



The Good Practice Guide to Handling and Storing Live Crustacea

Research and Development, Seafish
Author: Marcus Jacklin, Jason Combes



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The Good Practice Guide to Handling and Storing Live Crustacea

Summary

Seafish has an ongoing programme to produce good manufacturing practice guidelines (GMP) for the fishing and related industries.

These GMP guidelines have been produced for commercial operatives engaged in handling and storing live crustacea within the United Kingdom. They aim to help businesses achieve high standards of operation by encouraging practices that ensure product safety, product quality, and efficient use of resources. The advice has been produced in collaboration with the industry and appropriate regulators.

The guidelines are relevant to sectors that handle live crustacea from capture to the point of dispatch (primary producers). They cover activities aboard vessels, at live holding premises ashore and during 'vivier' transportation.

The use of this guide by fishermen is voluntary and it does not have legal status. The guide describes relevant legal requirements and some interpretation may be included; however, they do not absolve the Trade from the law.

The information in it will help fishermen meet their legal obligations, and ensure the safety of the fish they land. The advice is for guidance and information purposes only; the document is not intended to be used as a formal training manual.

This project has been part financed by EU FIFG (Financial Instrument for Fisheries Guidance) delivered through the Scottish Executive and administered by Seafood Scotland.

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1. Introduction

1.1 Background

Seafish has an ongoing programme to produce good manufacturing practice (GMP) guidelines for the fishing and related industries.

These GMP guidelines have been produced for commercial operatives engaged in handling and storing live crustacea within the United Kingdom. They aim to help businesses achieve high standards of operation by encouraging practices that ensure product safety, product quality, and efficient use of resources. The advice has been produced in collaboration with the industry and appropriate regulators.

The guidelines are relevant to sectors that handle live crustacea from capture to the point of dispatch (primary producers). They cover activities aboard vessels, at live holding premises ashore and during 'vivier' transportation.

The information will help fishermen meet their legal obligations, and ensure the safety of the fish they land. The advice is for guidance and information purposes only; the document is not intended to be used as a formal training manual.

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External Industry Working Group

This guide has been developed by the following group of stakeholders:

- Libby Woodhatch, Seafood Scotland
- Clive Askew Shellfish Association Great Britain
- Chris Venmore Seafish board member and Chairman of Seafish Shellfish Advisory Committee
- Matthew Harvey Shoreside holding operator, (W. Harvey and Sons)
- Chris Leftwich Fishmongers' Company
- Dick James Northern Ireland Fish Producers Organisation
- Trevor Bartlett National Federation Fishermen Organisation and commercial fisherman and processor,
- Mike Glavin Food Standards Agency

1.2 The need for GMP guides

The purpose of GMP guides is to help businesses achieve high standards of operation. From the perspective of the businesses, this includes the need to meet commercial requirements for product quality and efficiency of operation, as well as ensuring food safety and meeting other legal requirements (for product labelling and waste disposal, etc). These various aspects of good practice combine in the operation of each business. All businesses can benefit from such guides but they have particular value for small businesses, which have limited technical resources of their own to call upon. The guides have further value as a basis for training and quality assurance schemes.

The recent EU concerted action on fish quality monitoring and labelling recognised that the changing nature of trade within the seafood industry is increasing the commercial need for GMP standards. Seafood distribution chains are long and often international, with an increasing amount of remote buying. The branded product suppliers and multiple retailers of the corporate food industry now have a firm grip on the retail market. GMP is required of all the businesses in the supply chains in order to assure product standards.

The current review and consolidation of EU food hygiene legislation has recognised the need for approved guides to good hygiene practice to aid compliance with food law, particularly in relation to the responsibility the legislation will place on food businesses to identify and control any risks to food safety. The new Regulation on The Hygiene of Foodstuffs stipulates that Member States should encourage the development of such guides by business sectors, and it provides for their use in support of the law. The Regulation extends this general requirement to all foods and all sectors.

To best achieve their purpose, GMP guides should be developed jointly by industry and the relevant authorities, and be tailored to the particular needs and ways of operation of the business sector to which they are addressed. Business operators are more likely to engage with such documents if they are brief, are written in terms that they can relate to, and are directly relevant to their business. By targeting particular sectors, such documents can deal with the specifics of that type of business rather than expressing generalities. This is particularly important for the seafood industry in which specialised sectors handle different types of fish and shellfish (live bivalve molluscs, chilled or frozen finfish and live crustacea, etc) each with very different quality and food safety requirements and ways of operation.

The Regulation on the Hygiene of Foodstuffs provides for national guides to good hygiene practice and for Community guides if required. There are no requirements for HACCP (Hazard Analysis and Critical Control Point) for live shellfish but there is a need for legally recognised industry GMP guidelines instead. Such guides should include appropriate information on hazards that may arise in primary production and associated operations, and actions to control them. The Regulation is specific that Member States should encourage the development of national guides, and their dissemination and use, although their use by food business operators remains voluntary. National guides should be developed by food business sectors in consultation with other interested parties, have regard to Codex Alimentarius and to the law. Particular requirements are set out for the content of guides concerning primary production to compensate for businesses in primary production not having to apply HACCP. The Food Standards Agency in the UK will review the national guides to ensure that they comply with these requirements and are practical and suitable as guides to compliance for the sectors and foodstuffs covered.

From an industry perspective, such guides will be of general benefit in helping businesses comply with food law and in establishing a common approach that should satisfy the food authorities throughout the UK. There will be particular benefit to the many small and low risk businesses in the seafood industry in helping them meet the needs for hazard identification and control without resorting to an

inappropriate level of HACCP procedures. The application of GMP is the most effective way of ensuring food safety in many of these businesses.

Ensuring food safety is fundamental but Seafish can also account for the broader industry needs and benefits of establishing GMP standards. We are uniquely positioned to carry this forward with the seafood industry and indeed our existing consultative approach to the development of sectoral GMP guides is broadly compliant with the new legal requirements.

With the reduction in some white fish fisheries and over supply in some traditional shellfish markets, live crustacea is becoming an increasingly important sector supplying high value export markets in southern Europe. Although of relatively low risk (to human rather than animal health) it is a specialised and largely separate sector, in which the issues of live handling pass through the supply chain. The premium prices that can be realised by live crustacea have an associated risk; high mortality levels have no financial return at all.

1.3 Purpose, scope and remit

The purpose of the guidance is to provide GMP advice for the handling of live crustacean shellfish (crabs, lobsters, and shrimps). The purpose of GMP is to advise those involved with handling live crustacea in order to encourage practices that ensure product quality and efficient use of resources.

The remit was to focus on sectors that handle live crustacea from capture to the point of dispatch; this includes the retail and catering sector because they are considered to be 'retailers' by Europe. It was beyond the scope of the project to include aspects for the fish and food regulators (Food Standards Agency (FSA), Scottish Fish Protection Agency (SFPA), Environmental Health Officer (EHO) and Sea Fisheries Committees (SFC); however, these guidelines will be of interest to them.

These guides describe relevant legal requirements and some interpretation may be included, but this document does not have legal status and does not absolve the Trade from the law.

1.4 Structure of the guidance

Guidance within this document is laid out in discreet sections that describe different aspects of commercial operations.

Section 2 deals with legislation. It will help fishermen, food businesses and others to comply with existing laws, and it will also help them to improve the quality of their live product.

Section 3 provides broad general guidance on good handling practices for handling and storing live animals. This guidance can be applied to all crustacean species and will help to keep them in good condition. This section also contains data sheets that provide a summary of the general guidance on good handling practices, and describe the 'ten golden rules' that you should follow when handling live animals.

Section 4 provides detailed information about each particular species – this is called 'specific guidance'. In order to look after a particular species, eg lobster, as well as possible you should read **all** the advice in the general section **as well as** the advice about lobster provided in the specialist section.

Section 5 describes sources of additional information and section 6 provides information about identifying and controlling food hazards.

2. Legislation

2.1 Introduction to Legislation for Handling Live Crustacea Commercially within the UK

The information in this section has been produced to help commercial operators who handle live crustacea within UK. It will help fishermen, food businesses and others to comply with existing laws, and it will help them to improve the quality of their live product.

All UK countries (England, Scotland, Wales, and Northern Ireland) have to implement EU directives and have to interpret and implement EU regulations. In addition, they can create and enforce their own national legislation.

Commercial handling of live crustacea within the UK; however, is regulated relatively lightly, and the legislation deals broadly with (1) food safety, (2) animal health and welfare and (3) fisheries management.

- (1) In terms of food safety, live crustacea is generally considered a low risk product; however, standards of food safety and food hygiene are important to ensure public confidence and satisfy relevant sections of food law.
- (2) In a similar way, you need to know about Animal health and welfare legislation because it aims to prevent risk to animal health, and ensure that animals are kept in the best conditions.
- (3) Parts of fishery management legislation are important because they restrict the size and breeding condition (females with eggs) of some animals that are landed and transported alive.

Within the UK, food safety is administered by the Food Standards Agency (FSA). Laws on Animal health and welfare within England and Wales are managed by the Department for The Environment Food and Rural Affairs (DEFRA), by the Scottish Executive Marine Directorate (SEMD) in Scotland and by the Department of Agriculture and Rural Development Northern Ireland (DARDNI). Fisheries management in England and Wales is administered mainly by DEFRA and the Sea Fisheries Committees (SFCs), by DARDNI in Northern Ireland, and by SEMD in Scotland.

Scope

The information tells you about the legal responsibilities of owners/skippers, provides guidance for the design of vessels, premises and equipment, and on working practices. It covers activities aboard vessels, at shore based live holding premises and during 'vivier transportation'. The information is meant to guide you what to do and is not meant to be used for training purposes.

2.2 Summary of Legal Requirements

The legal requirements that apply to the operation of a fishing vessel, a shore based commercial premises and vehicular transportation that handle live crustacea cover

basic issues of food safety, animal health and welfare, fish marketing, and health and safety. Most of these meet requirements set by the European Union. It is the interpretation of these regulations and procedures of best practice, which are the focus of this guide.

2.2.1 Food safety and food hygiene

EC Regulation No. 178/2002 extends food law throughout the food chain from primary production to retailing, including transport, and is the principle element of food law. Fishing is included in primary production. Like the Food Safety Act 1990, it requires that food shall not be unsafe or be misleadingly presented and places the responsibility on food business operators to ensure that their businesses comply with food law. It also requires that traceability be established at all stages of the food chain and that food business operators withdraw or recall food that does not comply with food law.

EC Regulation No. 852/2004 on the hygiene of foodstuffs is scheduled to be implemented in 2006, will establish basic hygiene rules for all food businesses, and includes a specific set of hygiene rules for primary production that includes training requirements. The general rules include the registration of food businesses and the implementation of safety controls based on HACCP principles by food business operators, although HACCP is not required for primary production. It encourages the development and use of officially approved guides to good practice, particularly for primary production.

EC Regulation No. 853/2004 establishes additional, more detailed sets of hygiene rules for specific foods including fishery products. It has replaced the UK Food Safety (Fishery Products and Live Shellfish) (Hygiene) Regulations 1998. It includes primary production through to, but generally not including retail.

The Food Safety Act 1990 is national Act that is the primary Act of Food Safety legislation. It establishes the essential principles of food safety, gives powers to the Food Authorities to enforce food safety, and provides a means of enacting subsidiary Regulations on more detailed aspects of food safety.

Commission Regulation No. 2065/2001/EC provides detailed rules for application of Council Regulation (EC) 104/2000. It specifies wording of labels and that the production method and catch area shall be available at every stage in the production chain.

The European Union adopted Regulation 1774/2002 of the European Parliament and the Council laying down health rules concerning animal by-products not intended for human consumption in May 2003 and is enforced in England by the Animal By-products Regulations 2003 (ABPR).

The aim of the legislation is to prevent any risks to public or animal health from animal by-products by controlling the collection, transport, storage, handling, processing and use or disposal of animal by-products.

2.2.2 Animal Health

Lobsters (Control of Importation/Control of Deposit) Order 1981 SI 1985 Nos. 995 and 994 restricts the ability to deposit American or European lobsters in sea areas (defined) that they were not caught in. Licensed exceptions permitted.

The Lobsters (Control and Deposit) Order 1981 SI 1981 No. 994 states that all deposits of lobsters (alive or dead) in coastal zones of Britain must be licensed.

Water Industry Act 1991 describes disposal options for trade effluent. All waste liquids from shore premises are classed as 'Trade Effluent'.

The groundwater Regulations 1998 controls discharge of trade effluent to surface waters or ground waters.

2.2.3 Animal Welfare

The Welfare of Animals Transport Order 1997 SI 1997 No. 1480 states in the general provisions that no person shall transport an animal in any way, which causes or is likely to cause injury or unnecessary suffering. Any person carrying cold-blooded animals shall do so in accordance with Schedule 6, which states that, "cold-blooded animals shall be transported in such receptacles or means of transport, under such conditions (in particular with regard to space, ventilation, temperature and security) and with such a supply of oxygen and liquid as are appropriate for the species concerned".

Transport by air

This is referred to in the Order, and states that air transport requires to comply with standards set by International Air Transport Association (IATA). These are published by the IATA, 2000 Peel Street, Montreal, Canada H3A 2R4.

2.3 Structure of Guidance

Information within sub-sections 2.3.1, 2.3.2 and 2.3.3 are laid out in a three-column format:-

- The first or left hand column describes the current legal requirement. The title of the legislation is given, but usually the actual wording of the legislation appears under a title's sub heading, e.g. 'Part' or 'Schedule' or 'Article' or paragraph number.

- The second or middle column provides an interpretation of the legal requirement. This says what commercial operators who handle live shellfish must do to comply with the law.
- The third or right-hand column gives advice on good or best practice, which if undertaken will exceed the minimum requirement of the law.

To make it easier for you to understand what the laws mean to individual operators, information is arranged into three commercial categories: vessels, shore and transportation.

To use this guide, look at the appropriate 'commercial category' you require information on. If you require an interpretation of the law, look at the middle column. If you require advice on best practice look at the right hand column.

For example: 'Vessel' category

Legislation	Interpretation	Guidance
The Food Safety Act	This legislation means that ...	You must ...

Please note that this information is not a definitive interpretation of the law – only the courts can provide this. It is the responsibility of individual businesses to ensure that they comply with the legislation, which is subject to constant review and change.

For a current interpretation of the legislation in your region, you will need to contact your Regional Authorities. The main ones are:

i) England and Wales:

The Food Standards Agency (FSA)
 Sea Fisheries Committees (SFC)
 Dept. for Environment, Food and Rural Affairs (DEFRA) Fisheries Directorate

ii) Scotland:

The Food Standards Agency (FSA)
 Scottish Executive Marine Directorate (SEMD)

iii) Northern Ireland:

The Food Standards Agency (FSA)
 Department of Agriculture and Rural Development Northern Ireland (DARDNI)

