)
2016	5099 (1056)	42 (18)	3345 (764)

Fishery overview and developments

	2014	2015	2016
Fleet size < 10m / 10+ m	181 / 20	190 / 19	179 / 19

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. Landings for the last 6 years are the highest on record.

The very low level of landings for males presents the assessment methodology with significant problems in determining exploitation level and stocks size for males. In particular it means that any MSY levels for males and females are not comparable. The relative lack of males in the landings is likely to result from the males occurring on ground not covered by the fishery (either in space or time) and therefore this portion of the stock is offered a degree of protection. As it is the size of the female portion of the stock which mainly governs the potential to produce further generations, it is considered appropriate to characterise the status and exploitation rate of this stock on the fishery statistics for females.

The level of effort in the Devon and Severn IFCA district is reported to have remained consistent. The potting fisheries on the district's North Coast are seasonal with boats switching target species. In the winter/spring they target whelks until around April when the water temperature increases and they target lobsters. Crabs are the main target through the autumn although they also form a bycatch in the summer lobster fishery. The ground targeted in the autumn is the optimal crab ground and is associated with movement of the females at this time of the year – they are likely to have mated and are very actively feeding. Males may be present on this ground at other times of the year when the fishery is absent.

Fishery Management measures

- EC and UK minimum landing sizes of 140mm apply to ICES divisions VII f (in ICES division VII g an EC MLS of 130mm is applicable), but off Devon and Cornwall UK law stipulates an MLS of 160mm for males. EC law also restricts the proportion of the crab landings which is detached claws caught by pots or creels to less than 1% by weight of total catch. A by-catch limit of no more than 75kg per day of crab claws taken by other gear types can be landed.
- National legislation restricts the number of shellfish licences available (in England and Wales) and also prohibits landing of berried and soft crabs.
- Cornwall IFCA applies a 150mm MLS for female crabs and 160mm for males. Local IFCA legislation varies and is detailed in the table below.

Table 1. Regional byelaws on Celtic Sea crab fisheries.

Title of Byelaw	Devon & Severn	Cornwall
Shellfish Permits	Yes	Yes
Minimum Landing Size	Yes, 160mm for males	Yes, 150mm (females), 160mm (male)
Maximum Pot Limit	Yes	No
Escape Gaps	Yes	Yes
Maximum Vessel Length	Yes - 15.24M	Yes - 16.46M
Towed Gear Restrictions	Inshore Potting Agreement Area	No
Prohibits the Use of Crab for Bait	No	No
Prohibits the Removal of Parts of Crabs	Yes	Yes

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



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