



Cancer pagurus

Homarus gammarus

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Numerous crab and lobster species are sold in the UK. They are amongst the UK's most valuable species. The most widely available edible crab species is the brown crab, *Cancer pagurus*. The velvet swimming (*Liocarcinus puber*) and spider (*Maia squinado*) crabs are also landed in the UK but there is little demand for these species in UK retail markets. Two closely-related lobster species are available in the UK – the European lobster, *Homarus gammarus*, and the imported American lobster, *Homarus americanus*.

UK fleets landed around 29,000 tonnes (t) of brown crab in 2012, valued at £38 million (1). England and Wales average 14,000 t and Scotland 13,000 t (1). The rest of the European catch is shared between France (5,000 t) and Norway (5,000 t) (2). Most of the annual UK landings of brown crab are exported live to France and Spain, but there is an increasing trend to add product value through processing for both home consumption and export.

The UK landed 3,100 t of European lobster in 2012, with a value of £30.8 million

(1). UK landings of lobsters are mostly exported live, although there is a local market for both whole live and processed product.

Total annual landings for the North American lobster fishery in 2011 were 123,798 t with around 50% landed Canada and USA respectively (3).

The purpose of this guide is to outline the status of crab and lobster stocks and describe some of the measures being taken to protect them.

BUYERS' TOP TIPS

Know your source of supply

In England and Wales crab and lobster assessments have been undertaken by the Centre for Fisheries and Aquaculture Science (CEFAS). Indicators show that most stocks are within recommended limits and efforts are being made to ensure sustainability. Many countries have concerns for increasing fishing levels, and there is widespread agreement that further precautionary measures are required to safeguard stocks.

Comply with regulations

In many cases it is easy to establish whether a crab or lobster has been landed in compliance with regulations. All crab and lobster fisheries have minimum landing size (MLS) regulations, and in some areas, the landing of soft pre- and recently moulted, egg-bearing or 'berried' crabs and lobsters is prohibited. Also, some lobsters have a V-notch clipped into the tail to indicate that they are breeding stock and should not be landed. Your supplier should be able to demonstrate that all animals supplied comply with legislation. Do not dispose of any unused stock, or parts of crabs and lobsters, in coastal waters.

Seafish Responsible Sourcing Service

This is one of a series of Responsible Sourcing Guides which can be found on the Seafish website.

For further guides and information see:

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Distribution

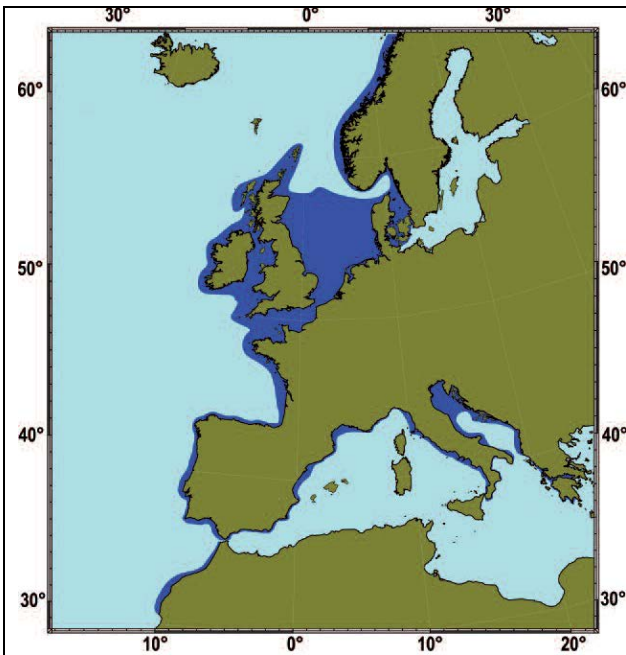
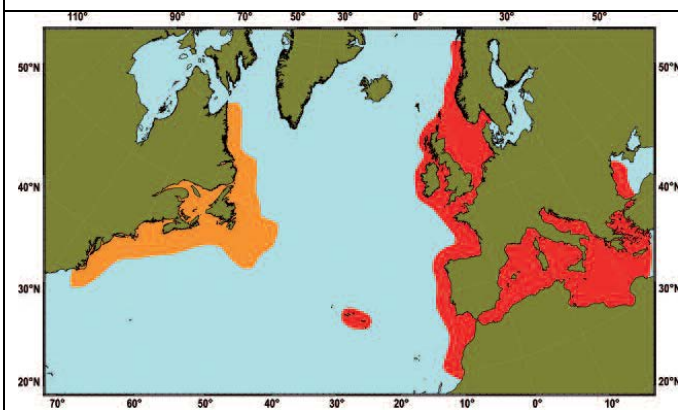


Figure 1: Distribution of fisheries for **brown crab**



Figures 2: Distribution of fisheries for **American lobster** and **European lobster**

Organisation key

ICES: The International Council for Exploration of the Sea is responsible for providing scientific advice for North East Atlantic fishery management.