2.3.1 Vessels

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
EC Regulation No.178/2002 enforced by General Food Regulations 2004	EC Regulation No 178/2002 replaces the food safety requirements found in the Food Safety Act 1990. It also introduces traceability and product recall. This regulation applies to all food handlers, including vessels that handle food.	Vessel operators must comply with the articles detailed below. More information on traceability is provided in the Appendix II .
Article 14 Food safety requirements Article 14.1 Food shall not be placed on the market if it is unsafe. Article 14.2 Food shall be deemed to be unsafe if it is considered to be: (a) injurious to health; (b) unfit for human consumption. Article 14.3 In determining whether any food is unsafe, regard shall be had: (a) to the normal condition of use of the food by the consumer and at each stage of production, processing and distribution, and	When considering health risks posed by live crustacea allowances can be made for intended processing that would remove the risk.	Vessel owners and skippers are required to train and supervise crewmen to comply with legal requirements. It is also the responsibility of all employees (including share-fishermen) to follow instructions in order to avoid personal liability. Do not do anything to your catch, which could make it dangerous to eat. Skippers and crew must not contaminate live crustacea, e.g. from diesel fuel, bilge waters, and chemicals. Cover the catch to protect from seagull waste. Switch off vivier pumps before entering harbour. Turn on vivier air pumps if not already on. Do not use deckhose on catch when in or near to harbours. Ensure seawater intakes are not near any waste outlets from vessel. Keep up to date with information about health risks that are not removed by intended processing, such as cooking.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
EC Regulation No.178/2002 enforced by General Food Regulations 2004	EC Regulation No 178/2002 replaces the food safety requirements found in the Food Safety Act 1990. It also introduces traceability and product recall. This regulation applies to all food handlers, including vessels that handle food.	Vessel operators must comply with the articles detailed below. More information on traceability is provided in the Appendix II .
(b) to the information provided to the consumer, including information on the label, or other information generally available to the consumer concerning the avoidance of specific adverse health effects from a particular food or category of foods. Article 14.4 In determining whether any food is injurious to health, regard shall be had: (a) not only to the probable immediate and/or short- term and /or long-term effects of the food on the health of the person consuming it, but also on subsequent generations; (b) to the probable cumulative toxic effects.	Live crustacea would not be considered unsafe if the consumer is provided with information on how to make it safe. Information about risks of which the consumer should already be aware do not have to be included. Live crustacea may be considered unsafe if they contain contaminants that may be harmful if consumed over a long period of time, or have long term effects.	Vessel operators need to become familiar with available information concerning health risks associated with live crustacea. Keep up to date with information about contaminants in live crustacea that may be harmful if consumed over a long period of time, or have long term effects. Be aware of health warnings about harvesting restrictions.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Article 18 Traceability The traceability of food shall be established at all stages of production.	This law enables dangerous or contaminated foods to be recalled out of the food chain. This requires food businesses to keep records showing who supplied them with any food products and those businesses to whom they supply food products. These records must be available to authorities if needed.	You must keep clear records that show when and to whom you supply live crustacea, and be able to identify anyone else that had live crustacea from the same batch. These records must be available to food authorities if needed.
Article 19 Responsibilities for food: food business operators If a food business operator considers or has reason to believe that a food...is not in compliance with the food safety requirements, it shall immediately initiate procedures to withdraw the food and inform the competent authorities there-of .	Food businesses must recall, and/or withdraw food from the market if it does not comply with food safety requirements, and to notify relevant authorities.	You must keep records for a sufficient time to allow live crustacea to be recalled if a food safety problem is identified after sale. An appropriate time would be 3 months. If it is not possible to recall all affected live crustacea, the local food authority must be informed of the problem.
EC Regulation No. 852/2004	This Regulation contains the basic rules for the hygiene of foodstuffs. The regulation applies to food businesses throughout the food chain, including vessels that handle food.	
Article 1.1 This Regulation lays down general rules for food business operators on the hygiene of foodstuffs, taking particular account of the following principles: (a) primary responsibility for food safety rests with the food business operator; (b) it is necessary to ensure food safety throughout the food chain, starting with primary production.	EC Regulation 852/2004 applies to vessel operators that handle live crustacea since it applies to all food handlers throughout the food chain including primary production. Each business operator in the supply chain is responsible for producing safe food. This includes fishermen, transporters and wholesalers.	Vessel operators that handle live crustacea must comply with relevant articles detailed below if they land more than 25 tonnes of fishery product in any calendar year.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Article 1.2(c) This Regulation shall not apply to the direct supply, by the producer, of small quantities of primary products to the final consumer or to local retail establishments directly supplying the final consumer;	The regulation does not apply to fishermen supplying small quantities to the final consumer or to local businesses who will supply the final consumer. Local businesses are those in the same or neighbouring counties. A small quantity is up to 25 tonnes of fishery products in any calendar year.	Vessel operators do not need to comply with Regulation 852/2004 if they land less than 25 tonnes of fishery product in any calendar year. However, there is still a legal requirement to ensure that food is safe.
Article 3 Food business operators shall ensure that all stages of production, processing and distribution of food under their control satisfy the relevant hygiene requirements laid down in this Regulation.	The person responsible for the business is responsible for ensuring that all relevant legislation is complied with. This may be the business owner, manager or employees if they make decisions about the operation of the business.	Vessel skippers must ensure that all relevant legislation is complied with. This may be the business owner, manager or employees if they make decisions about the operation of the business. Follow the 'best practice' guidance advice provided below.
Article 4.1 Food business operators carrying out primary production shall comply with the general hygiene provisions laid down in part A of Annex I and any specific requirements provided for in EC Regulation No 853/2004.	As a primary producer, handlers of live crustacea must comply with the rules given in Annex I. There will also be additional rules under EC Regulation No 853/2004.	Vessel skippers handling live crustacea must comply with the hygiene provisions in ANNEX I, PRIMARY PRODUCTION, PART A, detailed below.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Article 6.1 Food business operators shall cooperate with the competent authorities in accordance with other applicable Community legislation or, if it does not exist, with national law.	Food business operators must comply with any reasonable requests from their local authority.	Vessel skippers must comply with reasonable requests from their local authority, such as Environmental Health or Port Authority.
Article 6.2. In particular, every food business operator shall notify the appropriate competent authority, in the manner that the latter requires, of each establishment under its control that carries out any of the stages of production, processing and distribution of food, with a view to the registration of each such establishment.	Vessel operators must notify their local authority of their food business with 28 days of commencing production. The authority should supply you with the relevant forms. They will require details of your business including the processes carried on. Registration is to allow local authorities to plan their inspection duties effectively. Registration cannot be refused or revoked on the basis of one hygiene inspection.	Vessel operator must contact their local authority about requirements for registration.
Food business operators shall also ensure that the competent authority always has up-to-date information on establishments, including by notifying any significant change in activities and any closure of an existing establishment.	You must also inform your local authority within 28 days of any significant changes to your business. This will include changes of ownership, processes or closure.	Vessel operator must contact their local authority within 28 days of any significant changes to their business.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
ANNEX I, PRIMARY PRODUCTION, PART A: general hygiene provisions for primary production and associated operations I. Scope 1. This Annex applies to primary production and the following associated operations: (a) the transport, storage and handling of primary products at the place of production, provided that this does not substantially alter their nature; (b) the transport of live animals, where this is necessary to achieve the objectives of this Regulation; and (c) in the case of products of plant origin, fishery products and wild game, transport operations to deliver primary products, the nature of which has not been substantially altered, from the place of production to an establishment. Annexe 1, Part A II : Hygiene provisions 2. As far as possible, food business operators are to ensure that primary products are protected against contamination, having regard to any processing that primary products will subsequently undergo.	All businesses handling live crustacea are classed as primary production. Primary production must comply with the requirements of Annex I. You must protect crustacea from contamination. Processes that the crustacea will undergo, which may remove any contamination, can be taken into account in deciding if a crustacea is contaminated.	Vessel operators must comply with hygiene provisions detailed below. Vessel operators should ensure that live crustacea are harvested from waters that are free from contamination, such as oil or areas containing sewage. Ensure that live crustacea are protected from physical, chemical, and biological contamination. Cover animals to protect them from seabird faeces, and ensure that they are not

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Annexe 1, Part A II (3) Notwithstanding the general duty laid down in paragraph 2, food business operators are to comply with appropriate Community and national legislative provisions relating to the control of hazards in primary production and associated operations, including: Annexe 1, Part A II 3(a) Measures to control contamination arising from the air, soil, water, feed, fertilisers, veterinary medicinal products, plant protection products and biocides and the storage, handling and disposal of waste,	Vessel operators must comply with legislation to control hazards in primary production processes Vessel operators must put in place procedures, to identify and control hazards.	contaminated with materials such as metal or glass. Crew clothing must be kept clean. Protective waterproofs should be washed down as necessary. You must not smoke or spit in areas used for handling or storing live crustacea. Wounds on hands or exposed parts of the body must be covered with waterproof dressings. Crew must wash their hands and gloves prior to any fish handling activity, particularly after going to the toilet. To control hazards see guidance provided in section 6, Hazard Analysis. Ensure that only good quality seawater comes into contact with live crustacea. During fishing, discard all unwanted crustacea from the vessel. See section 6, Hazard Analysis, for guidance on controlling contamination.
Annexe 1, Part A II (4) Food business operators rearing, harvesting or hunting animals or producing primary products of animal origin are to take adequate measures, as appropriate:		

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Annexe 1, Part A II (4a) to keep any facilities used in connection with primary production clean and, where necessary after cleaning, to disinfect them in an appropriate manner.	All areas of the vessel must be cleaned after use.	Before starting a fishing trip, the skipper or a designated crew member must check the standard of hygiene for all areas used for handling and storing live crustacea. Equipment and areas used for handling live crustacea should be hosed down with clean seawater as necessary. Where necessary, food-safe chemicals should be used to ensure adequate disinfection. More information is provided in Appendix I , section 7.
Annexe 1, Part A II (4b) to keep clean and, where necessary after cleaning, to disinfect, in an appropriate manner, equipment, containers, crates, vehicles and vessels.	Equipment, containers, and vessels must be kept clean.	Equipment and areas used for handling live crustacea must be hosed down frequently with clean seawater during fishing trips.
Annexe 1, Part A II (4d) to use potable water, or clean water, whenever necessary to prevent contamination.	Clean water should be used wherever possible to prevent contamination.	Use clean water wherever possible to prevent contamination. Do not let clean fresh water come into contact with live crustacea.; use only clean seawater.
Annexe 1, Part A II (4e) to ensure that staff handling foodstuffs are in good health and undergo training on health risks.	Staff must be trained about health risks. Training on health risks should be given by the skipper to new and existing crew members.	Staff must be trained on health risks. Training should ensure that all crew members have a clear understanding of the importance of high standards of cleanliness and the means of achieving them. Crew members suffering from stomach upsets or diarrhoea must not handle fish until the symptoms have fully cleared. Further information regarding crew hygiene and training is given in Appendix I , section 7.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Annexe 1, Part A II (4f) as far as possible to prevent animals and pests from causing contamination;	Fishing vessels operators must ensure that the presence of pests does not present a food-safety risk to the catch. Any type of animal onboard a fishing vessel will constitute a pest. Pests have the potential to carry two types of contamination hazard into the fish handling and storage areas. Firstly, they harbour and carry germs, both in terms of food related illness and other types of disease. Secondly, they present a foreign body risk to the fish; this can be from dead specimens of the pests themselves, or faeces, fur, feathers, etc. The greatest pest problem encountered at sea will be from seabirds. When vessels are in harbour however, infestation from insects and rodents may also present a significant hazard in addition to the risks from birds.	Do not take animals aboard the vessel. Any evidence of pests must be investigated and appropriate action taken. Any sightings of pests must be reported to the skipper. Any infestation of pests must be eliminated. Affected areas must be cleaned. Crew should be made aware of the signs of pest infestation, and actions to be taken. Upon sailing, ensure that containers and exposed areas used to handle live crustacea are clean. Bird faeces deposited on open deck areas and equipment must be washed off in a timely manner. Protective clothing of the crew must be cleaned of bird faeces as necessary. Gear must be checked regularly and kept free from live crustacean waste and debris.
Annexe 1, Part A II (4g) to store and handle waste and hazardous substances so as to prevent contamination;	Hazardous substances likely to contaminate fish onboard, which include cleaning chemicals, must not be stored beside live crustacea intended for human consumption.	Store cleaning chemicals in a dedicated storage area away from live crustacea.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Annexe 1, Part A III (7) Record-keeping 7. Food business operators are to keep and retain records relating to measures put in place to control hazards in an appropriate manner and for an appropriate period, commensurate with the nature and size of the food business. Food business operators are to make relevant information contained in these records available to the competent authority and receiving food business operators on request.		Vessel skippers must keep records of any measures put in place to control hazards. See guidance in Hazard Analysis, section 6.
EC Regulation No. 853/2004	This Regulation lays down specific rules on the hygiene of food of animal origin for business operators and supplement Regulation. The regulation does not apply to fishermen supplying small quantities to the final consumer or to local businesses who will supply the final consumer. Local businesses are those in the same or neighbouring counties. A small quantity is up to 25 tonnes of fishery products in any calendar year. However, there is still a legal requirement to ensure that such food is safe.	Vessel operators catching and supplying locally more than 25 tonnes of live crustacea in any calendar year must abide by the provisions below.

2.3.1 Vessels

Legal requirement	Interpretation	Recommended 'best practice'
Part II Hygiene Requirements 1. When used, the sections of vessels or the containers set aside for the storage of fishery products must be kept clean and maintained in good repair and condition. In particular, they must not be contaminated by the fuel used or bilge water.	Handling and storage areas must be kept clean and maintained in a good condition. Repairs should be carried out in a timely manner. Containers used for holding live crustacea must be easy to keep clean and uncontaminated, free from foreign bodies (e.g. glass or metal) or chemicals that could cause the food to be harmful to humans. Containers must be clean before use. Care should be taken that fuel or bilge water cannot come into contact with live crustacea.	Check and maintain live crustacean storage and handling areas in good condition. Check for contamination from fuel or bilge water. Hose down frequently with clean seawater. At the end of each fishing trip and after landing of the catch, all fish handling and stowage areas, equipment and boxes etc, should be cleaned with good quality seawater. Ensure that containers (boxes, bins and bongos) are empty and clean before you use them. Hose down frequently with clean seawater. Keep all boxes, bongos etc away from fuel (spillages) and away from bilge water.
2. As soon as they are taken on board, the fishery products must be protected from contamination and from the effects of the sun or any other source of heat. Any water which may come into contact with the product must be potable or clean seawater.	The responsibility of ensuring the safety of live crustacea begins as soon as they are brought on board. Handling practices must ensure the live crustacea is kept in the most suitable conditions, away from heat. Only clean seawater must come into contact with live crustacea.	Protective crustacea from contamination, and from sunlight and heat. Store live crustacea in good quality seawater with in a vivier system, if possible. Otherwise, cover them (e.g. non- foam backed carpet) and keep them cool and wet, using spray-bars or deckhose. Use only clean seawater in vivier tanks supplied from the deckhose.
3. The fishery product must be handled in a way to prevent bruising.	Live crustacea must be handled in a way that prevents physical damage.	Always handle gently as possible when clearing pots or moving animals. Live crustacea will be stressed or damaged if handled roughly. Never drop or throw live crustacea.

Legal requirement	Interpretation	Recommended 'best practice'
CHAPTER II Requirements during and after Landing		
1.a) ensure that unloading and landing equipment that comes into contact with fishery products is constructed of material that is easy to clean and disinfect and maintained in a good state of repair and cleanliness.	All equipment that comes into contact with live crustacea during the landing of the catch must be easy to clean and properly maintained. Containers and other equipment should be cleaned thoroughly after each use.	Thoroughly clean all containers used for storing and landing live crustacea after each trip. Rinse them well with clean seawater or potable water.
b) avoid contamination of fishery products during unloading and landing, in particular by:-	Do not use equipment and practices that can cause contamination when unloading or landing live crustacea.	Carry out unloading and landing operations rapidly.
(i) carrying out unloading and landing operations rapidly;	Carry out unloading and landing operations as quickly as possible.	Do not leave the catch on the open quayside unattended for any length of time. Place live crustacea, without delay, in a protected environment.
(ii) placing fishery products without delay in a protected environment at the temperature specified in Chapter VII; and	Place live crustacea without delay in a protected environment and at suitable temperature for the species.	See information provided in Section 3 of this good practice guide, which provides general advice on handling live crustacea.
(iii) not using equipment and practices that cause unnecessary damage to the edible parts of the fishery products.	Do not use equipment and practices that can damage live crustacea.	Handle live crustacea carefully to avoid damaging them. Follow guidance provided in Section 3 of this good practice guide, which provides general advice on handling live crustacea.

Legal requirement	Interpretation	Recommended 'best practice'
CHAPTER VII: Storage of Fishery Products 4. Fishery products kept alive must be kept at a temperature and in a manner that does not adversely affect food safety or their viability.	Live crustacea should be kept under conditions that ensure they remain safe to eat and alive.	Follow general guidance provided in section 3 of this good practice guide, together with specific guidance provided in section 4.

Legal requirement	Interpretation	Recommended ‘best practice’																				
Labelling Regulation 2065/2001/EC enforced by the Fish Labelling Regulations 2003 in each of the devolved regions. Article 8 2065/2001/EC The information required concerning the commercial designation, the production method and the catch area should be available at each stage of marketing of the species concerned. This information together with the scientific name of the species concerned shall be provided by means of the labelling or packaging of the product, or by means of a commercial document accompanying the goods, including the invoice.	When live crustacea are sold they must be accompanied by labelling or documentation giving details of their common name (e.g. Crab), the production method (e.g. caught at sea), and the catch area as specified, e.g. north-east Atlantic. There is an exemption from labelling for fishermen selling live crustacea direct to the final consumer and worth less than 20 Euros (about £15).	Live crustacea landed from a vessel must be identified e.g. on a label, invoice, sales note or delivery note, together with the common name, catch area and production method. <table><thead><tr><th>Common Name</th><th>Latin Name</th></tr></thead><tbody><tr><td>CRAB (BROWN)</td><td><i>Cancer pagurus</i></td></tr><tr><td>CRAB (SPIDER)</td><td><i>Maia squinado</i></td></tr><tr><td>CRAB (VELVET)</td><td><i>Liocarcinus puber</i></td></tr><tr><td>LOBSTER</td><td><i>Homarus gammarus</i></td></tr><tr><td>CRAWFISH</td><td><i>Palinurus spp</i></td></tr><tr><td>DUBLIN BAY PRAWN</td><td><i>Nephrops norvegicus</i></td></tr><tr><td>ROSEPRAWN</td><td><i>Palaemon serratus</i></td></tr></tbody></table> <table><tbody><tr><td>Catch area</td><td>- e.g. ‘North East Atlantic’</td></tr><tr><td>Production method</td><td>- e.g. ‘Caught at Sea’</td></tr></tbody></table>	Common Name	Latin Name	CRAB (BROWN)	<i>Cancer pagurus</i>	CRAB (SPIDER)	<i>Maia squinado</i>	CRAB (VELVET)	<i>Liocarcinus puber</i>	LOBSTER	<i>Homarus gammarus</i>	CRAWFISH	<i>Palinurus spp</i>	DUBLIN BAY PRAWN	<i>Nephrops norvegicus</i>	ROSEPRAWN	<i>Palaemon serratus</i>	Catch area	- e.g. ‘North East Atlantic’	Production method	- e.g. ‘Caught at Sea’
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Legal requirement	Interpretation	Recommended 'best practice'
Animal Health and Welfare Welfare of Animal Transport Order 1997 Schedule 6, Article 4(7) Other vertebrate animals and cold-blooded animals shall be transported in such receptacles or means of transport, under such conditions (in particular with regard to space, ventilation, temperature and security) and with such supply of liquid and oxygen as are appropriate for the species concerned.	This legislation requires transporters of live crustacea to create best biological conditions for all live crustacea during their transport.	Follow the general guidance provided in section 3 of this guide, together with appropriate specific guidance provided in section 4.
S4(1) No person shall transport any animal in a way which causes or is likely to cause injury or unnecessary suffering to that animal.	Do not cause injury to your live crustacea during transport. Do not handle excessively as considerable damage and stress can occur, especially on the vivier boats.	Follow the general guidance provided in section 3 of this guide, together with appropriate specific guidance provided in section 4.

Legal requirement	Interpretation	Recommended 'best practice'
Lobsters (Control of Deposit) Order 1981 The deposit in any area of water, (as designated in the order) of any lobster of the species <i>Homarus gammarus</i> or the species <i>Homarus americanus</i>, being taken from any live crustacea bed outside that area of water, is prohibited.	You need a licence to put any American lobster (dead or alive) into UK tidal waters, adjacent fresh waters or ashore within one mile of these waters. The same applies to European lobsters not caught in UK waters, and European lobsters that have been in contact with American ones. This is to stop the spread of the Lobster disease Gaffkaemia from imported American lobsters to native European lobsters.	Please contact relevant agency for details and guidance. England and Wales Department for Environment, Food and Rural Affairs (DEFRA) Northern Ireland Department of Agriculture and Rural Development Northern Ireland (DARDNI) Scotland Scottish Executive Marine Directorate (SEMD)
Fisheries Management	Live crustacea may not be kept aboard, landed or sold if smaller than statutory minimum landing size (MLS). These sizes are set by EU and UK Regulations and also through Byelaws from Local Sea Fisheries Committees in England and Wales.	Please contact relevant agency for details and guidance. England and Wales Department for Environment, Food and Rural Affairs (DEFRA) Northern Ireland Department of Agriculture and Rural Development Northern Ireland (DARDNI) Scotland Scottish Executive Marine Directorate (SEMD)

2.3.2 Shore

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
EC Regulation No. 178/2002 enforced by General Food Regulations 2004	EC Regulation No. 178/2002 introduces traceability and product recall. It also replaces the food safety requirements found in the Food Safety Act 1990	Shore operators must comply with the articles detailed below. More information about traceability is provided in the Appendix II .
Article 14 Food safety requirements 1. Food shall not be placed on the market if it is unsafe. 2. Food shall be deemed to be unsafe if it is considered to be: (a) injurious to health; (b) unfit for human consumption. 14.3 In determining whether any food is unsafe, regard shall be had: (a) to the normal condition of use of the food by the consumer and at each stage of production, processing and distribution, and (b) to the information provided to the consumer, including information on the label, or other information generally available to the consumer concerning the avoidance of specific adverse health effects from a particular food or category of foods.	Handlers must not treat live crustacea in a way, which may make them unfit for human consumption. Handling practices must ensure that live crustacea are kept free from contamination, which may make them then unfit for human consumption. When considering health risks posed by live crustacea allowances can be made for intended processing that would remove the risk. Live crustacea would not be considered unsafe if the consumer were provided with information on how to make it safe. Information about risks of which the consumer should already be aware does not have to be included.	Owners/managers of businesses must ensure their staff are adequately trained and supervised in food safety matters. Employees must comply with instructions given to ensure food safety and avoid personal liability. Do not do anything to the live crustacea that could make them dangerous to eat. Do not contaminate the live crustacea and make it unfit to eat. Ensure the vivier tanks use only clean seawater and that any filtration and purifying systems are working properly. Ensure the live crustacea cannot come into contact with any cleaning, pest control or other chemicals. Keep up to date with information about health risks that are not removed by intended processing, such as cooking. Consumers would be expected to know to cook live crustacea prior to consumption, and this information need not be provided.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
EC Regulation No. 178/2002 enforced by General Food Regulations 2004	EC Regulation No. 178/2002 introduces traceability and product recall. It also replaces the food safety requirements found in the Food Safety Act 1990	Shore operators must comply with the articles detailed below. More information about traceability is provided in the Appendix II .
Article 14.4 In determining whether any food is injurious to health, regard shall be had: (b) not only to the probable immediate and/or short- term and /or long-term effects of the food on the health of the person consuming it, but also on subsequent generations ; (b) to the probable cumulative toxic effects.	Live crustacea may be considered unsafe if they contain contaminants that may be harmful if consumed over a long period of time, or have long term effects.	Keep up to date with information about contaminants in live crustacea that may be harmful if consumed over a long period of time, or have long term effects. Be aware of health warnings about harvesting restrictions.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Article 18 Traceability The traceability of food shall be established at all stages of production	This law enables foods that are dangerous or contaminated to be recalled out of the food chain. It requires food businesses to keep records showing who supplied them with any food products and those businesses they supplied food products to. These records must be available to authorities if needed.	You must keep clear records that show who supplied you with live crustacea, and when, and to whom you then supplied live crustacea, and when. These records must be available to food authorities if needed.
Article 19 Responsibilities for food: food business operators If a food business operator considers or has reason to believe that a food...is not in compliance with the food safety requirements, it shall immediately initiate procedures to withdraw the food...and inform the competent authorities thereof.	Food businesses must recall, and/or withdraw food from the market if it does not comply with food safety requirements, and to notify relevant authorities.	Records must be kept for sufficient time to allow live crustacean to be recalled if a food safety problem is identified after sale. A recommended period is 3 months. If it is not possible to recall all affected live crustacean the local food authority must be informed of the problem.
Regulation 852/2004	This Regulation contains the basic rules for the hygiene of foodstuffs.	
Article 1 Scope 1. This Regulation lays down general rules for food business operators on the hygiene of foodstuffs, taking particular account of the following principles: (a) primary responsibility for food safety rests with the food business operator; (b) it is necessary to ensure food safety throughout the food chain, starting with primary production.	Regulation 852/2004 applies to all food handlers throughout the food chain including primary production. Each business operator in the supply chain is responsible for producing safe food. This includes fishermen, transporters and wholesalers (shore operators).	Shore operators that handle live crustacea must comply with relevant articles detailed below if they handle more than 25 tonnes of live crustacea in any calendar year.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
2.This Regulation shall not apply to: (c) the direct supply, by the producer, of small quantities of primary products to the final consumer or to local retail establishments directly supplying the final consumer;	The regulation does not apply to fishermen supplying small quantities to the final consumer or to local businesses who will supply the final consumer. Local businesses are those in the same or neighbouring counties. A small quantity is up to 25 tonnes of live crustacea in any calendar year.	Shore operators do not need to comply with Regulation 852/2004 if they land less than 25 tonnes of live crustacea in any calendar year. (However, there is still a legal requirement to ensure that food is safe.).
Article 3 General obligation Food business operators shall ensure that all stages of production, processing, and distribution of food under their control satisfy the relevant hygiene requirements laid down in this Regulation. Article 4.6 Food business operators may use the guides provided for in Articles 7, 8 and 9 as an aid to compliance with their obligations under this Regulation.	The person responsible for the business is responsible for ensuring that all relevant legislation is complied with. This may be the business owner, manager, or employees if they make decisions about the operation of the business. Although you do not have to follow the advice given in official guides to good practice, following the advice given can be used as evidence of legal compliance.	The person responsible for the business must ensure that all relevant legislation is complied with. This may be the business owner, manager, or employees if they make decisions about the operation of the business. Follow the 'best practice' guidance advice provided below. Follow the 'best practice' guidance in this document to demonstrate legal compliance.
Article 4 General and specific hygiene requirements 1. Food business operators carrying out primary production shall comply with the general hygiene provisions laid down in part A of Annex I and any specific requirements provided for in Regulation (EC) No. 853/2004.	As a primary producer, handlers of live crustacea must comply with the rules given in Annex I. (There will also be additional rules under regulation 853/2004)	Shore operators handling live crustacea must comply with the hygiene provisions in ANNEX I, PRIMARY PRODUCTION, PART A: detailed below.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Article 6 Official controls, registration and approval 6.1 Food business operators shall cooperate with the competent authorities in accordance with other applicable Community legislation or, if it does not exist, with national law. 6.2 In particular, every food business operator shall notify the appropriate competent authority, in the manner that the latter requires, of each establishment under its control that carries out any of the stages of production, processing, and distribution of food, with a view to the registration of each such establishment. Food business operators shall also ensure that the competent authority always has up-to-date information on establishments, including by notifying any significant change in activities and any closure of an existing establishment.	Shore operators must comply with any reasonable requests from your local authority. This may include requests for information and access to premises for inspection purposes. Shore operators must notify the local authority of your food business with 28 days of commencing production. The authority should supply you with the relevant forms. They will require details of your business including the processes carried out. Registration is to allow local authorities to plan their inspection duties effectively. Registration cannot be refused or revoked on the basis of one hygiene inspection. Shore operators must inform your local authority within 28 days of any significant changes to your business. This will include changes of ownership, processes, or closure.	Shore operators must comply with reasonable requests from their local authority. Shore operator must contact their local authority about requirements for registration. Shore operator must contact their local authority within 28 days of any significant changes to their business.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
ANNEX I, PRIMARY PRODUCTION, PART A: general hygiene provisions for primary production and associated operations I. Scope 1. This Annex applies to primary production and the following associated operations: (a) the transport, storage and handling of primary products at the place of production, provided that this does not substantially alter their nature; (c) the transport of live animals, where this is necessary to achieve the objectives of this Regulation; and (c) in the case of products of plant origin, fishery products and wild game, transport operations to deliver primary products, the nature of which has not been substantially altered, from the place of production to an establishment.	All businesses handling live crustacea are classed as primary production. They must comply with the requirements of Annex I.	Shore operators must comply with hygiene provisions detailed below.
II. Hygiene provisions 2. As far as possible, food business operators are to ensure that primary products are protected against contamination, having regard to any processing that primary products will subsequently undergo.	You must protect the crustacea from contamination. Processes that live crustacea will undergo, which may remove any contamination, can be taken into account in deciding if a crab is contaminated.	Ensure that live crustacea are protected from physical, chemical, and biological contamination, such as cleaning fluids, fuel, metal, or glass. Keep all dangerous chemicals in locked cabinets. Use chemicals only in accordance with written cleaning schedules. Staff must be properly trained in their use. Take care not to contaminate your live crustacea with chemicals or other foreign matter.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
3. Notwithstanding the general duty laid down in paragraph 2, food business operators are to comply with appropriate Community and national legislative provisions relating to the control of hazards in primary production and associated operations, including: (a) measures to control contamination arising from the air, soil, water, feed, fertilisers, veterinary medicinal products, plant protection products and biocides and the storage, handling and disposal of waste.	Shore operators must comply with any legislation to control hazards in primary production processes. Shore operators must put in place procedures to identify and control hazards.	Staff clothing should be kept clean. Protective waterproofs should be washed down after each day. You must not smoke or spit in the fish handling or storage areas. Wounds on hands or exposed parts of the body should be covered with waterproof dressings. Crew must wash their hands and gloves prior to any fish handling activity, and particularly after going to the toilet. To control hazards see guidance provided in section 6, Hazard Analysis. Ensure that only good quality seawater comes into contact with live crustacea. Dispose of all waste according to guidance provided on Animal By-products legislation. For guidance on controlling contamination see section 6, Hazard Analysis.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
4. Food business operators rearing, harvesting or hunting animals or producing primary products of animal origin are to take adequate measures, as appropriate:	Shore operators must take the appropriate actions to ensure that premises and fittings are cleanable and hygienic (clean).	Ensure that your premises and fittings are hygienic and cleanable. Floors should be waterproof and slope down towards the drains. There should be adequate drainage to prevent the pooling of contaminated water on the floor. Walls and doors should be smooth and waterproof. Overhead spaces should not allow the build up of debris that could fall into vivier tanks or onto the shellfish. Use only clean seawater or potable water for cleaning purposes.
(a) to keep any facilities used in connection with primary production clean and, where necessary after cleaning, to disinfect them in an appropriate manner;	Handling and access areas must be designed to have enough space for work to be carried out in a hygienic manner. Handling and access areas must be kept clean	Clean live crustacean handling and access areas using potable water. Check tanks regularly and remove dead shellfish. Keep dead crabs separate from live crabs. Do not contaminate your shellfish. Maintain good levels of hygiene. Where necessary, food-safe chemicals should be used to ensure adequate disinfection. More information is provided in Appendix I of this guide.
b) to keep clean and, where necessary after cleaning, to disinfect, in an appropriate manner, equipment, containers, crates, vehicles and vessels;	Equipment or containers that come into contact with live crustacea must be readily cleanable and kept clean. Surfaces that come into contact with live crustacea must be kept clean and, if necessary, disinfected.	Equipment and containers used for handling live crustacea should be hosed down frequently with potable water. Equipment should be constructed from durable and impermeable materials that are easy to clean. Where necessary, food-safe chemicals should be used to ensure adequate disinfection. More information is provided in Appendix I of this guide.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
(d) to use potable water, or clean water, whenever necessary to prevent contamination;	Use only potable water for staff hygiene and cleaning equipment and surfaces.	Use potable water to clean tanks and facilities to minimise contamination.
e) to ensure that staff handling foodstuffs are in good health and undergo training on health risks;	Staff must be in good health when handling live crustacea. They must receive adequate training or supervision to enable them to carry out their duties in a hygienic manner.	Staff who are suffering from stomach upsets or diarrhoea must not handle live crustacea until their symptoms have cleared. Staff must be trained on health risks. Training should ensure that all staff has a clear understanding of the importance of high standards of cleanliness and the means of achieving them. Further information regarding crew hygiene and training is given in Appendix I .
(f) as far as possible to prevent animals and pests from causing contamination;	All pests that may present a hazard to crustacea, must be controlled.	Control pests and vermin. Fly-screens and fly-curtains are good for keeping out flies and other flying insects. Change insectocutor bulbs annually. Evidence of pests must be investigated and appropriate action taken. Infestation of pests must be eliminated. Affected areas must be cleaned. Staff should be made aware of the signs of pest infestation.
(g) to store and handle waste and hazardous substances so as to prevent contamination;	Waste products or hazardous substances must not contaminate live crustacea.	Watertight containers should be used for storing dead shellfish. For more guidance see Animal by-product legislation below. Shore operators must use only cleaning chemicals suitable for food use. Cleaning chemicals should only be used in accordance with the manufacturers instructions Chemicals used for cleaning, pest control or other purposes should be kept in a safe place and labelled clearly so they do not pose a contamination risk.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
III. Record-keeping 7. Food business operators are to keep and retain records relating to measures put in place to control hazards in an appropriate manner and for an appropriate period, commensurate with the nature and size of the food business. Food business operators are to make relevant information contained in these records available to the competent authority and receiving food business operators on request.	Shore operators must keep records of any measures put in place to control hazards	You must keep records of any measures put in place to control hazards. A recommended time period is 3 months. More information is provided in Hazard Analysis , section 6. You must provide such information to the competent authority and receiving food business operators on request.
EC Regulation No. 853/2004	This Regulation lays down specific rules on the hygiene of food of animal origin for business operators and supplements Regulation 852/2004. Crustacea are included as a 'fishery product' for the purposes of this regulation, but they are not considered as 'shellfish'. So in these particular Regulations, the sections referring to 'shellfish' do not apply to live crustacea. The regulation does not apply to shore operators who supply small quantities to the final consumer or to local businesses who will supply the final consumer. Local businesses are those in the same or neighbouring counties. A small quantity is up to 25 tonnes of fishery products in any calendar year. However, there is still a legal requirement to ensure that such food is safe.	Shore operators supplying locally more than 25 tonnes of live crustacea in any calendar year must abide by the provisions below.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Article 3 General Obligations 1. Food business operators shall comply with the relevant provisions of Annexes II and III. 2. Food businesses operators shall not use any substance other than potable water or where EC Regulation 852/2004 or this regulation permits clean water to remove surface contamination from products of animal origin.	Where using potable water is inappropriate, as is the case with live crustacea; only clean seawater should be used to remove surface contamination from live crustacea.	Use clean seawater to remove surface contamination from live crustacea. Clean seawater should be extracted away from sources of contamination such as freshwater, oil and bilge effluent.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Annex II, Section VIII, Chapter VIII Storage of Fishery Products 4. Fishery products kept alive must be kept at a temperature and in a manner, which does not adversely affect food safety or their viability.	You should ensure that your storage and handling practices are designed to create the best environment so that the live crustacea do not become stressed or damaged.	Follow advice provided in section 3 and section 4 of this good practice guide to maintain the viability of live crustacea. Follow advice provided for EC Regulation 852/2004 so as not to adversely affect food safety.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Labelling EC Regulation No. 2065/2001/EC enforced by the Fish Labelling Regulations 2003 in each of the devolved regions. Article 8 2065/2001/EC The information required concerning the commercial designation, the production method and the catch area should be available at each stage of marketing of the species concerned. This information together with the scientific name of the species concerned shall be provided by means of the labelling or packaging of the product, or by means of a commercial document accompanying the goods, including the invoice.	 	