EU: The European Union is responsible for fisheries management within its Exclusive Economic Zone.

SSMO: The Shetland Shellfish Management Organisation was established in 1996 to manage Shetland's shellfish fisheries (within the six mile limit).

Inshore Fisheries and Conservation Authorities (IFCAs). IFCAs were created in April 2011. They are either committees or joint committees of local authorities. They are tasked with the sustainable management of inshore sea fisheries resources in their local area.

NMFS: The National Marine Fisheries Service is responsible for the management, conservation and protection of living marine resources within United States waters.

ASMFC: Atlantic States Marine Fisheries Commission. Coordinates the conservation and management of the Eastern United States shared near-shore fishery.

DFO: Department of Fisheries and Oceans. Provides the scientific basis for conservation and sustainable economic use of Canadian fishery resources.

Management authorities

Canadian lobster stocks are assessed by the Federal Department of Fish and Oceans (DFO) and their fisheries are managed within 55 lobster fishery areas. Lobsters in USA waters are separated into Gulf of Maine, Georges Bank and Southern New England stocks and managed under seven Management Areas. Inshore stocks are assessed and managed by individual States, under the umbrella of the Atlantic States Marine Fisheries Commission (ASMFC). The offshore fisheries are managed by the Federal National Marine Fisheries Service (NMFS) under the US Atlantic Coastal Fisheries Cooperative Management Act.

Biology and assessment of crab and lobster stocks

Biology

The majority of crab and lobsters are caught in shallow coastal waters, but American lobsters can also be found in deep water, particularly in or near canyons. Both species usually live in crevices, under rocks or in burrows, from which they emerge at slack water to feed on a wide range of organisms living on the sea-bed, including other shellfish, which they crush with their powerful claws.

As they have a hard exoskeleton, crabs and lobsters are only able to grow incrementally at the time of moulting, when the entire outer shell is cast. The soft internal tissues of the emerging animal rapidly increase in volume by the absorption of water before the new exoskeleton hardens. Moulting is frequent and growth is fast during their early life. Both the frequency of moulting and the proportional increase in size decrease with age and maturity.

When moulting, crabs and lobsters are vulnerable to predation and are of poor marketable quality, but this is also the time when females mate. In due course, the eggs are extruded and attached to paddle-like appendages underneath the female's tail. Such egg-bearing females are said to be 'berried'. This occurs typically in early winter in brown crabs, and in late summer or autumn in lobsters.

Both crabs and lobsters survive discarding from pots. This means that the minimum landing size controls the effective retention size. Therefore knowing the size of maturity

means that the number of opportunities for breeding prior to retention can be estimated. In many crab and lobster fisheries this is at least once. Potentially this reduces risk of depletion; however excessive fishing can mean that the stocks are not exploited optimally.

Assessments

Assessments of brown crab and lobster stocks are based on analyses of size distribution data and trends in landings and fishing effort. This enables an index of stock abundance to be estimated, as well as the level of recruitment of young animals to the stock. A variety of mathematical models have been used (4) to assess whether local populations are being exploited optimally.

Currently there is no international assessment of either crabs or lobsters.

Assessments in England and Wales are carried out by CEFAS (5). In these scientists advise an optimum exploitation rate (fishing mortality rate or F_{MSY}) that will produce a spawning stock biomass of 35% of the virgin stock. This is considered to correspond to Maximum Sustained Yield (MSY). To avoid risk of depletion the stock should not be fished at a rate (Fishing mortality limit F_{limit}) which would result in a stock below 15% of its virgin stock biomass. In Scotland assessments are carried out by Marine Scotland (2) but only against the fishing mortality corresponding to F_{MSY} reference point; F_{limit} is not defined.

Status of Crab and Lobster stocks September 2013

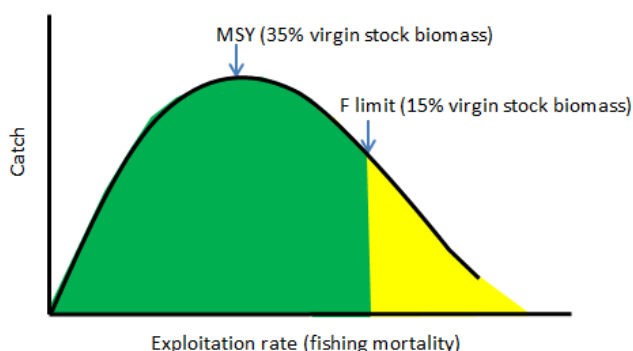


Figure 3: Schematic Maximum Sustainable Yield (MSY) curve for brown crab and lobster. MSY assumed to be achieved when the exploitation rate (fishing mortality) corresponds to a stock level of 35% of the virgin spawning stock biomass. CEFAS advise a maximum exploitation rate (F limit) corresponding to 15% of the virgin spawning stock biomass.

In England and Wales, six stock units have been described for brown crab. Each stock unit is based upon what is known of the species' local biology and fishery. However, brown crabs may exhibit wide-ranging migrations, and the ICES Crab Working Group is working towards international assessments and management advice for this species (2).

In 2010 the Group (2) has designed a standard reporting format with all relevant fisheries statistics, and assessments for all crab species exploited in the ICES region. These standard formats took the form of: a map of agreed assessment units for each species; a data table describing available fisheries indicators; assessment methodology and the status of the stock.

Assessment of lobster stocks

Lobster stocks are mostly coastal, with restricted movements once they have settled on the seabed, and they can be assessed and managed on a national basis.

European lobster: There is no assessment of stocks by ICES in the North East Atlantic. Recent assessments by CEFAS suggest that the status of the five lobster stocks in English and Welsh coastal waters is mixed.

North American lobster: There are three stocks of lobster in U.S. waters - Gulf of Maine, Georges Bank, and southern New England. Generally, the Atlantic States Marine Fisheries Commission assesses the lobster stocks every 2 to 5 years. Results of stock assessments help the Commission's lobster management board make decisions on management measures that may be needed to address problems with the lobster resource. The management board looks to industry advisors to provide recommendations for managing the fishery to meet management objectives.

The American lobster's range is divided into seven areas for management purposes. There are seven Lobster Conservation Management Teams for each of these management areas. These teams, made up of industry representatives, recommend measures to address the specific needs of their respective management areas.

The most up to date assessments are summarised in Table 1 for crabs and Table 2 for lobsters.

Table 1 Crab stocks. See figure 4.

Stock/ fisheries unit	Landings 2011 (t) (from 2)	Scientific Advice and Management
Inside safe biological limits		
Western English Channel	4576 (England and Wales)	2011 Fishing mortality and spawning stock biomass have been inside safe biological limits for the past 3-4 years, appear stable, and around levels that produce MSY. Landings have remained constant for the past 5-years. There are multiple spawning opportunities before legal removal. Management measures include minimum landing sizes, restrictions on vessel length, permit schemes, escape gaps in traps, and towed gear restrictions (5).
Celtic Sea	2074 (England and Wales)	2011 Fishing mortality and spawning stock biomass have been inside safe biological limits for the past 3-4 years and appear stable, though above the level that will produce MSY. Landings are at an all-time high. Crabs will have 1-2 spawning opportunities before legal removal. Other management measures include restrictions on vessel length, permit schemes, and trap escape gaps (5).
Eastern English Channel	384 (England and Wales)	2011 Fishing mortality and spawning stock biomass are within recommended limits. However exploitation of females in 2011 was approaching the limit. Landings have stayed at roughly the same level since 1999. Crabs will have 1-2 spawning opportunities before legal removal. Other management measures include restrictions on vessel length, permit schemes, and trap escape gaps (5).
Around recommended maximum exploitation rate (F limit)		
Southern North Sea	1999 (England and Wales)	2011 Fishing mortality is above the maximum recommended level for females. The spawning stock biomass is currently unknown due to changes in recording. Crabs will have some spawning opportunity before legal removal. Management measures include restrictions on vessel length, permit schemes, trap escape gaps, and towed gear restrictions (5).
Central North Sea	1993 (England and Wales)	2011 Fishing mortality is high, with an increasing trend for males but still within the recommended limit. The spawning stock biomass is around the minimum limit. Crabs will have some spawning opportunity before legal removal. Other management measures include restrictions on vessel length, permit schemes, and towed gear restrictions (5).
MSY defined, but recommended maximum exploitation rate (F limit) not defined		
Scotland, Hebrides and Sule,	~12,000	2008 fishing mortality is approximately at that corresponding with MSY (2)
Scotland; Clyde, South Minch		2008 fishing mortality was estimated to be significantly above that corresponding with MSY for both males and females in and Southeast (2).
Orkney, North Coast and East Coast		2008 the fishing mortality for female stocks is close to MSY while males are being fished above MSY (2).