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Animal Health Animal By-products Regulation 1774/2002/EC	This regulation lays down rules for the collection, transport, storage, handling, processing and use or disposal of animal by-products. It aims to prevent these products from presenting a risk to animals or human health. This regulation applies to live holding premises since whole and parts of dead crustacea not intended for human consumption are classified as animal by-products.	Shore operators handling live crustacea must abide by Articles 4-6; and Annex 2, Chapters 1,2 and 3, see below.
Articles 4-6	This article specifies that any animal by-product not intended for human consumption must be disposed of through appropriate routes. There are three categories of animal by-product with specific regulations for each. Live crustacea that have died while being stored (or transported) are classed as mortalities, which are Category 2.	Whole and parts of dead live crustacea must be disposed of through facilities approved for treating Category 2 animal by-products. You should contact your local authority (waste disposal department) to identify suitable disposal options in your area. Only use licensed companies to dispose of any dead shellfish.
	Permitted storage and disposal methods include: i) Incineration (burning) ii) Rendering (heating) iii) Composting (subject to approval) These activities must be carried out in approved premises.	You should contact your local authority (waste disposal department) to identify suitable disposal options in your area.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Annex 2, chapter1, 2 and 3	These sections describe requirements for storing (and transporting) and labelling animal by-products.	Material must be stored in sealed new packaging (strong plastic bag) or covered leak proof containers. It must be labelled with information describing the date, type of material, origin, name, and address of origin. Material that has to be stored before it can be collected should be kept in a dedicated freezer until there is enough waste to make it economical to have it collected.
Water Industry Act 1991 S141 Trade effluent is 'any liquid, either with or without suspended particles, which is wholly or partly produced in the course of any trade or industry carried on at a trade premises'.	This legislation describes disposal options for trade effluent. All waste liquids from shore premises is classed as 'Trade Effluent'.	Dispose of trade effluent according to guidance provided by your local authority or environmental regulator.
S118 The occupier of any trade premises in the area of a sewerage undertaker may discharge any trade effluent proceeding from those premises into the undertaker's public sewers if he does so with the undertakers consent.	Trade effluents can be discharged into a foul sewer with consent from your statutory sewerage undertaker. Effluent from all processes on site can be discharged to the sewers with consent from the local water company. Charges will apply. The sewerage company may prohibit the discharge of seawater into the sewer because the salt may disrupt the biological treatment plant.	In order to discharge any waste water (trade effluent), including salt water from a vivier storage tanks, into any other water or sewer you will require permission (a 'consent for discharge') from the local water authority or sewerage provider. You will have to pay for discharging your waste water. Confirm that the local sewerage company will allow you to discharge vivier water into the drains.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
The Groundwater Regulations 1998 Controls discharges of trade effluent to surface waters or groundwater.	Surface waters include rivers, lakes, lochs, reservoirs, ponds, streams, canals, ditches, coastal waters, and estuaries. Groundwater is all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. Consent will be required from the relevant environmental regulator	In order to discharge directly into surface or groundwater you will need to get consent from the appropriate environmental regulator.
Water Resources Act 1991 S24 No person shall abstract water from any source or supply or cause or permit any other person to abstract any water except in pursuance of a licence granted by the authority and in accordance with the provisions of that licence.	Water abstraction is the removal of water from any source including rivers and coastal waters. If you abstract water, you will need a licence from your local environmental regulator.	Contact your local environmental regulator about an abstraction licence.

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Animal Welfare Welfare of Animal Transport Order 1997 Schedule 6, Article 4(7) Other vertebrate animals and cold-blooded animals shall be transported in such receptacles or means of transport, under such conditions (in particular with regard to space, ventilation, temperature and security) and with such supply of liquid and oxygen as are appropriate for the species concerned.	This legislation aims to create best biological conditions for all live crustacea during their transport.	Follow the general guidance provided in section 3 of this guide, together with appropriate specific guidance provided in section 4 .
S4(1) No person shall transport any animal in a way, which causes or is likely to cause injury or unnecessary suffering to that animal.	During storage, live crustacea must be kept in the best possible conditions to ensure their maximum survival.	Follow the general guidance provided in section 3 of this guide, together with appropriate specific guidance provided in section 4 .

2.3.2 Shore

Legal requirement	Interpretation	Recommended 'best practice'
Lobsters (Control of Deposit) Order 1981 The deposit in any area of water, (as designated in the order) of any lobster of the species <i>Homarus gammarus</i> or the species <i>Homarus americanus</i>, being taken from any live crustacea bed outside that area of water, is prohibited.	You need a licence to put any American lobster (dead or alive) into UK tidal waters, adjacent fresh waters or ashore within one mile of these waters. The same applies to European lobsters not caught in UK waters, and European lobsters that have been in contact with American ones. This is to stop the spread of the Lobster disease Gaffkaemia from imported American lobsters to native European lobsters.	Please consult the relevant agency for details and guidance. England and Wales Department for Environment, Food and Rural Affairs (DEFRA) (Fish Diseases Laboratory at Weymouth) Northern Ireland Department of Agriculture and Rural Development Northern Ireland (DARDNI) Scotland Scottish Executive Marine Directorate (SEMD)
Fisheries Management	Live crustacea may not be kept, or sold if they are smaller than their statutory Minimum Landing Size (MLS). These sizes are set by EU and UK Regulations and also through Byelaws from Local Sea Fisheries Committees (England and Wales). There are also restrictions on landing of V-notched female lobsters and crawfish and the landing of berried females of some species. Please consult the relevant agency for up to date MLSs and other fisheries management restrictions. It is also illegal to land soft-shelled crabs, berried female crabs or crab claws.	Please consult the relevant agency for details and guidance. England and Wales Department for Environment, Food and Rural Affairs (DEFRA) Northern Ireland Department of Agriculture and Rural Development Northern Ireland (DARDNI) Scotland Scottish Executive Marine Directorate (SEMD)

2.3.3 Transport

Legal requirement	Interpretation	Recommended 'best practice'
EU Regulation 178/2002 enforced by General Food Regulations 2004	EC Regulation No. 178/2002 introduces traceability and product recall. It also replaces the food safety requirements found in the Food Safety Act 1990. This regulation applies to all food handlers, including transport operators.	Transporters must comply with articles detailed below. More information on traceability is provided in the Appendix II .
Article 14 Food safety requirements 1. Food shall not be placed on the market if it is unsafe. 2. Food shall be deemed to be unsafe if it is considered to be: (a) injurious to health; (b) unfit for human consumption. 14.3 In determining whether any food is unsafe, regard shall be had: (a) to the normal condition of use of the food by the consumer and at each stage of production, processing and distribution, and	Transporters must not treat live crustacea in a way that may make them unfit for human consumption. Handling practices should ensure that live crustacea are kept free from contamination, which may make them then unfit for human consumption. When considering health risks posed by live crustacea allowances can be made for intended processing that would remove the risk.	Transporters are required to train and supervise staff to comply with legal requirements. It is also the responsibility of all employees to follow instructions in order to avoid personal liability. Do not do anything to the live crustacea, which may make them harmful to humans. Do not contaminate the live crustacea and make them unfit to eat. Ensure any vivier tanks used have only clean seawater and that any filtration and purifying systems are working properly. Ensure the live crustacea cannot come into contact with any cleaning, pest control or other chemicals and that handling practices are hygienic. Keep boxes and baskets clean. Ensure cleaning, pest control and other chemicals do not get into containers. Keep up to date with information about health risks that are and are not removed by intended processing, such as cooking.

Legal requirement	Interpretation	Recommended 'best practice'
(b) to the information provided to the consumer, including information on the label, or other information generally available to the consumer concerning the avoidance of specific adverse health effects from a particular food or category of foods. Article 14.4 In determining whether any food is injurious to health, regard shall be had: (a) not only to the probable immediate and/or short- term and /or long-term effects of the food on the health of the person consuming it, but also on subsequent generations ; (b) to the probable cumulative toxic effects;	Live crustacea would not be considered unsafe if the consumer is provided with information on how to make it safe. Information about risks of which the consumer should already be aware does not have to be included. Live crustacea may be considered unsafe if they contain contaminants that may be harmful if consumed over a long period of time, or have long term effects.	Consumers would be expected to know to cook live crustacea prior to consumption, and this information need not be provided. Keep up to date with information about contaminants in live crustacea that may be harmful if consumed over a long period of time, or have long term effects. Be aware of health warnings about harvesting restrictions.

Legal requirement	Interpretation	Recommended 'best practice'
Article 18 Traceability The traceability of food shall be established at all stages of production	This law enables recall of foods out of the food chain that are dangerous or contaminated. It requires food businesses to keep records showing who supplied them with any food products and those businesses to which they supplied food products. These records must be available to authorities if needed.	Transporters must keep clear records that show who supplied you with shellfish, and when, and who you then supplied with shellfish, and when. These records must be available to food authorities if needed.
Article 19 Responsibilities for food: food business operators If a food business operator considers or has reason to believe that a food...is not in compliance with the food safety requirements, it shall immediately initiate procedures to withdraw the food...and inform the competent authorities thereof.	This places an obligation on food businesses to recall, and/or withdraw food from the market if it does not comply with food safety requirements, and to notify relevant authorities.	Transporters must keep records for sufficient time to allow for recall of live crustacea or live crustacean products if a food safety problem is identified after sale. A recommended time is 3 months. If it is not possible to recall all affected live crustacea, the local food authority must be informed of the problem.
EC Regulation No. 852/2004	EC Regulation No. 852/2004 contains the basic rules for the hygiene of foodstuffs.	
Article 1.1 This Regulation lays down general rules for food business operators on the hygiene of foodstuffs, taking particular account of the following principles: (a) primary responsibility for food safety rests with the food business operator;	EC Regulation 852/2004 applies to transporters that handle live crustacea since it applies to all food handlers throughout the food chain including primary production. Each business operator in the supply chain is responsible for producing safe food. This includes fishermen, transporters, and wholesalers.	Transporters who handle live crustacea must comply with articles detailed below in ANNEX I PRIMARY PRODUCTION. PART A: general hygiene provisions for primary production and associated operations, if they handle more than 25 tonnes in any calendar year.

Legal requirement	Interpretation	Recommended 'best practice'
(b) it is necessary to ensure food safety throughout the food chain, starting with primary production; 2.This Regulation shall not apply to: (c) the direct supply, by the producer, of small quantities of primary products to the final consumer or to local retail establishments directly supplying the final consumer;	The regulation does not apply to transporters supplying small quantities to the final consumer or to local businesses who will supply the final consumer. Local businesses are those in the same or neighbouring counties. A small quantity is up to 25 tonnes of fishery products in any calendar year.	Transporters do not need to comply with Regulation 852/2004 if they handle less than 25 tonnes of live crustacea in any calendar year. However, there is still a legal requirement to ensure that food is safe.
Article 3 General obligation Food business operators shall ensure that all stages of production, processing, and distribution of food under their control satisfy the relevant hygiene requirements laid down in this Regulation. 6.Food business operators may use the guides provided for in Articles 7, 8 and 9 as an aid to compliance with their obligations under this Regulation.	The person responsible for the business is responsible for ensuring that all relevant legislation is complied with. This may be the business owner, manager, or employees if they make decisions about the operation of the business. Although you do not have to follow the advice given in official guides to good practice. Following the advice given can be used as evidence of legal compliance.	Transporters who are the person responsible for the business must ensure that all relevant legislation is complied with. Following the advice provided in this guide will demonstrate legal compliance.
Article 4 General and specific hygiene requirements 1. Food business operators carrying out primary production shall comply with the general hygiene provisions laid down in part A of Annex I and any specific requirements provided for in EC Regulation No. 853/2004.	Handlers of live crustacea are primary producers. They must comply with the provisions given in Annex 1. There will also be additional rules under EC Regulation 853/2004.	Transporters handling live crustacea must comply with the hygiene provisions in ANNEX I, PRIMARY PRODUCTION, PART A: see below.

Legal requirement	Interpretation	Recommended 'best practice'
Article 6 Official controls, registration and approval 6.1 Food business operators shall cooperate with the competent authorities in accordance with other applicable Community legislation or, if it does not exist, with national law. 6.2 In particular, every food business operator shall notify the appropriate competent authority, in the manner that the latter requires, of each establishment under its control that carries out any of the stages of production, processing, and distribution of food, with a view to the registration of each such establishment. Food business operators shall also ensure that the competent authority always has up-to-date information on establishments, including by notifying any significant change in activities and any closure of an existing establishment.	Food business operator must comply with any reasonable requests from your local authority. This may include requests for information and access to premises for inspection purposes. Food business operators must notify the local authority of your food business with 28 days of commencing production. The authority should supply you with the relevant forms. They will require details of your business including the processes carried on. Registration is to allow local authorities to plan their inspection duties effectively. Registration cannot be refused or revoked. Transporters should also inform their local authority within 28 days of any significant changes to their business. This will include changes of ownership, processes, or closure.	Transporters must comply with reasonable requests from your local authority. Transporters must contact their local authority about requirements for registration. Transporters must contact their local authority within 28 days of any significant changes to your business.

Legal requirement	Interpretation	Recommended 'best practice'
ANNEX I PRIMARY PRODUCTION. PART A: general hygiene provisions for primary production and associated operations I. Scope 1. This Annex applies to primary production and the following associated operations: (a) the transport, storage and handling of primary products at the place of production, provided that this does not substantially alter their nature; (b) the transport of live animals, where this is necessary to achieve the objectives of this Regulation; and (c) in the case of products of plant origin, fishery products and wild game, transport operations to delivery primary products, the nature of which has not been substantially altered, from the place of production to an establishment. II. Hygiene provisions 2. As far as possible, food business operators are to ensure that primary products are protected against contamination, having regard to any processing that primary products will subsequently undergo.	Transporters must protect live crustacea from contamination. Processes that remove contamination from the live crustacea, such as cooking, can be taken into account in deciding if a crab is contaminated.	Ensure that live crustacea are protected from physical, chemical, or biological contamination, such as cleaning fluids, fuel, metal, or glass. Keep all dangerous chemicals in locked cabinets. Use chemicals only in accordance with written cleaning schedules. Staff must be properly trained in their use. Take care not to contaminate your live

2.3.3 Transport

Legal requirement	Interpretation	Recommended 'best practice'
3. Notwithstanding the general duty laid down in paragraph 2, food business operators are to comply with appropriate Community and national legislative provisions relating to the control of hazards in primary production and associated operations, including: (a) measures to control contamination arising from the air, soil, water, feed, fertilisers, veterinary medicinal products, plant protection products and biocides and the storage, handling and disposal of waste; and	Transporters must comply with Community and national legislation to control hazards in primary production processes. Transporters must put in place procedures, to identify and control hazards.	crustacea with chemicals or other foreign matter. Clothing must be kept clean. Protective waterproofs should be washed down at the end of each day's operation. You must not smoke or spit in areas used for handling or storing live crustacea. Wounds on hands or exposed parts of the body must be covered with waterproof dressings. Transporters must wash their hands and gloves prior to handling live crustacea, particularly after going to the toilet. Transporters should control hazards using the information provided in section 6, Hazard Analysis. Ensure that only good quality seawater comes into contact with live crustacea. See Hazard Analysis, section 6, for controlling contamination. Dispose of all unwanted crustacea according to advice provided in Animal by-products legislation.
4. Food business operators rearing, harvesting or hunting animals or producing primary products of animal origin are to take adequate measures, as appropriate:		

2.3.3 Transport

Legal requirement	Interpretation	Recommended 'best practice'
(a) to keep any facilities used in connection with primary production clean and, where necessary after cleaning, to disinfect them in an appropriate manner;	Facilities used in connection with primary production must be kept clean and, where necessary after cleaning, disinfected in an appropriate manner;	Before loading and unloading live crustacea, the transporter must check the standard of hygiene of the facilities being used. Areas must be clean and not pose a contamination risk to live shellfish.
(b) to keep clean and, where necessary after cleaning, to disinfect, in an appropriate manner, equipment, containers, crates, vehicles and vessels;	Equipment, containers, crates, vehicles, and vessels must be kept clean.	Before transporting live crustacea, a transporter must check the standard of hygiene of the vehicle. Equipment and areas used for handling live crustacea should be hosed down with clean water or clean seawater. Where necessary, food-safe chemicals should be used to ensure adequate disinfection. More information is provided in Appendix I .
(d) to use potable water, or clean water, whenever necessary to prevent contamination;		Use clean water wherever possible to prevent contamination. Do not let potable or clean fresh water come into contact with live crustacea.
e) to ensure that staff handling foodstuffs are in good health and undergo training on health risks;	Staff handling foodstuffs must be in good health and undergo training on health risks	Staff must be trained on health risks. Training should ensure that all crew members have a clear understanding of the importance of high standards of cleanliness and the means of achieving them. Staff suffering from stomach upsets or diarrhoea must not handle fish until the symptoms have fully cleared. Further information regarding staff hygiene and training is given in Appendix I .
(f) as far as possible to prevent animals and pests from causing contamination;	Transporters must ensure that the presence of pests does not present a food-safety risk to the live crustacea. Any type of animal within shellfish handling/storage areas will constitute a pest.	Do not let animals come into contact with live crustacean handling/storage areas inside the vehicle being used to transport live crustacea.

Legal requirement	Interpretation	Recommended 'best practice'
(g) to store and handle waste and hazardous substances so as to prevent contamination;	Vehicles may be susceptible to infestation from insects and rodents. Hazardous substances or waste, which could contaminate live crustacea, must not be stored under conditions that could allow live crustacea to become contaminated.	Evidence of pests must be investigated and appropriate action taken. Any infestation of pests must be eliminated. Affected areas must be cleaned. Transporters should be made aware of the signs of pest infestation. Store cleaning chemicals in a dedicated storage area. Store waste in watertight containers in a separate storage area prior to disposal. For more guidance, see Animal By –Products legislation, below. Transporters must use only cleaning chemical suitable for food use. Cleaning chemicals should only be used in accordance with the manufacturers instructions Chemicals used for cleaning, pest control or other purposes should be kept in a safe place and labelled clearly so they do not pose a contamination risk.
III. Record-keeping 7. Food business operators are to keep and retain records relating to measures put in place to control hazards in an appropriate manner and for an appropriate period, commensurate with the nature and size of the food business. Food business operators are to make relevant information contained in these records available to the competent authority and receiving food business operators on request.	Food business operators must keep and retain records that relate to measures put in place to control hazards.	Transporters must keep records of any measures put in place to control hazards. More information is provided in Hazard Analysis, section 6.