Table 2 Lobster stocks. See figure 5.

Stock/ fisheries unit	Landings 2011 (t) (from 5)	Scientific Advice and Management
Inside Safe biological limits		
Southwest England	~250 (England and Wales)	2011 Fishing mortality and spawning stock biomass have been inside safe biological limits for the past 3-4 years. Whilst exploitation rate is close to that associated with MSY, SSB is below optimum and declining. Most individuals have one spawning opportunity before they are legally removed. The minimum landing size for lobster in the SW is 90mm, not the 87mm used elsewhere in the UK. Other management measures include restrictions on vessel length within 6nm, permit schemes, and escape gaps in traps (5).
Gulf of Maine and Georges Bank	68,000 tonnes (2010)	Stocks are exploited close to MSY and have a healthy spawning stock biomass (3).
Around recommended limits		
Southeast and south coast	~225 (England and Wales)	2011 Fishing mortality and spawning stock biomass are around the recommended limit, and remained roughly constant for 3-4 years. Landings have remained constant for the past six years. There is some spawning opportunity before legal removal. Other management measures include vessel length restrictions, a maximum pot limit (Sussex IFCA), and escape gaps.
Yorkshire and Humber	~800 (England and Wales)	2011 Fishing mortality and spawning stock biomass are beyond the recommended limits but stable. Landings are at an all-time high. Most individuals have a spawning opportunity before legal removal. NE IFCA employ a permit scheme.
Northumberland and Durham	~250 (England and Wales)	2011 Fishing mortality and spawning stock biomass are beyond the the recommended limits. Landings are at an all-time high. Most individuals have a spawning opportunity before legal removal. Northumberland IFCA employ a maximum pot limit per vessel and permit scheme.
Southern New England		2011 Biomass is at a low level, but exploitation is at a rate which is sustainable due to low fishing opportunities (3).
Exploitation rate and stock size unknown		
East Anglia	~70 (England and Wales)	2011 Exploitation and stock size are currently unknown. In previous years both were above recommended limits but showing a positive trend towards recovery. Landings have fluctuated widely over the past 10 years. Most individuals have a spawning opportunity before legal removal. Other management measures include vessel length restrictions, permit schemes, and escape gaps.
Scotland		2006- 2008 In Scotland, overall, assessments for the period 2006-2008 show that most lobster assessment units were fished close to, or above, the optimum level (6).
Canada	66,500 (2011)	2013 ; Stocks do not appear to have been assessed for 6 years although generally considered to be stable. A range of management measures in place (7).

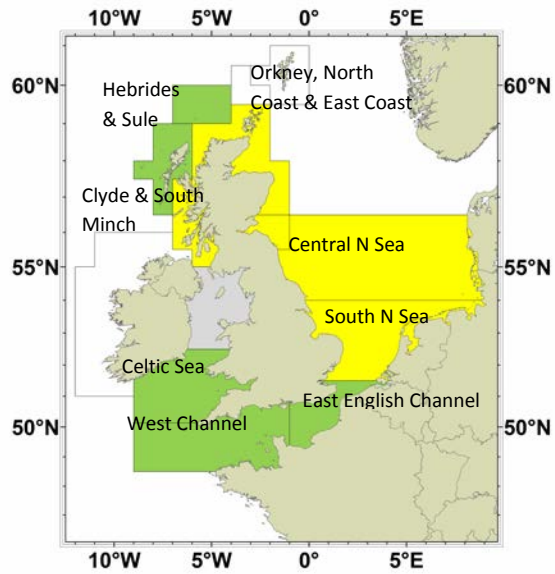


Figure 4: Status of UK brown crab stocks.

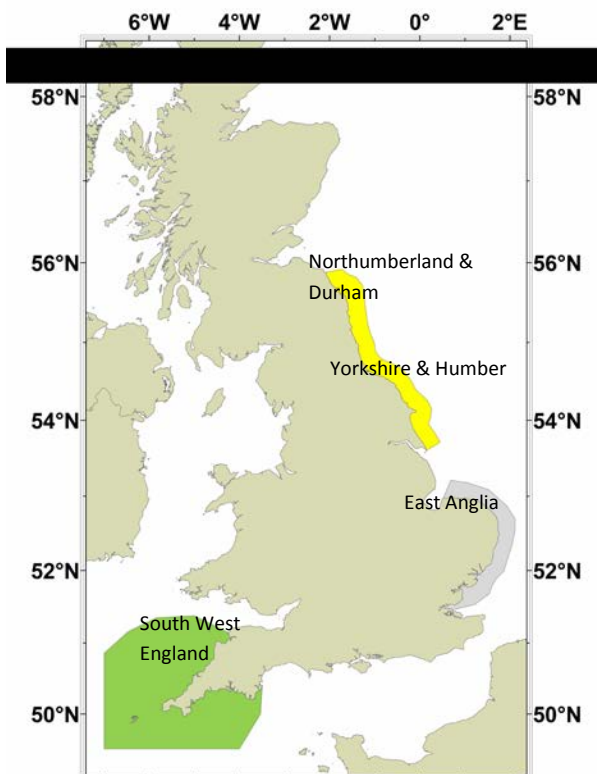


Figure 5: Status of lobster stocks in England.

Fishing gear and methods

Most crabs and lobsters are captured in baited pots (also known as traps or creels), but they can also be taken in trawls and static nets such as gill nets or tangle nets. Pots are either top opening (inkwell pot) or side-opening with a retaining chamber (parlour pot). In European waters, pots are fished individually or in strings (fleets) of up to 100 pots, at each end of which is an anchor and buoy. The total number of pots used is determined by boat size, the number of crew and the fishing ground. Fishing with pots is considered to be a sustainable fishing method for two reasons. First, there is a behavioural buffer against overexploitation, because capture relies on crabs and lobsters being attracted to the pot only when they are feeding. Second, fishing with pots has very little effect on the seabed or other organisms in the fishing area (8).

The main fishing season for crabs is from May to December, peaking in the autumn when mainly mature females are targeted. Potting for lobsters tends to be a localised activity and may occur throughout the year, but fishing is concentrated from April to October, particularly in inshore waters, when the water temperature is high enough to stimulate feeding activity. The largest vessels in the crab fleet are nomadic, working wherever the fishing is best, and they are fitted with vivier tanks for storing crabs live.

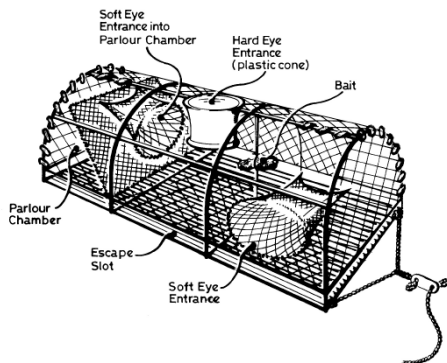


Figure 6: Parlour pots for crabs and lobsters; these are typically 0.8 – 1.0 metres long.

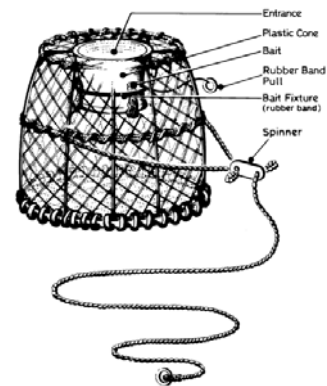


Figure 7: Traditional inkwell; these are typically 0.6 – 0.8 metres long.

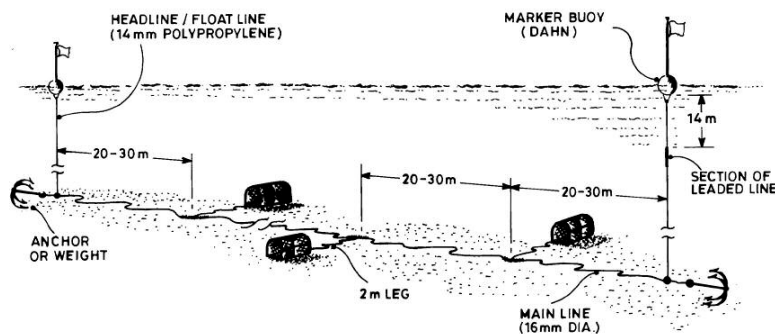


Figure 8: Typical gear configurations; the length of a 'string' of pots would vary according to environmental conditions.