Legal requirement	Interpretation	Recommended 'best practice'
EC Regulation 853/2004	This Regulation lays down specific rules on the hygiene of food of animal origin for business operators and supplement Regulation.	Transporters handling live crustacea must comply with relevant articles in Annex II, Section VIII, Chapter VIII Transport of Fishery Products.
Article 3 General Obligations 1. Food business operators shall comply with the relevant provisions of Annexes II and III.	Transporters must comply with the relevant provisions of Annexes II and III.	
2. Food businesses operators shall not use any substance other than potable water or where EC Regulation 852/2004 or this regulation permits clean water to remove surface contamination from products of animal origin.	Only clean seawater water should be used to clean surface contamination from live crustacean.	Transporters should ensure that only clean seawater comes into contact with live crustacea. Clean seawater should be extracted away from sources of contamination such as freshwater, oil and bilge effluent.
Annex II, Section VIII, Chapter VIII Storage of Fishery Products 4. Fishery products kept alive must e kept at a temperature and in a manner, which does not adversely affect food safety or their viability.	You should ensure that your storage and handling practices are designed to create the best environment so that the live crustacea do not become stressed or damaged.	Follow advice provided in section 3 and section 4 of this good practice guide to maintain the viability of live crustacea. Follow advice provided for EC Regulation 852/2004 so as not to adversely affect food safety.
Annex III, Section VIII, Chapter VIII Transport of Fishery Products 4. Fishery products to be placed on the market live	Transporters must not transport live crustacea under conditions that adversely affect food safety	Follow advice provided in section 3 of this good practice guide to maintain the viability of live

Legal requirement	Interpretation	Recommended 'best practice'
must be transported in such a way as not to adversely affect food safety or their viability.	or their viability	crustacea. Follow advice provided for Regulation 852/2004 so as not to adversely affect food safety.

Legal requirement	Interpretation	Recommended 'best practice'
Animal Health Animal By-products Regulation 1774/2002/EC	This regulation lays down rules for the collection, transport, storage, handling, processing and use or disposal of animal by-products. It aims to prevent these products from presenting a risk to animals or human health. This regulation applies to vehicles used to transport live crustacea since whole and parts of dead shellfish shellfish not intended for human consumption are classified as animal by-products.	Transporters of live crustacean must abide by Articles 4-6; and Annex 2, chapters 1, 2 and 3, see below.

2.3.3 Transport

Legal requirement	Interpretation	Recommended 'best practice'
Articles 4-6	This article specifies that any animal by-product not intended for human consumption must be disposed of through appropriate routes. There are three categories of animal by-product with specific regulations for each. Live shellfish that have died while being stored (or transported) are classed as mortalities, which are Category 2.	Whole and parts of dead shellfish must be disposed of through facilities approved for treating Category 2 animal by-products. You should contact your local authority (waste disposal department) to identify suitable disposal options in your area.
	Permitted storage and disposal methods include: iv) incineration (burning) v) rendering (heating) vi) composting (subject to approval). These activities must be carried out in approved premises.	You should contact your local authority (waste disposal department) to identify suitable disposal options in your area.
Annex 2, chapter 1, 2 and 3	These sections describe requirements for storing, transporting, and labelling animal by-products.	Animal by-product material must be stored in sealed new packaging (e.g. strong plastic bag) or covered leak proof containers. It must be labelled with information describing the date, type of material, origin, name, and address of origin. Material that has to be stored before it can be collected should be kept in a dedicated freezer until there is enough waste to make it economical to have it collected.

Legal requirement	Interpretation	Recommended 'best practice'
WATER Water Industry Act 1991 S141 Trade effluent is 'any liquid, either with or without suspended particles, which is wholly or partly produced in the course of any trade or industry carried on at a trade premises.'	Any water discharges from vehicles is classed as trade effluent.	Dispose of trade effluent according to guidance provided by your local authority or environmental regulator.
S118 Subject to the provisions of chapter III, the occupier of any trade premises in the area of a sewerage undertaker may discharge any trade effluent proceeding from those premises into the undertaker's public sewers if he does so with the undertaker's consent.	Trade effluent can be discharged into a foul sewer with consent from your statutory sewerage undertaker. Charges will apply. The sewerage company may prohibit the discharge of seawater into the sewer because the salt may disrupt the biological treatment plant.	Any waste water (trade effluent), including all vivier water, will require consent for discharge into any water or sewers. Consent can be obtained from local authority or environmental regulator. You will have to pay for discharging your waste water. Confirm that the local sewerage company will allow you to discharge vivier water into the drains.
The Groundwater Regulations 1998 Controls discharges of trade effluent to surface waters or groundwater.	Surface waters include rivers, lakes, lochs, reservoirs, ponds, streams, canals, ditches, coastal waters, and estuaries. Groundwater is all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. Consent will be required from the relevant environmental regulator.	In order to discharge directly into surface or groundwater you will need to get consent from the appropriate environmental regulator.

Legal requirement	Interpretation	Recommended 'best practice'
Water Resources Act 1991 S24 No person shall abstract water from any source or supply or cause or permit any other person to abstract any water except in pursuance of a licence granted by the authority and in accordance with the provisions of that licence.	Water abstraction is the removal of water from any source including rivers and coastal waters. If you abstract water, you will need a licence from your local environmental regulator.	Contact your local environmental regulator for a licence to abstract water.
Animal Welfare Welfare of Animal Transport Order 1997 Schedule 6, Article 4(7) Other vertebrate animals and cold-blooded animals shall be transported in such receptacles or means of transport, under such conditions (in particular with regard to space, ventilation, temperature and security) and with such supply of liquid and oxygen as are appropriate for the species concerned.	This legislation requires transporters of live crustacea to provide best biological conditions for all live crustacea during their transport.	Follow the general guidance provided in Section 3 of this guide, together with appropriate specific guidance provided in Section 4.
S4(1) No person shall transport any animal in a way, which causes or is likely to cause injury or unnecessary suffering to that animal.	During storage, live crustacea must be kept in the best possible conditions to ensure their maximum survival.	Follow the general guidance provided in section 3 of this guide, together with appropriate specific guidance provided in section 4.

Legal requirement	Interpretation	Recommended 'best practice'
Lobsters (Control of Deposit) Order 1981 The deposit in any area of water, (as designated in the order) of any lobster of the species <i>Homarus gammarus</i> or the species <i>Homarus americanus</i>, being taken from any shellfish bed outside that area of water, is prohibited.	You need a licence to put any American lobster (dead or alive) into UK tidal waters, adjacent fresh waters or ashore within one mile of these waters. The same applies to European lobsters not caught in UK waters, and European lobsters that have been in contact with American ones. This is to stop the spread of the Lobster disease <i>Gaffkaemia</i> from imported American lobsters to native European lobsters.	Please consult the relevant agency for details and guidance. England and Wales Department for Environment, Food and Rural Affairs (DEFRA) (Fish Diseases Laboratory at Weymouth) Northern Ireland Department of Agriculture and Rural Development Northern Ireland (DARDNI) Scotland Scottish Executive Marine Directorate (SEMD)

Legal requirement	Interpretation	Recommended 'best practice'
Fisheries Management	Live crustacea may not be kept, or sold if they are smaller than their statutory Minimum Landing Size (MLS). These sizes are set by EU and UK Regulations and also through Byelaws from Local Sea Fisheries Committees (England and Wales). There are also restrictions on landing of V-notched female lobsters and crawfish and the landing of berried females of some species. Please consult the relevant agency for up to date MLSs and other fisheries management restrictions. It is also illegal to land soft-shelled crabs, berried female crabs or crab claws.	Restrictions apply to sizes of shellfish, V-notched lobsters, and berried females of some species. England and Wales Department for Environment, Food and Rural Affairs (DEFRA) (Fish Diseases Laboratory at Weymouth) Northern Ireland Department of Agriculture and Rural Development Northern Ireland (DARDNI) Scotland Scottish Executive Marine Directorate (SEMD) Contact relevant agency for details.

3. General Principles and Guidance for Storing and Handling Live Crustacea

3.1 Introduction

Fishing is seen by many to be one of the last pioneering professions, hunting and catching a wild food. Indeed, whilst this is the case, fishermen are also working in the food industry to harvest an expensive food. As such, fishermen must recognise their duty of care for the catch for their customers. They are the first to handle and store crustacea and so have, perhaps, the greatest responsibility to set high standards. Thereafter, the crustacea may pass through several short and/or long term storage systems, ashore or during transport, before arriving at the market place. Each individual that handles and stores crustacea should try to follow good practice since the markets reward a good quality live product with good prices, but will reject poor quality or dead product. Good handling is free – it does not cost any money and you can only benefit.

The authors recognise that due care for live crustacea has to be balanced with the need for commercial operations to proceed at a realistic pace. However, it is certainly worthwhile to consider how practices are carried out and how they might be altered to improve handling and storage conditions. Generic guidance is the general advice that applies to all species and to all sectors that store and handle live crustacea. Some species need further detail to cover specific tasks, e.g. nicking crab claws or tube storage of Nephrops, and the relevant information is provided in the area giving detailed advice for the species concerned.

This section comprises five main sub-sections. Sub-sections 3.2 and 3.3 provide background information on crustacea and describe their biological requirements, whereas sub-section 3.4 and 3.5 provide guidance on best handling practices for handling and storage.

The last, sub-section 3.6, contains data sheets that provide a summary of the general information provided in sections 3.4 and 3.5, and describes the 'Ten Golden' Rules that you should follow when handling live animals.

3.2 Background to Crustacea

Crabs, lobsters, *Nephrops*, and prawns belong to a large class of animals called Crustacea. They are characterised by their hard outer shells (exoskeletons) and having five pairs of legs. The crustacea are very diverse and are found on all types of seabed (including free swimming species) and at all depths of the oceans. They are rarely far from shelter of some kind, whether a crevice under a stone or a burrow made in the mud. They can be active at any time but may well have patterns of activity that relate to tidal cycles or day and night. Typically, they emerge from shelter at night, or at dawn and dusk, to forage for food. Many are omnivorous consuming a wide range of marine organisms, including other crustaceans, molluscs, worms and fish. The Velvet swimming crab is exceptional as it also eats a lot of kelp seaweeds. However, most crustacea are generalist hunters and scavengers

consuming a diverse range of foods, and most have some capability to filter seawater for plankton, if necessary. The social hierarchy is complex and varies between species; some are generally solitary in habit whilst others, such as *Nephrops* (that tend to share a burrow), Crawfish (that form interacting social groups or 'herds', and Spider crab, (that form social 'mounds' during the breeding season) display more communal habits. For some species, such as lobster, competition for shelter and ritualised defending of a territory are important behavioural characteristics on occasions. All the commercially important UK species live in seawater, which is a very stable environment. There are a few freshwater species, but they are beyond the scope of this guide.

As an environment, the sea provides:-

- Temperatures generally between 5–16°C with changes in temperature occurring slowly.
- Salinity of 30–35 parts per thousand or grams of salts per litre of water.
- Oxygen (although levels of dissolved oxygen in seawater [measured in milligrams per litre] is low, even at 100% saturation, compared with freshwater or air at the same temperature).
- Cushioning from vibration and shock.
- Shading from bright light.
- A way to get rid of soluble waste products.

There are of course exceptions to these stable conditions especially for species that may be found along the shoreline. However, most exploited species are generally found in deeper water where conditions are more constant. The general principles of good storage and handling practices are based upon mimicking, where possible, the 'natural conditions and environment' that crustacea inhabit.

3.2.1 Stress in Live Crustacea

Crustacea suffer stress when subjected to changes in the conditions in which they live. Storage conditions should be a place of shelter where live crustacea can rest, acclimatise to the new conditions, and reduce their use of energy reserves. Even a single cause of stress may have many broad ranging effects that can lead to a consignment of crustacea dying before they reach their final market place, which means loss of money and reputation for the producers.

A single stress can have many interrelated effects such as:-

- increased stress hormone levels
- depletion of energy reserves
- increased use of oxygen
- increased excretion of waste products
- re-absorption of ovary and thereby tainting of the flesh
- reduced ability to fight disease
- development of disease and eventually death

Stress, caused at any point in the journey from fishing vessel to customer, may not result in death until many hours later. However, it should be understood that where customers are experiencing mortalities amongst a consignment of crustacea it is a reflection upon all concerned - fisherman, exporter, importer and transporter.

Sources of stress are of concern to everyone that handles and stores live crustacea. Each stress or condition that can contribute towards the mortality of live animals will be visited in turn. Each section starts with an introduction to explain their biology and physiology followed by the implications for storing and handling. It will very quickly be apparent to the reader that many of the factors interact so that no one factor can be taken in isolation. The storage and handling of live crustaceans needs skilled and well trained people.

3.2.2 Common and Latin Names of Live Crustacea

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name, either written in *italics* or underlined, that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name and/or the FAO 3alpha code (see the table overleaf).

Common names, Latin names, and FAO 3 alpha codenames for live crustacea common to UK fisheries and/or markets. FAO codes from www.fao.org using the February 2004 edition.

Species	Common Name	Latin Name	FAO 3 Alpha Code
Crabs	Velvet swimming crab	<i>Necora puber</i> (although previously known as <i>Macropipus puber</i> or <i>Liocarcinus puber</i>)	LIO
	Brown crab Partain Edible crab	<i>Cancer pagurus</i>	CRE
	Green crab Shore crab	<i>Carcinus maenas</i>	CRG
	Red crab	<i>Chaceon affinis</i>	No record in February 2004
	Harbour crab Swimming crab	<i>Liocarcinus depurator</i>	IOD
	Harbour crab	<i>Liocarcinus holsatus</i>	No record in February 2004
	Harbour crab	<i>Liocarcinus corrugatus</i>	ICC
	Atlantic Spider crab	<i>Maja brachydactyla</i> (Previously <i>M. squinado</i>)	SCR
	Squat lobster	<i>Munida rugosa / sarsi</i>	No record in February 2004
	Mud crab	<i>Scylla serrata & spp</i>	MUD (further codes for related species)
	Chinese mitten crab	<i>Eriocheir sinensis</i>	ERS
Lobster	Crawfish	<i>Palinurus elephas</i> <i>Palinurus mauritanicus</i>	SLO PSL
	European Lobster	<i>Homarus gammarus</i>	LBE
	American Lobster	<i>Homarus americanus</i>	LBA
	Prawn (in Scotland) Dublin bay prawn Langoustine Scampi (tail only section)	<i>Nephrops norvegicus</i>	NEP
Shrimp/ Prawn	Brown shrimp	<i>Crangon crangon</i>	CSH (further codes for related species)
	Common prawn	<i>Palaemon serratus</i>	CPR

3.2.3 Capture Methods

Introduction

The method that is used to capture live crustacea can have a great impact upon survival. Stress and damage caused at this point will weaken the animals for handling or storage thereafter. Fishers therefore have a very important part to play especially as stress and damage may take time to have an effect, i.e. when in the keep pot, shore-side holding tank, or vivier lorry.

Trap fisheries (creel, lobster pot)

A trap of some type has been and remains the favoured method for catching live crustacea. Their design relies upon the simple principle of using food bait to entice crustacea into the trap through an entrance that allows entry but not exit.

Creels have been filmed on the seabed as they fish. There is considerable interaction between individual crustacea and between species when trapped in the creel. Some individuals and species will dominate a creel depending on factors such as: size, sex, moult status, and breeding status. These

interactions can lead to stress and or shell damage if fighting occurs. Parlour creels can help to alleviate these issues because the second chamber, without bait, allows the animals to move away from the bait when they have stopped feeding. Escape gaps or larger mesh net may be used on creels in order to allow undersized or unwanted by-catch species to escape. To do so may help to reduce stress and damage in the portion of the catch that will be retained and will also help reduce handling when clearing the creel on the fishing boat. Escape gaps can be of limited use when prosecuting a mixed fishery.

Fishers can also consider trying varied soak times (the time elapsed between laying the baited creel and lifting it to empty the catch). The ideal soak time will depend on many things such as season, tide, weather, bait used, creel design and species, moult status breeding status and access to the grounds. Each fisher will have to make a judgement as to the best soak time for their situation, to ensure a good catch, but not to allow the creel to become overfull that will lead to stress and damage in the catch.

Crustacea can be very difficult to remove from the creel, cramming themselves into corners, and holding on with legs and claws. This is frustrating for fishermen, especially with brown crab, often leading to force being used, and this, in turn, may result in leg and claw damage. A smooth plastic insert to cover the base of the creel may well help to reduce the potential for crabs to get a grip.

Accept when a crustacean has been damaged and return it to the sea.

Trawl net

Live crustacea are usually caught with traps and can attract a premium price. Trawlers targeting live *Nephrops* markets are attracted by the higher return and making progress towards a live, trawl-caught *Nephrops* product.

Tangle net

Tangle nets, which are nets often set on or near the seabed to capture fish or crawfish, can also capture other species of crustacea destined for the live market. Great care must be taken when removing the crustacean catch from the netting as damage can easily occur, particularly due to the cutting effect of monofilament under tension; it is good practice to place the animals into a bin, still wrapped in the netting, until the entire net has been lifted. It is understood that this practice may be necessary for safety reasons, but the crustacea catch can be easily stressed by being placed upside down, fighting, exposed to sunlight, or by direct heat stress.

Accept when a crustacean has been damaged and return it to the sea.

3.3 Biological Impacts – How Crustacea Live

3.3.1 Oxygen

Crustacea have feather-like gills to obtain oxygen from sea-water. The gills (dead men's fingers) are thin-walled structures that are well supplied with blood vessels, situated in chambers to either side of the head under the carapace (the 'head' section of the shell). Oxygen is absorbed from and carbon dioxide transferred to the surrounding water from the blood through the gills. Water is drawn into the gill chambers at the base of the legs, passes over the gills and it is then pumped out of the gill chamber by the gill bailer situated beside the mouthparts. The direction of the water flow through the chamber can be reversed, if necessary, to clear particulate matter that may have settled on the gill surfaces. The gill bailer can be seen beating rapidly and creating a current of water from the mouthparts.

Crustacea have the ability to survive for some time out of water; however, when in air the animals may appear to be blowing bubbles, which they use to keep their gills moist and thereby allow some exchange of oxygen. However, this leads to a build up of waste products in the blood and gill chamber, which are released rapidly when the animal is returned to seawater. Storing crustacea out of water will dry out the gills causing damage that can prevent animals from recovering when re-immersed and this can result in high mortality.

Crustacea have also developed a short term capability to cope with water that has low concentrations of dissolved oxygen. However, low levels of dissolved oxygen leads to a build up of waste products in the blood and this will weaken the animal.