Management and conservation measures

Crab and lobster stocks are managed primarily through fishing effort limitation and technical conservation measures. Generally, they are not managed through Total Allowable Catch (TAC) or quota allocation, except for the offshore canyon fisheries for American lobster.

In Europe, crabs and lobsters are managed at EU, national, regional, and local level. For both species, the key technical measure is the minimum landing size (MLS), designed to ensure animals are allowed to grow to maturity to sustain breeding stocks. This is a particularly effective way to manage crab and lobster fisheries, as undersized animals returned to sea from pots suffer very low mortality rates (mortality rates are probably higher in trawl and net fisheries).

Licensing

UK pot fisheries for crabs and lobsters are controlled through a shellfish licensing scheme, which restricts entry of new vessels to the fishery, and requires returns of catch and fishing effort information. Local or regional management measures are enforced through IFCA (8) bye-laws that apply out to the 6 mile fishery limit around England and Wales; these are described in Figure 10. There are analogous local management bodies in Scotland, such as the Shetland Shellfish Management Organisation (9). However, most Scottish and Northern Irish crab and lobster fisheries are regulated by the Devolved Governments and EU legislation.

In addition to licensing and MLS regulations, EU (10) or national legislation on crabs, includes bans on landing berried females and soft pre-moult or recently moulted crabs. In certain areas, crabs are taken as by-catch in static gear, such as gill nets. It is difficult to remove them whole from the nets so they are often de-clawed and only claws retained. This is regulated by EU legislation and local bye-laws.

Technical measures for crabs

The MLS for crabs (Figure 9) varies around the UK coast because of regional variations in growth rate, size at first maturity and marketing practices.

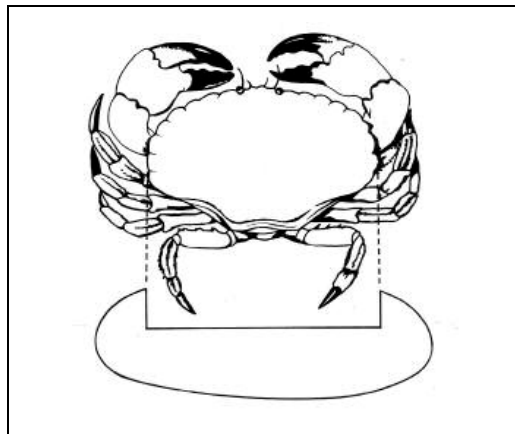


Figure 9: Crabs measured across the widest part of the carapace or shell.

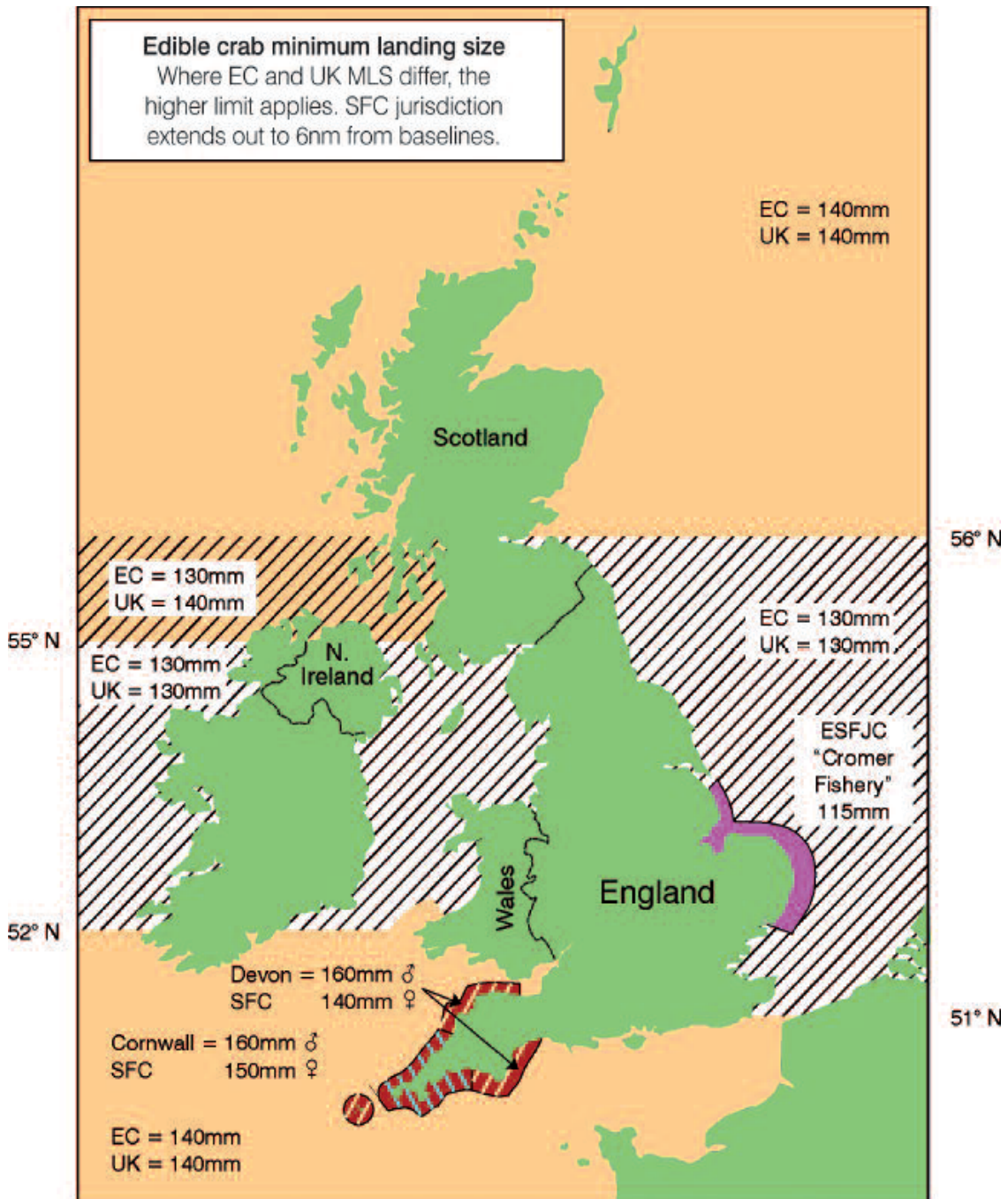


Figure 10: Variable MLS regulations for brown crab; note that Sea Fisheries Committees (SFCs) have been superseded by Inshore Fisheries and Conservation Authorities (IFCAs).

Technical measures for lobsters

Prohibiting the landing of V-notched lobsters and enforcing the MLS are very effective conservation measures for lobsters. They allow breeding stock, or animals smaller than a certain size, to be returned alive to the sea.

For UK lobster fisheries, national management measures (11) prevent the landing of V-notched lobsters. Local legislation (within the 6 mile limit (8) may include: protection of berried (egg-bearing) females; prohibition on landing soft lobsters or parts of lobsters; restriction on the size of vessel; limits on the number of pots per vessel; escape gaps in pots to allow undersized animals to escape; closed areas; closed seasons; marking of gear and a higher MLS of 90mm compared with

87 mm (EU minimum) carapace length.

EU minimum landing size regulations of 87 mm carapace length apply for all UK coasts, and within England and Wales. However, some IFCA's (8) have introduced local bye-laws. This has resulted in South Wales, Devon, Cornwall and the Isles of Scilly setting an MLS of 90mm carapace length (Figure 8) within the 6 mile fishery limit.

Canada and the USA

The lobster fishery in Canada and the USA has a wide range of management measures, which vary across fishing regions and are generally more restrictive than management measures in the European lobster fisheries. Regulations include: limits on pot numbers per vessel;

limited entry of vessels into the fishery; minimum and maximum landing sizes; prohibition on the landing of berried and V-notched females; closed seasons and areas; and escape gaps and devices to prevent 'ghost fishing' if pots are lost.

New management measures have been introduced for the lobster fishery in the USA in 2009 including: changes to the lobster maximum carapace (shell) length restrictions; a requirement for all federal lobster dealers to submit weekly electronic reports for all lobster they purchase from vessel owners with federal permits; and a change to the v-notch definition applicable to several lobster conservation management areas (5).

V-notching

Because egg-bearing or berried lobsters are not present all year round it is not always possible to distinguish breeding stock. Therefore, programmes are undertaken whereby the tails of breeding lobsters (mostly females, but sometimes males) are notched with a V-mark by the fishermen or IFCA officers (8) and released (Figure 11). Some IFCA also prohibit the landing of berried lobsters from within their fishery districts (inside the 6-mile limit). This means you can always verify whether crabs and lobsters are landed legally by measurement and visual appearance. Note the legislation also forbids tampering with a V-notched lobster's tail to remove the notch. If you have any doubts speak to your supplier.