3.3.2 Impact of Oxygen Factors on Storage and Handling

Maintain levels of dissolved oxygen in seawater holding systems

- The level of dissolved oxygen in seawater can be low so aeration of the seawater in storage tanks, where stocking densities are much higher than in the wild, is essential. Aerate to prevent oxygen saturations falling below 95%.
- The aeration of a storage vessel should be at a depth of at least 1m (or less if shallower, but at the bottom of the tank in any event) and a good quality diffuser is required to generate small bubbles and ensure good transfer of oxygen to the seawater. Smaller bubbles increase the transfer of oxygen.
- Aeration of the seawater is particularly important when returning crustacea to water after a period out of water because the animals will have a greatly increased oxygen demand for a few hours.
- Cool seawater can contain more dissolved oxygen than warm seawater. Aeration can help increase the concentrations of oxygen in both.

- The rate of oxygen consumption by the animals will increase as a result of many factors associated with storage and handling such as, rapid temperature changes, stress, overcrowding, limb loss, being dropped etc.
- Consideration must be given as to how water, and aeration if used, is to be circulated to the centre of a container of crustacea. Airlines and/or water supply pipes may need to be laid into the container at the bottom and/or during the filling of containers or tanks.
- Those with experience in holding lobsters have found that oxygen needs to be maintained at around 8mg/l. Excessive aeration in order to massively boost oxygen levels is not recommended as it can reduce survival (gas bubbles form on membranes) and lead to high turbulence (*Nephrops* are particularly susceptible to reduced survival when aeration is used). Oxygen levels should not be allowed to drop below 6mg/l as then the lobsters will be in a weakened state, they tend not to molt successfully, the healing of wounds does not occur and survival during onward transport is low.

Maintaining fully functional gills in live crustacea

- Crustacea breathe using gills that need to be in seawater or damp conditions. Gills must be kept wet. They are damaged irreparably if allowed to dry out.
- If dry transport must be used then ensure that crustacea are carried in a cool, damp environment and the 'right way up' so that the water on the gills evaporates very slowly.
- The gill chamber can become clogged and choked with mud, fine sand and silt. Clean water should be used in storage systems, and keep pots must be laid on suitable seabed that is not too muddy.
- The gill bailer is positioned besides the mouthparts and can be seen beating to create a current in the water. It is one of the last signs that a crustacean is alive, even when the legs and tail have drooped.

Risks after a period of time out of water

- When crustacea are stored out of water metabolic, waste products will accumulate in their blood as they use mechanisms to survive with low oxygen concentrations. Those survival mechanism adversely affects their condition, quality, survival rate and the taste and quality of the eaten product. The crustacea will remove waste products through their gills if returned to water, but this will affect water quality. Biological filters in re-circulation systems will take time to remove the waste products. In through-flow systems, the rate of water turnover may need to be increased.

3.3.3 Growth and Moulting

The hard shell (exoskeleton) of crustacea limits the room for growth so they have to moult (cast, shelling) to allow further growth. Moulting is a major

event in the life cycle of crustacea, affecting behaviour and quality due to the preparation that is necessary for the moult and recovery afterwards. Prior to moulting (remould), a new soft shell slowly forms underneath the old one. Eventually the crustacea is ready to moult. The body tissues absorb water causing the animal to swell and the old shell to rupture at the joint between the head (carapace) and the tail (abdomen). The animal then withdraws its head, legs and claws from the front part of the shell, and then extracts its tail from the abdominal section. Immediately after shedding the old shell, the animal is so soft that it is unable to stand up, walk, or defend itself. It is very vulnerable and would have sought shelter, before moulting, as protection. The actual casting of the old shell takes less than an hour. The body tissues absorb more water causing the soft new shell to stretch before it begins to harden, which can take up to several weeks. During the moulting period the texture of the flesh is extremely watery and animals are very susceptible to damage and stress, and display high mortality if handled. In the period between moults (inter-moult) the water absorbed at moulting is replaced gradually by body tissue. Adult crustacea moult usually once every one or two years whereas juveniles moult up to ten times in a year.

Impact of growth and molting factors on storage and handling

- Some crustacea will take cues to time their moult, typically moulting at or near peak spring tides i.e. full moons. These cues can still operate when the animals are in tanks in buildings.
- Crustacea that are preparing to moult or are recovering from a moult have high energy demands and therefore readily enter pots and creels to feed.
- Wild populations will have peaks in moulting, typically males in spring and females in early summer, during which time the quality of the catch will be poor.
- Crustacea that have recently moulted will be of poor quality for a number of reasons:-
 - Weakened and not able to survive stress.
 - Feel lightweight and contain flesh that is watery and unsuitable for sale.
 - Need feeding in storage that can lead to problems of water quality.
 - Their shell is thin and weak so that they are easily cracked or punctured.
- Animals that are likely to undergo moulting during long term holding should be kept in isolation to avoid cannibalism.
- Avoid landing and storing crustacea that are preparing to moult or are recovering from a moult.

3.3.4 Temperature

Crustacea are cold-blooded animals adopting the same body temperature as their surroundings. Their level of activity and oxygen consumption are related to the temperature of the seawater so that low temperatures lead to low levels

of activity, low demands for energy (food) and low oxygen consumption. Paradoxically, seawater at low temperatures can have a greater amount of oxygen dissolved in it, and therefore available to the animals, than warmer seawater. Low temperatures during dry storage will reduce evaporation that can dry out the gills. Using ice to cool live crustacea will be too much of a shock and risks killing them. Freshwater ice will also affect salinity. Ice should only be used in an indirect way, i.e. sealed in plastic bags and floated in vivier tanks to cool seawater in the summer, or ice packs/chilled gel packs to chill the air within dry transport containers but not in direct contact with the crustacea.

The opposite applies to warmer storage conditions; activity increases using more energy, while oxygen use increases but the level of dissolved oxygen in seawater decreases. Water loss through evaporation becomes a major problem during dry transport.

Impact of temperature factors on storage and handling

- Crustacea cannot control their internal temperature so need to be protected from sources of heating and cooling.
- Any changes of temperature need to be slow because crustacea do not experience rapid temperature changes in their natural environment.
- Heat from the hands of those handling the animals can warm and stress them, particularly if handling is frequent.
- Rapid and frequent changes in temperature are a killer. Maintain a cool temperature throughout the handling chain.
- Cool water has more dissolved oxygen in it than warm water.
- Cool crustacea:-
 - use less energy and need less feeding.
 - are less likely to fight.
 - are less likely to molt.
- Direct icing, i.e. covering live crustacea with ice will cause thermal shock that will kill them. Indirect icing is more appropriate i.e. floating ice in a sealed container or plastic bag in a vivier tank or ice packs/chilled gel packs to chill the air within dry transport containers can be used to cool temporary storage systems.
- Be aware that aeration on a warm summer's day or from a compressor that inadvertently heats the compressed air will have a considerable warming effect on seawater. Consideration should be given to cooling/chilling the compressed air i.e. water bath.
- A reasonable temperature to aim for is 4-8°C.

3.3.5 Feeding

Crustacea in good condition and held in correct storage conditions can live for several months without feeding, especially if kept at low temperatures (less than 10°C), but this is not to be recommended. Meat quality and flavour can

deteriorate, even after a few weeks without feeding, if animals are not stored properly. Crustacea cannot be held indefinitely without food. Crustacea use their energy reserves much more quickly if they have to remain active because of disturbance (i.e. grading, handling, fighting, high temperature, overcrowding, lighting etc). Fish provides an ideal food but it should be fresh or frozen rather than the heavily salted preserved fish suitable for baiting lobster pots. Fish that has started to 'go off' may be good bait for lobster pots, but it is very unsuitable for feeding stored crustacea. It has a high bacterial count and great potential to pollute the water, especially in a recirculating seawater system. It is also essential to develop a good stock management system to ensure rotation of stock and avoid holding animals for too long. Live crustacea that have been fed during storage should be prepared before onward transport. When fed, a number of actions occur; the digestive process increases the demand for oxygen and increases the need to get rid of soluble waste products through the gill and insoluble waste in the faeces. These reactions to recent feeding will degrade water quality within small and highly packed tanks of a vivier lorry. These issues of waste are even more critical for crustacea destined for dry storage or transport because passing soluble waste through the gills relies on being in water. Pre-treatment involves stopping feeding 2-5 days in advance of onward transport so that the digestive system can be cleared and waste products purged whilst there is adequate seawater to do so.

Impact of feeding factors on storage and handling

- Different species have different energy requirements (see species specific guidance).
- Feeding crustacea in a storage system will be necessary if storage is for more than two weeks.
- Any disturbance relating to grading, handling, fighting, high temperature, overcrowding and lighting stress will increase their energy usage.
- Feeding crustacea will have a detrimental impact upon water quality, caused by uneaten food and waste products from digestion. Ensure that biological filters can cope with this load and/or that a through-flow system has sufficient through put.
- Crustacea should be starved as a pre-treatment to vivier or dry transport. This will reduce their need for oxygen and their need to release waste products that will decrease water quality and could affect flavour qualities.

3.3.6 Illumination

Crustacea live in an environment with low levels of light and typically inhabit shelters, burrows, under overhangs of rock, under boulders etc that are well shaded or dark. Crustacea are mainly nocturnal animals and, as such, do not like strong light; normally, they do not experience bright daylight as light is absorbed as it passes through seawater. Consequently, the shock of sudden bright light can stimulate crustacea to try to move quickly away into shade. In doing so, stress levels increase, energy reserves are wasted, oxygen use increases and localised overcrowding in the shady areas can occur.

Impact of lighting factors on storage and handling

- Keep catch in the dark or at least in the shade and covered with wet blanket or carpet.
- Dim lighting (ideally red) over the storage area during the day is best. Some holding systems are all but in the dark.
- Safe working conditions may require supplementary lighting. Lighting should be switched on gradually and used only when working in the immediate area.
- Avoid sudden increases in light levels. Ideally, dim lights should be on a time switch so that they come on first, before the brighter lights.
- Light is a daily and seasonal cue. Try to avoid disrupting these cycles when using artificial light i.e. avoid using the main lights during night time or first thing in the morning. Torches can be used to minimize disturbance.
- Some form of shelter or a shaded area in a storage tank will allow the crustacea freedom to avoid light.

3.3.7 Vibration, Impacts and Electricity

The seabed can be a 'noisy' place along the shoreline but tends to be 'quieter' in deeper water. Storage and handling of live crustacea can easily lead to physical shock and vibration leading to stress. In addition, constant levels of 'un-natural' and unfamiliar 'noise' frequencies can cause stress.

Impact of vibration, impacts and electricity on storage and handling

- Staff must never throw or drop crustacea (see general handling for details and explanation).
- Boxes keep pots, keep bags etc must be handled with care rather than roughly moved about.
- Storage facilities must be designed to minimise the transfer of noise and vibration from pumps, motors, and compressors to the storage tanks.
- Some stages of the storage systems i.e. at sea and on a vivier lorry will unavoidably involve vibration so consider what other stresses can be reduced at this time.
- Some operators of holding systems have found that electric welding can affect survival of crustacea, principally lobster. Whilst unconfirmed, it may be appropriate to consider other operations bordering a holding system, such as power sub-stations and operations generating electric fields etc.

3.4 Storage Methods

3.4.1 Storage of Crustacea Out of Water

Dry storage of crustacea is advisable only for short periods of time, but may be essential for reasons such as vessel stability, during capture and landing, need for dry transportation or for airfreight. When crustacea are stored in dry

conditions, they retain toxic waste substances in their blood. Best practice should be followed during dry transport if quality is to be maintained.

Ideal conditions for dry transport should be-

- Dark
- Cool
- Damp
- Protected from drying out

These conditions can usually be met with innovative solutions such as:-

- Keeping the crustacea in fish boxes that are covered with a carpet or sacking and regularly drenched with seawater.
- Using 'tube' arrangements, as is done by the *Nephrops* creel and trawl sector. Lemonade bottles can be used very effectively to create a tube matrix for lobsters.
- Using a sprinkle tank whereby a small amount of water is sprinkled over the crustacea in a through flow system, although a recirculating system whereby the water drains to a sump and is then reused can also be used. It is important to ensure that the system remains cool and oxygenated if recirculating the water.
- The Canadians have been air-freighting lobster to London for some time. Their lobsters are transported in a lightweight, reliable, single-use, dry transport system that is acceptable to aircraft operators. A waxed cardboard box contains 8 lobsters in a matrix of dividers. The lobsters are held head uppermost. Each box contains a sachet of a gel that has been chilled. In doing so conditions are maintained cool, dark, and damp.
- Dry transport conditions have the risk of damage by crushing from the weight of other crustacea or by stacking boxes. Operators should consider how protection can be given.
- Crustacea can be stored for a few days in bottom of the fridge provided that they are covered with damp newspaper to prevent drying out.

Suitable containers for dry storage

Special consideration should be given as to the containers that are used to hold live crustacea. Local practices vary greatly according to vessels and quayside set ups; bongos (half a 45 gallon plastic drum), fish bins, nesting fish boxes, fish baskets, keep creels etc are examples. There are some underlying considerations for any container that is to be used: -

- Legs and claws are easily cracked and broken off if holes in the containers allow limbs to protrude.
- The containers should be robust enough to withstand any crushing force that may occur due to stacking. There may be occasions where people will need to walk over containers of crustacea, i.e. on a small fishing vessel, but this should be discouraged whenever possible. Containers

must be robust enough to withstand a crewmember standing on them without causing any damage to the crustacea. Damage to the carapace of crustaceans, such as cracks or crushing, will be fatal. This is particularly relevant to nest and stack boxes that can crush a catch if stacked in the wrong manner.

- Containers should not be so deep that the weight of stock risks crushing animals in the bottom of the container.

3.4.2 Seawater Supply to Storage Systems

Storage facilities for live crustacea fall into 3 main types; at sea, shore-based through flow, and shore-based recirculating systems.

At sea

- Small coastal inlets that have a fence or dam to retain the crustacea.
- Keep creels stored on the seabed.
- Mesh bags suspended from boats or floats.
- Rafts with cages beneath.
- Vivier tanks aboard fishing boats.
- *Shore-based tanks with an open supply of seawater pumped directly from the sea into the tanks and then returning to the sea via an overflow.*
- *Shore-based tanks, including vivier lorries, retail and catering display aquaria, with a closed system to recirculate seawater within the system. A biological filter (biofilter) is typically incorporated that contains a suitable medium for healthy bacteria to grow and cleanse the seawater (see relevant section on biofilters). Vivier lorries do not have a biofilter. Most recirculation systems periodically require a partial water change with seawater, from the sea or artificial salt mixes, or freshwater (caution of chlorine, which can damage the gills) to maintain the correct quantity of water and make allowance for evaporation increasing salinity. Tiered raceway systems rely upon water entering into the top tier of the raceway and then cascading down through the raceways underneath. Raceways are an extremely effective method of storing crustacea since they allow easy organisation and access to the stock but experience has highlighted the need to monitor water quality diligently.*

Several underlying principals apply to the supply of seawater to the systems listed above.

- It is important to monitor the salinity of water coming into, as well as within, a holding system since increases or decreases may occur. The salinity of seawater around the UK is generally about 32-35‰ (parts per thousand i.e. 32-35 grams of salt in 1000 grams of water (1 litre)). This can be measured with inexpensive optical salinity meters.
- Freshwater is less dense than seawater and can form a layer that floats upon seawater. Heavy rain, discharge pipes and rivers flowing into the sea can all contribute to this phenomenon. Poorly placed seawater extraction

pipes or sites for a floating keep creel will expose the catch to reduced salinities and thereby stress the animals.

- The surface layers of seawater are warmed during summer weather and become less dense than deeper waters. The warm layer will contain less dissolved oxygen (see sub-section 3.3.1 covering Biology - Oxygen) and plankton blooms in this layer can also affect water quality. Once again, a poorly placed seawater intake or floating keep creel will lead to a loss in quality.
- All these storage methods depend upon the best quality seawater. Harbour water is not suitable since diesel and bilge water as well as antifouling paints and the pumping of boats heads may well contaminate the water and that will, in turn, contaminate the stored crustaceans. These factors must be considered at all states of the tide.
- Silted seawater can be a major problem for storage systems. Pumps, pipes, storage tanks and crustacea can all become clogged with silt so it is advisable to fit a filter.
- Seawater extraction pipes and pumps can become fouled with live barnacles and mussels or seaweed debris. This fouling can be expensive to remedy. Ideally seawater would be drawn from a well in a sandy beach, the sand filtering the seawater (caution, the seawater from a sand well may be low in oxygen or contain high levels of hydrogen sulphide and therefore need thorough aeration before use). Alternative solutions are to have two systems so that pumping can be routinely switched from one to the other to allow maintenance and removal of growth. It may be possible to avoid extracting seawater at the time of year when barnacles and mussel larvae are settling out from the plankton (this will vary locally but typically mid-late April in UK). Regardless, all pipe routing should be designed to have the minimum number of turns or constrictions and incorporate rodding points to access all areas of the system. Routine rodding and disassembly to clear pipework and pumps might be necessary as part of routine system maintenance.
- The aeration of a storage vessel should be at a depth of at least 1m (or less if the tank is shallower); using a good quality diffuser to generate small bubbles and ensure good transfer of oxygen to the seawater. Vigorous aeration also assists with 'skimming off' protein that forms a white bubbly scum on the water's surface. This is not a 'fault' with your system. This proteinaceous scum or foam should then pass away down stand pipes or outfall pipes. Specific protein skimmers can be made or purchased.
- Water quality parameters should also be monitored especially if there is doubt as to the quality of water supply or the holding facility is relying upon a newly commissioned filter system. Monitoring temperature, salinity, dissolved oxygen concentrations, ammonia, nitrite, nitrate, and pH are recommended, but advice must be sought as to the limits. Records of water quality parameters and notes on stock behaviour and survival should be maintained so that comparisons can be made over time.