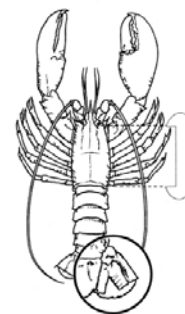


Figure 11: Measuring a V-notched lobster from behind eye socket to rear of carapace.

Management and conservation measures contd

Though European crab and lobster stocks are generally considered to be harvested sustainably, there are some management concerns:

Uncertainties about stock structure

For both crabs and lobsters, assessments are carried out on stock units defined by fishery characteristics and practicalities of management, not by biologically defined stock boundaries. The management of biological stocks or populations would require international co-operation. For example, crabs in the western English Channel seem to share many characteristics with crabs from the Bay of Biscay, and it is probable that Irish Sea crabs have more in common with those on the Malin Shelf (SW Scotland), and to the west of Scotland, than with crabs found in the Celtic Sea. Previous research to identify major crab spawning grounds, and the possible existence of separate crab populations in different areas (12-14), is being extended by investigating the genetic structure of the crab stocks in

UK waters and around Ireland, France and Scandinavia (15). A four year crab-tagging programme to determine growth and distribution in the English Channel commenced in October 2007.

Inaccurate landings and effort data

In the past, assessments of crab and lobster stocks have been compromised by a lack of data on landings and fishing effort; in particular, the number of pot hauls carried out on each fishing trip. Since 1 January 2000, vessels over 10m in length have had to complete EU log books documenting catch and fishing effort in the pot fishery. This requirement was extended to vessels under 10m in 2006. Improved fishery data should enable the UK to carry out better crab and lobster assessments in future.

Size-based assessments

Crab and lobster assessments in Europe are currently based on size-based data. Although age can be determined by measuring the accumulation of certain pigments (16, 17), it is not yet possible to carry out

fast, routine ageing of samples to provide data for use in age-based assessment methods. This would enable the growth and harvesting (fishing mortality) rates to be estimated more accurately.

Additional management measures

Measures that conserve young animals or breeding stock, such as a MLS or V-notching, need to be complemented by controls on fishing effort, such as limiting the number of pot-days, otherwise there is a risk that the stock will become overfished. The current UK licensing scheme restricts entry of new vessels into the UK crab fishery, but it does not restrict the numbers of days or the number of pots that each vessel may fish. Agreement needs to be reached as to how this may be achieved. In the UK lobster fishery, there is general consensus that further national measures to safeguard the spawning stock would be beneficial, possibly by introducing a maximum landing size or increasing the current minimum landing size.

Product characteristics (for handling see 18, 19, 20)

Crabs can be sold cooked whole or as processed products. 'Dressed crab' generally uses picked meat from larger crabs, repacked into smaller shells. Because of the high minimum landing sizes in force, there is a shortage of suitable small brown crab shells. Some producers have resorted to filling shells from other crab species with brown crab meat, which has led to enquiries from customers about provenance.

Brown meat from crabs also contains relatively high levels of cadmium compared to other foodstuffs. A recent report by the Food Standards Agency found that consumption of some brown crabmeat products would result in the recommended weekly intake of cadmium for adults being exceeded. However the FSA concluded that an occasional exceedence of this limit would not cause concern (21).

European and American lobsters are usually sold whole and alive. The colour of live European lobsters ranges from powder blue to midnight blue-black, and they tend to have elongated claws that are white along their serrated edges. The American lobster is generally a muddy brown or green colour, and has more rounded claws tinged with red along the cutting and crushing serrations. It is important to source American lobsters from an authorised supplier. They can carry a disease, called *Gaffkaemia*, which can cause rapid death among European lobsters but is not harmful to humans. *Gaffkaemia*-type organisms are present, but not prevalent, in European waters, and there are strict regulations that apply to storing American lobsters in tanks in the UK to prevent disease spread.

Supply chain standards

Responsible practice in the chilled and frozen supply chain depends on correct catching, gutting, washing, chilling or freezing, processing and handling practices throughout the chain. There are standards which cover these aspects from capture to retailer:

- **Seafish Responsible Fishing Scheme.** Sets best practice standards for fishing vessels, based on British Standards Institution specifications (BSi: PAS 72:2006); and
- **British Retail Consortium (BRC) Global Standard & Safe & Local Supplier Approval (SALSA) certification.** Designed to raise standards in the seafood processing and wholesaling sectors.

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