3.4.3 Filtration of seawater

Filtration is an essential component of any holding system.

Mechanical filtration

Mechanical filtration applies to all holding systems and removes insoluble, particulate matter from the seawater. In a through flow system or vivier tank, on a vessel or in a lorry, mechanical filtering prevents seaweed, sand, gravel silt and unwanted species entering the system. In a recirculating system a mechanical filter is the first stage in filtration and removes accumulation of faeces, hatched larvae, cast limbs etc. This crude filtration may consist of a sieve arrangement followed by filter mats (e.g. fibre-mats) and settling tanks. Fibreglass roof insulation is not suitable as it may be treated chemically and it also poses a risk to operator health. Mechanical filters need to be regularly checked and cleared as necessary as they can easily become choked.

Biological filtration

Biological filters rely upon healthy bacteria to remove dissolved compounds such as ammonia and nitrite. Only recirculating systems need to have these filters. Crustacea produce ammonia as a highly toxic waste product, especially after prolonged exposure to the air. High levels of ammonia will also affect the pH (a measure of acidity and alkalinity) and that, in turn, also affects other aspects of seawater chemistry.

Bio filters rely upon having a very large surface area for the bacteria to grow on and digest the waste from the crustacea. Some of these bacteria, called Nitrosomonas, eat the ammonia and excrete nitrites in a process called 'nitrification'. Nitrites are very toxic, but another type of bacteria, Nitrobacter ingests the nitrite and excrete nitrate, which is much less toxic to crustacea than ammonia or nitrite. The large surface area is created by filling a container with a suitable material for the bacteria grow on its surface; examples include cockle, oyster or barnacle shells, pieces of foam, pieces of plastic, kitchen pan scrubbers, coarse sand, commercially available products or marble chips. The marble and shells help to buffer the pH of the seawater the biofilter may contain either entirely one medium or a series of layers typically finishing with the finest medium at the bottom. Critically the filter media must have air spaces to allow the 'good' bacteria to work effectively. Used seawater trickles into top of the filter, trickles through the media, and drains out at the bottom, hence the name 'gravity percolation biological filter'. (These biofilters work on the same principal as the gravel beds seen at sewerage treatment works). Such a filter will remove the 'nasties' and a simple 'waterfall' at the bottom will help to oxygenate the water. Biofilters may heat the water slightly and work better at warmer temperatures; operators need to monitor water temperatures in and out of their biofilters since maintaining low temperatures is key to high survival of live crustacea. Biofilters come in different designs and pressure drums containing sand or cartridge type filters can also be purchased but these are both expensive, suit very small-scale operations and require frequent replacement or maintenance if they become blocked.

New biofilters need to be inoculated with 'good' bacteria, these can be purchased as starter cultures from suppliers or substrate from an existing filter can be introduced to the top of the new biofilter. It will take a period of time, 3 days to 5 weeks, for the biofilter to establish a capacity to cleanse the water. The operator should take this opportunity to monitor and record the water quality parameters (oxygen, pH, ammonia, ammonium, nitrites, nitrates, temperature, salinity, flow rates etc) during the start up period so that they can learn how their system works and then to compare these values to those they are able to obtain from good quality seawater.

Ultraviolet (UV) filtration

UV filtration is not always considered essential for live crustacea holding although the UV treatment will destroy bacteria that are in the water and this will promote stock health, thereby suggesting it is best practice in recirculation systems. Some operators also use them to help ensure water clarity, by preventing bacterial blooms, if customers are viewing the crustacea. The UV filter is a maintainable unit, containing the UV light tube, a protective glass sleeve (so that water does not contact with the electrics) and the outer casing that is placed in the plumbing after the biological filter in a recirculating system. If used, it is essential that they are maintained in accordance with manufacturer's recommendations if they are to function effectively.

Materials for construction of holding tanks

Careful consideration needs to be given to the materials used in the construction of tanks for storing live crustacea. Any new system must be flushed through with freshwater and then seawater several times before commissioning. It will be essential to talk to manufacturers to ensure that products are non-toxic to the crustacea and humans, and that the product can cope with the extreme conditions; varied salinity, periods of drying when empty, cleaning chemicals, prolonged periods of being full of seawater, contain considerable weight of water. Use 'food grade' materials where possible.

Properties of materials used in the construction of holding tanks

Material	Suitability	Comments
Glass	Yes	Ensure that sealants are non toxic. Use ones made for aquaria – others are toxic.
Aluminium	Yes	Can be expensive. Needs to be a suitable grade for seawater. Will it have electrolytic action with any other parts in the system?
Stainless steel	Yes	
Copper, bronze, brass, lead zinc i.e. sacrificial anode	No	Heavy metal issue with seawater and foodstuffs.
Fibreglass and epoxy resins	Yes	Caution is needed with polyester resin, as it may leak styrene into the holding system. If it is a recirculating system, the styrene can accumulate to toxic levels. Epoxy resin leaches fewer chemicals, but is more expensive than polyester. In either case the tank system should be thoroughly flushed to ensure removal of all toxic lactates from the resin.
Wood, bare natural and plywood	Yes	Wood is a good material for a making a cheap tank for a trial. Marine plywood products are ideal. Ensure that glues are non toxic.
Wood treated with preservative	No	Could be used to provide structure but not suited for containing water due to the preservatives.
Paints	Some	Talk to paint manufacturers to ensure that the product is suited to the application and that it is non toxic and if possible 'food grade'.
Plastics, often used for pipework	Some	Ensure that any plastic cements/glues are non toxic. Food-grade vinyl tubing or PVC pipe. Ensure that glue doesn't collect inside the pipe joins and after drying flush with freshwater.
Cement/concrete/block work	Yes	Suitable for open through flow systems. Cheap and readily modified but will need to be lined for closed recirculating systems due to potential leaching of aluminium and other metals that may be in the sand used to make the cement.
Netting	Yes	Rigid plastic netting or fishing netting taut over a frame can be used to provide 'shelving' within a tank to increase the 'floor space' for crustacea whilst allowing water to still circulate. Check for toxicity.

Tank shape is of little consequence. The 'rounding' of any corners can help to enhance water circulation and prevent the build up of debris or crustacea in corners. Providing some forms of shelter may help to reduce stress during longer term storage, i.e. stacks of pipes, upturned roofing tiles (remove any metal fittings).

3.4.4 Storage Methods for Retail, Food Service and Consumers

Food service, retail, and to a lesser degree consumers, still have a duty of care to keep live crustacea in the highest quality conditions possible in order to maintain the quality of the eaten product. The '**10 golden rules**' (section 3.6) still apply, although it is recognised that complex seawater-filled vivier systems, as discussed elsewhere in this guide, may not be appropriate. Simple seawater tanks or aquaria containing artificial seawater, aeration and simple biological filters, of the kind that are available from marine aquaria suppliers, can be very effective for low density, short-term storage and display, if properly maintained.

For dry storage, Brown crabs and lobster will stay alive for three to four days provided that they are kept cold and damp, ideally in the bottom of a fridge, and covered with a damp cloth (i.e. damp, dark, cool, quiet). They must be checked about three times a day to see that they are still capable of some movement. An indication that crustacea are no longer alive is the lack of voluntary movement - in particular the paddling motion of the gill bailer just to the side of the mouthparts (they can be easily seen to beat vigorously in live crustacea), and the eyes failing to respond to touching. Storage out of water is only suitable for short periods of time due to the increase in retained metabolic by-products, which may taint the meat.

The best approach is to buy or source the live crustacea on the day, or the day before, you plan to have the meal. In general, if animals die they should be discarded unless the operator can be absolutely certain that they will pose no risk to human health; under these exceptional circumstances, it may be permissible to cook them immediately provided that there are no unpleasant 'off' odours. If in doubt, throw it out! Green crabs are the best species for dry storage since they will survive, even out of the fridge, longer than any other live crustacea as they live inter-tidally in nature.

Live prawns, *Nephrops*, Spider and Velvet crabs do not survive well out of seawater, quickly developing unpleasant 'off' odours and flavours. It is best to buy them when they will be used within a matter of hours.

3.5 Handling Live Crustacea

3.5.1 Pre-treatment before Handling and Onward Transport

Activity in live crustacea reduces as the temperature is decreased. At low temperatures animals can be easier to handle and any handling should be less stressful. Their reduced activity will also reduce the amount of waste products that they release, and a period of starvation (24-48hrs) will also reduce their production of waste products. The gradual reduction in temperature and a period of starvation should be considered as pre-treatments for vivier transport or dry transport (including air freight) because there is a reduced opportunity for the animals to get rid of waste products under these transport conditions.

3.5.2 Initial Handling by Fishing Gear and Fishermen

Initial handling by the fishermen is critical to ensure good survival and quality thereafter. The greatest increase in stress is likely to occur from the point that the fishing gear captures the crustacea, in the case of mobile gear and static nets, or when the catch is emptied from the creel. Crustacea readily lose their claws and legs, and since mutilated or 'crippled' animals are less valuable, it is important to use care when removing the catch from the net or creel. Some creels and pots incorporate a solid base to try to prevent claws and legs getting a firm hold. When withdrawing a crab from the creel, it is best not to pull on the claws since they may be cast in an escape response. Hauling creels or nets is a busy time and it is understood that best practices can slow the hauling process. However, adopting best practice may secure better returns as the landed catch are in better condition and reduced mortality ensures better financial return from the markets. The balance of time, cost and benefits has to be considered by the skipper.

The initial grading and selection that occurs on the fishing vessel is the most important part of the chain and fishermen must recognise their responsibilities in this respect. Fishermen should aim to select the catch from the creel to ensure that the rejected portion of the catch is returned to the sea over suitable ground.

3.5.3 Good Handling Practice is Essential for everyone that handles Live Crustacea including-

- fishermen
- holding pond operators
- packing station staff
- vivier lorry operators
- retail staff

The economic value of live crustacea does affect the way that they are handled. Good handling practices are often used by those that handle high value lobster or live prawns whilst the lower value species, such as Velvet, Brown, and Green crab, receive little care. Live crustacea command premium prices and careful handling is essential since dead crustacea are discarded and of little or no value.

The carapace or head region of a crustacean contains a large digestive gland called the hepatopancreas; this is the brown meat that some consumers enjoy eating. The hepatopancreas is a fragile organ that produces and contains powerful digestive enzymes called proteases. Trauma caused by rough handling by any means (throwing or dropping) can damage the organ leading to the release of these enzymes. Proteases are indiscriminate destroyers of protein and will readily digest the insides of the animal causing a loss in quality to the consumer and a reduction in shelf life whether live or cooked.

3.5.4 Selecting the Best

Selection is the sorting process that divides live crustacea into those that are to be kept and those that are to be discarded. Selection is essential if quality is to be maintained. Diseased (e.g. shell disease) and weak animals must be removed from storage since any that die will soon start to deteriorate and decrease water quality. Very quickly a 'domino effect' of mortality is created within the confines of a crowded storage facility. Identifying and removing sick or dead crustacea is much easier if they are held individually, in shallow trays, 'raceways' or in larger tanks where there is sufficient space for live stock to move away from the dead (although some species may cannibalise any dead).

Animals that have recently undergone moulting also need to be removed from storage systems and placed in isolation because they are likely to be cannibalised by other hard-shelled individuals. Typically, this leads to legs being eaten, so that even if the recent moulted animal survives it will be of little value because without legs and antennae missing it cannot feed effectively.

Even slight damage to the tips of the walking legs or a claw can result in heavy blood loss since clotting often does not occur at the site of wounds. When examining an animal any damaged limb should be made to cast. For claws, this can be done by putting the point of a knife into one of the joints and, if necessary, twisting it a little. For legs, it is best to break the middle joint. The animal will then naturally cast the limb at a point close to the body, which is designed to heal quickly with a minimum of blood loss. Crustacea with legs or claws missing, called 'cripples' in the industry, have a much reduced value but may be better assured of survival further down the handling chain if treated in this way.

Live crustacea will go through several selection processes from capture to consumption during which much the same criteria will apply (with the exception of the rejection of undersized crustacea on the fishing vessel). Some of the factors for assessment whilst selecting live crustacea are displayed in the table overleaf.

Factors for Assessment when Selecting Live Crustacea

Factor	Positive indicators	Negative indicators
Alertness	• Appear alert and respond positively, either by tail flicking or defensive posture, when handled.	• Lethargic behaviour, coupled with a weak, limp appearance, is a sure sign that things are not as they should be.
Moult status	• Heavy for its size. • Firm and hard shell.	• Light for its size. • Pliable shell. A new shell will also be extremely clean. • Very dark tips of legs.
Damage	• No damage.	• Small cracks in the carapace. • Cracked or broken rostrum. • Damage to the tips of the walking legs (can result in heavy blood loss since clotting often does not occur at the site of wounds). • Loss of limbs including the claws. • Antennae damaged (lobsters that have been held for some time will often have shortened antennae).
Breeding status	• Non breeding condition.	• Females carrying eggs under their tails should not be landed; indeed it is illegal for some species and/or in some geographical areas.
Disease	• No external signs of disease. • Barnacles and spiral worms on the shell are NOT a disease and do not affect eating quality, only the appearance of the animal.	• Diseases affect the appearance of the shell and the quality of the meat. • Discoloration of the shell, i.e. blackening. • Excessive external fouling reduces value.

There is a balance to be found between the need to select stocks to reduce competition, remove weak, diseased, and soft crustacea, and the need to leave the stock to settle to the holding system and reduce stresses. This is where the smaller holding systems that contain a few crustacea or even individual containers really do offer a more desirable solution than the en-masse approach.

- Be gentle when handling (mortality increases with handling).
- Never drop or throw an animal; always place the animal down (they are not designed to withstand any impacts).

- Never pick a lobster up by its antennae, legs, or claws.
- Never use force to stop a lobster or prawn from flicking its tail.
- Minimise the handling between capture and consumption by assessing where practices can be altered or modified.
- Selection will occur at a number of set events and consideration should be given as to how routines can be adapted to minimise the need for handling.
- The need to select live crustacea has to be balanced against the stress that will result from grading and the extra energy that the crustacea will use as a result of the disturbance.
- Regularly check live stock to ensure that any diseased, weak, or recently moulted animals can be removed and isolated.

3.5.5 Grade for the Best

Grading is a particular type of selection that divides the live crustacea into size or sex categories to fulfil market requirements. Grading can also be good practice whilst storing live crustacea because it can help to reduce size related competition within the confines of a vivier tank.

There may be occasions where sales of live crustacea are based upon the buyer's specification for particular size, weight, or sex. Such sales requests can be easily met if storage facilities are organised with separate tanks for particular grades, rather than having to search through a large tank containing all size/sex categories.

3.5.6 Undesirable Contamination of Live Crustacea

Various bad practices can lead to physical and chemical contamination of live crustacea. Contamination can span all sectors and all species, leading to loss in value or rejection of product. The contamination may be direct onto the crustacea or through a contaminated water supply.

Physical contamination

- Sticks
- Stones
- Plastics
- Seagull droppings
- Glass
- Discarded pieces of used bait
- Cigarette ends
- Seaweed
- Mud
- Litter
- By catch species

Chemical contamination

- Cleaning chemicals, washing up liquid, bilge cleaner or bleach from washing down storage tanks or decks.
- Bilge water from use of a single pump to clear bilges and provide deck wash.
- Diesel fuel spillage.
- Oil, engine oil and hydraulic oils.
- Contaminated air supply:-
 - Clogged or missing air filters.
 - Worn compressors leaking oil into air supply.
 - Poorly sited air intakes.
 - Exhaust fumes from engine driven compressors.
- Pesticides from fly spray, midge repellent, sticky flycatcher.
- Hand lotions or other skin care products if you do not use gloved hands in the tank.
- Chlorine; be sure to eliminate the chlorine from tap water if it is to be used to make artificial sea water or reduce salinity to compensate for evaporation. Some chlorination chemicals are very persistent or can generate ammonium salts on neutralisation by chemical additives.
- Heavy metals such as cadmium, copper, and mercury. Avoid bronze, phosphor-bronze, brass, zinc anodes or copper plumbing materials.
- Toxic construction materials are covered in detail in the relevant section but there is also a need to protect existing tanks from contamination from other building projects. Cement or lime dust would rapidly remove oxygen from the seawater in the tanks and excessive dust could risk blocking filters.

3.5.7 Generic Quality Assessment for Live Crustacea

The following table provides a quick reference guide to assess the quality of live crustacea

	Excellent	Poor	Reject
Freshness	- Fresh smell of the sea, almost metallic - Very lively, moving about, flicking tail, attacking anything and using claws aggressively	- Fresh smell of the sea but with slight fishy odours. - Alive, some moving about, tail flicked once or twice and claws nip closed if stimulated.	- Unpleasant off odours, repulsive. - Blackening of shell margin. - Almost dead, slow to move, claws and legs hang down if animal is picked up. - Joint between head and tail is gaping.
Moult state	- Shell is firm to the touch. - Some barnacles. - Heavy for its size.	- Shell yields to pressure (most animals are in this state during the summer when moulting occurs). - Animal not heavy for its size. - Shell is very heavily encrusted with barnacles and worms.	- Shell is soft, very clean and may be either intensely coloured or washed out. - Animal is light for size.
Breeding state	- Female is not carrying eggs under her tail (berried lobster may be landed in some areas but it is best not to if sound practice is to be followed). - No mutilation to the tail fan of lobster.		- Female crab is carrying eggs under her tail. - Lobster has a V shaped mark or any mutilation on any of the tail fins.
Shell damage	Shell has no damage and no signs of disease.	Shell has only slight damage abrasions and no signs of disease.	Shell has damage, snapped rostrum, and signs of shell disease such as discoloration.
Claws and legs	- Two claws. - Well banded or nicked if appropriate. 8 legs all with no damage.	- Only one claw. - A few legs missing. - Tips of leg damaged (leads to bleeding).	- No claws (except in claw-less crawfish) - Legs missing, cracked and non-operational, tips to legs are damaged.
Contamination	- No evidence of physical or chemical contamination. - All mud washed away.		- Evidence of physical or chemical contamination. - Muddy deposits on shell.

3.5.8 Scheduling or Business Arrangements

Good manufacturing practice is fundamentally about minimising the time that live crustacea have to endure conditions that will reduce their value to the final consumer. All parties in the handling chain must consider how they can best schedule and coordinate their working arrangements to maintain live crustacea in the best conditions.

3.5.9 Disposal of Fallen Stock and Vivier Water

Mortalities, other than those dispatched for further processing (cooking), require to be disposed of appropriately - see legislation section 2.0.

Water from vivier systems need to be treated and disposed of appropriately (chlorination and/or ultraviolet radiation) – see legislation section 2.0.

3.5.10 Stunning or Dispatch of Live Crustacea

Having stored and carefully handled live crustacea there comes a point when they need to be stunned prior to cooking. This may become a controversial and emotive issue so the welfare of live crustacea at dispatch must be considered carefully. An indication that crustacea are no longer alive is the lack of voluntary movement and in particular the paddling motion of the gill bailer just to the side of the mouthparts (they can be easily seen to beat in vigorously on live crustacea). The details of how to cook crustacea are beyond the remit for this guide for 'live crustacea' and covered in the GMP guides for shellfish cooking. Live crustacea can be stunned or dispatched in a number of ways, see overleaf.

Methods for Dispatch of Crustacea before Cooking

Method of Dispatch	Suitable for	Comment
Chilling - live crustacea are placed in a freezer until such time (approx 30 minutes) until no voluntary movement can be detected (rather than frozen solid)	All species.	Very effective and clean.
Plunging into boiling water.	Lobster, <i>Nephrops</i> and prawn, but not suitable for Brown crab since they shed their legs.	Rapid.
Pithing - inserting a sharpened awl or screwdriver through the mouthparts into the area behind the eyes.	Brown crab and lobster.	Good on large scale, may require experience. Can lead to release of bodily fluids during cooking. Can be distressing.
Drowning - placing live crustacea into freshwater until no voluntary movement can be detected. Much more rapid if the water can be boiled and allowed to cool, thereby removing most of the dissolved oxygen.	All species.	Suited to all scales of operation, effective and clean. Reports that drowning can lead to poor quality.
Inappropriate storage conditions, i.e. warm, dry, bright light, out of seawater etc.	All species.	Not recommended as the dispatch is uncontrolled and the animals will accumulate metabolic by-products that may taint the eaten product. Animals that have died through inappropriate storage conditions should not enter the human food chain.

3.5.11 The ‘Domino Effect’

Holding live crustacea can be more difficult due to the ‘domino effect’, which has two impacts:

1. Make just one mistake, one stress that is too great, and you are fighting a losing battle to keep them alive.
2. The death of one weak individual can reduce water quality. Reduced water quality can become a stress issue for the whole consignment, especially if crustacea are tightly packed in a holding tank.

3.5.12 Further Reading

External Publications

Publication: Artificial seawater for shellfish tanks.

Ref No: MAFF Laboratory leaflet 39

Publication: Storage and care of live lobsters.

Ref No: MAFF Laboratory Leaflet 66

Seafish Publications

Most of these are available from the Seafish website under the ‘publications’ page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate reference number (e.g. SR218) or key words from the title.

Publication: Opportunities in the UK crab fisheries resources - process technology - markets - new products.

Ref No: SR267

Publication: Live handling and transport of crustacean shellfish: an investigation of mortalities.

Ref No: SR280

Publication: Crab and lobster live holding systems. Part I, Tanks and Buildings. Part II, Water pumps, air pumps, and pipework. Part III, Filters and instrumentation.

Ref No: 1990/1/SF. 1990/2/SF/AM. 1990/3/SF/AM

Publication: Handling crabs for the live market. Part I, from fishing to exporter. Part II, Vivier transport.

Ref No: 1987/1/SF. 1990/4/SF

Publication: Handling, transport and storage of live crabs and lobsters.

Ref No: Seafish Open Learning Module.

Publication: Exploratory fishing for *Chaceon (Geryon) affinis* on Rosemary Bank.

Ref No: SR444

Publication: Fish waste production in the United Kingdom. The quantities produced and opportunities for better utilisation.

Ref No: SR537

Publication: Legislative requirements for disposal of seafood waste.

Publication: The evaluation of ghost fishing preventors for shellfish traps.

Ref No: SR549

Further Information

This Good Manufacturing Practice (GMP) guide for live crustacea has been issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then please telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

3.6 Summary Data Sheets

This section contains data sheets that provide a summary of the general information provided in the previous sections, and describe the main rules that you should follow when handling live animals.

- Datasheet for general crustacea guidance

- Ten Golden Rules

Datasheet for General Crustacea Guidance



Datasheet

for general crustacea guidance

Seafish, in conjunction with Seafood Scotland, has produced guidelines covering general principles of care for live crustacea for fishermen, buyers and vivier lorry operators. These guidelines aim to encourage high standards of care throughout businesses that handle and store live crustacea.

Keep crustacea in flowing seawater because it is their natural environment and provides protection against:-

- temperature changes (seawater will keep them cool in summer and warm in winter)
- crushing
- vibration
- drying out

Crustacea need to be in seawater to breathe and get rid of soluble waste products.

Seawater must be of the highest quality.

It must be:-

- free from contamination, diesel, oil or sediment and not taken from the harbour; and
- well oxygenated (consider installing a diffuser to create small bubbles).

Consider how to remove waste products from the water. Try vigorous aeration (except for *Nephrops*), biological filters, protein skimmers or a good through flow of seawater.

- Keep the seawater cool (4-8°C) and avoid rapid changes in temperature.
- If installing vivier tanks, consider vessel stability or axle weight in a vehicle. An alternative is to install a sprinkler to spray seawater over the catch instead.
- Holding crustacea in poor quality seawater can kill more quickly than correct aerial storage.

Handling

- Handle all crustacea gently.
- Treat carefully and never drop or throw. This will damage their internal organs, drastically reducing survival.
- Do not damage the shell – damage can facilitate pathogenic infection.
- Select the best and grade carefully for size, sex and berries. Do not land crustacea with lost limbs (cripples).

Legislation

- Conditions of storage must be 'appropriate for the welfare of the animals', according to statutory instrument 1997 No. 1480 The Welfare of Animals (Transport) Order 1997.
- Make sure that you discuss plans for holding live crustacea with your EHO.





Datasheet

for general crustacea guidance

10 GOLDEN RULES to look after your crustacea stock:

1. Cool the stock (4-8°C) and keep it cool.
2. Keep them in the dark.
3. Keep them in fresh, good quality seawater and exchange it regularly.
4. If you cannot put the crustacea into seawater, keep them cool and damp.
5. Handle gently; do not throw or drop them. Do not damage the shell.
6. Grade carefully - remove undersized, weak, diseased or injured specimens.
7. Keep the stock free from contamination.
8. Prepare the stock for onward transport; stop feeding them and cool them.
9. Return poor quality specimens to the sea - do not try to sell them.
10. Beware of the 'domino effect' - one mistake, one excessive stress, one death in a packed container and the survival rate falls away.

Further Information

This datasheet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. Datasheets are very much a summary and further detailed information is available in a booklet. If you would like more information, please telephone Seafish to speak to our experienced staff. We are also interested to hear your views on this guidance, based on your experience.

Please contact Seafish on Tel: **01482 327837**, Fax: **01482 223310**,
email: inshoregroup@seafish.co.uk or visit our web site www.seafish.org.

Alternatively contact Seafood Scotland Tel/Fax: **0131 557 9344**
email: enquiries@seafoodscotland.org web site: www.seafoodscotland.org

EUROPEAN COMMUNITY
Financial Instrument for
Fisheries Guidance



Further Information

This datasheet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. Datasheets are very much a summary.

If you are seeking greater detail then please try the Seafish report library accessible at the 'Publications' page at

<http://www.seafish.org/resources/publications.asp>

Please type in the appropriate reference number (e.g. SR218) or key words from the title.

Please contact Seafish Tel: 01482 327837 Fax: 01482 223310

4. Specific Species Guidance

This section provides specific information for each of the species listed below. The information summarises the legislation, background detail, guidance on handling and storage, and further sources of reading information. Species specific guidance should be read together with the general guidance on best handling practices for handling and storage, as described in sub-sections 3.3 and 3.4.

Species described are:-

- 4.1 Lobster
- 4.2 *Nephrops*
- 4.3 Brown Crab
- 4.4 Spider Crab
- 4.5 Velvet Crab
- 4.6 Common Prawn
- 4.7 Squat Lobster

4.1 Specific Guidance for Lobsters

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for lobsters should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical, but ignore one aspect and see the quality fade away, along with the returns from your business.

Name: Lobster

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

There are four species lobster that may be encountered on markets in the UK. The first is the European lobster that is native to the seas around UK. Its Latin name is *Homarus gammarus* and it should be labelled as such. The second species is the North American lobster that is called *Homarus americanus* and is air freighted to the UK from the east coast of the USA and Canada. The two species look similar to the untrained eye but they must be kept quite separately. The American lobster can carry a disease call Gaffkaemia that is very serious for the European lobster. Special consideration must therefore be given to ensure that any facility, holding tank, display counter, hand net, or seawater system is not used for both species at the same time and that if they are used for both species; the facilities are thoroughly disinfected between uses. Further to this, the American lobster must not be released in the UK so the disposal chain for cripples or dead American lobsters must not involve dumping at sea. Effluent water from facilities holding American lobster must also be sterilised prior to discharge, see legislation, section 2.

Four lobster species are encountered on UK markets, 2 clawed lobsters:

Country	Name (s)
UK	European lobster
Latin	<i>Homarus gammarus</i> may be shortened to <i>H. gammarus</i> . The rostrum (horn on the front of the shell) of a European lobster has 4 pairs of spines and a single tip. Underneath the tail is white.
Spain	Bogavante pais
Portugal	Lagavante
France	Homard European

Country	Name (s)
UK	American Lobster
Latin	<i>Homarus americanus</i> may be shortened to <i>H. americanus</i> . The rostrum (horn on the front of the shell) of the american lobster has 3 pairs of teeth and may have a bifid tip. Underneath the tail is red.
Spain	Bogavante canada
Portugal	Lagavanta canada
France	Homard americain

There are also two 'claw-less lobsters' called crawfish, spiny lobster, or sometimes crayfish. One crawfish species, *Palinurus elephas*, is the most common on the market; it is an orange to brown colour, and it occurs off the western shores of the UK. The second species of claw-less lobster (*P. mauritanicus* or Pink Spiny Lobster) is found in deeper waters and is less commonly seen. It is a redder colour with white spot markings. Other crawfish, usually from tropical and sub-tropical waters, are imported into the UK but they are usually in a frozen form.

Country	Name (s)
UK	Crawfish or Crayfish (not to be confused with the smaller freshwater crayfish species). Common spiny lobster [Pink Spiny Lobster]
Latin	<i>Palinurus elephas</i> [Palinurus mauritanicus]
Spain	Langosta [Langosta mora]
Portugal	Lagosta [Lagosta]
France	Lagouste rouge [Langouste rose]

The remainder of this section on lobster will be based upon the European lobster; but the advice may be used also for the crawfish in the absence of a dedicated guidance sheet.

Legislation:

The European lobster has UK minimum landing size, and the Crawfish/crayfish has UK minimum landing size of 110mm carapace length. This is measured from the back of an eye socket to the back edge of the carapace, the rigid head section of the shell. However, local Sea Fisheries Committees in England and Wales (SFCs) and Scottish Fish Protection Agency (SFPA) in Scotland or Department of Agriculture and Rural Development Northern Ireland (DARDNI) may have bylaws that may increase the minimum landing sizes for European lobster (some up to 90mm carapace length) so they must be consulted for each

area that is fished (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

Landing of Berried Hen Lobsters and or V-notched Females

The landing and selling of female lobsters carrying eggs under their tail (a condition fishermen call 'berried') or females that have had their eggs physically removed is not recommended and is prohibited in some areas (see legislative areas for those enforcement organisations that can provide definitive guidance for your area). Female lobsters may also be V-notched. The V-notched denotes a V-shaped notch that fishermen cut in the tail fans of females that are carrying eggs. The V-notch mark is a conservation measure to protect the breeding sector of the female population since any female with a V-notch must not be landed (see legislative areas for those enforcement organisations that can provide definitive guidance for your area). The V-notch gradually heals over successive moults during which period the female lobster is able to breed. The female may be landed once the tail fan has healed and no mark is visible.

Background Information

A lobster takes between five and seven years to reach minimum market size although local populations may vary.

Live Handling and Storage

Lobsters are one of the hardiest crustacea and will survive poor handling however, they do still require the same due care and attention that any crustacea should be given. The generic handling themes should be applied but lobsters require further good practice in handling. Their high value demands that they are in pristine condition and that starts with handling on the vessel and continues through the handling chain until they reach the final consumer.

Their powerful claws are a problem for the care of the catch and the handlers alike. Immediate protection can be afforded by using sacking or carpet to keep the catch separate. Innovative fishers often use lemonade bottles with the bottoms cut off to make lobster sized tube arrangements similar to those that are used for *Nephrops*. This method is fast, reliable and offers the lobster very good protection. In every case lobster claws need to be carefully banded with elastic bands as soon as possible. Consideration should be given to the type of rubber band that is used to ensure that it doesn't perish in seawater and break during subsequent storage. Cable ties may be more appropriate, if the lobster is to be held for more than a few weeks, in order to be assured that the rubber band does not perish or 'sweat off' the claw. It is important to apply the rubber band or cable tie in the correct way. It should be at the body end of the claws and behind the large peg or tooth on the claw in order to prevent the rubber band or cable tie from working its way forward and falling off.

Long Term Storage

Long-term storage refers to those facilities that aim to hold lobsters that are caught during the summer months held until the price rises to annual highs before Christmas time. Lobster is unique in that long term holding is a viable proposition. Holding tanks for lobster need to fulfil as many of the generic guidance criteria as possible. There are a number of options from the low

technology extensive holding tank to the high tech intensive facility, chilled and individual storage. Options are a keep creel laid on suitable seabed, floating crates, seawater ponds; shore based holding tanks with through-flow of seawater, right through to individual lobsters holding trays with refrigerated recirculating seawater. Tiered raceway systems rely upon water entering into the top tier of the raceway and then cascading down through the raceways underneath. These raceways are an extremely effective method of storing lobsters since they allow easy access to the stock, and use available space well, but experience has highlighted the need to monitor water quality in the lower levels carefully.

Consideration must be given to the balance of increasing stock value against the cost of running the holding facility and the inevitable losses due to mortality (gill infections, failed moults etc) and potential loss in weight of the lobsters during long term storage (hatching of eggs on berried hens, insufficient feeding). There may also be a loss in quality of lobster held in captivity due to factors such as the tendency for lobsters to eat each other's long red antennae or the blackening of the shell that can develop at the base of the legs. Both can affect value at the point of sale. Individual storage of lobsters can overcome some of the problem of mass storage. Seawater holding facilities for lobster can be chilled to slow the metabolism of the lobsters but this can be expensive. Chilling may also contribute to the blackening discoloration developing at the base of the legs that may affect value. There will be a requirement to feed lobster in a storage facility unless the chilling of the water is sufficient to suppress their need to eat and encourage a state of torpor. Feeding is essential to prevent cannibalism. A ration of 7% body weight has been found to be effective, fed twice a week in the summer and once a week in the winter. Feeding lobsters held in a seawater system can affect the water quality in terms of uneaten food (this needs to be removed) and waste products as the lobsters digest the meal.

Water Quality Parameters

Lobsters need to be stored in full strength seawater (30-35 ‰). Those that have experience in holding lobster for the longer term have found that thorough aeration is essential. A high level of dissolved oxygen (about 98% or 8mg/l and/or preferably 1mg/l greater than good quality seawater) ensures that small wounds heal, that moulting occurs successfully, that soft lobsters harden over time and that the lobsters continue to thrive. Excessive aeration in order to massively boost oxygen levels is not recommended as it can reduce survival and lead to high turbulence. Oxygen levels should not be allowed to drop below 6mg/l otherwise lobsters will become weak, tend not to moult successfully, wounds will not heal and survival during onward transport is low. The aeration should be at a depth of at least 1m, if the tank is deep enough, shallower if not, and a good quality diffuser is required to generate small bubbles and ensure good transfer of oxygen to the seawater. Vigorous aeration also assists with 'skimming off' protein that will form a white bubbly scum on the water's surface. This proteinaceous scum should then pass away down stand pipes or outfall pipes.

Other water quality parameters should also be monitored especially if there is any doubt as to the quality of water supply or the holding facility is relying upon a

newly commissioned filter system. Monitoring temperature, ammonia, nitrate, nitrite, pH are recommended but advice must be sought as to the limits and records kept so that comparisons can be made over time.

Seasonality and Availability

Although local patterns may vary, lobster is traditionally a summer fishery from late April, when they start to feed and enter creels/pots, until October. The winter fishery for brown crab, especially with the development of the super-crabber sector, has lead, as a by-catch, to a year round supply of lobster, although in lower quantities than during the summer. The high value of lobster has led to investment in holding facilities to store summer catches, when prices are low and supply plentiful, until the Christmas market in Europe when there is a price premium. Therefore, the availability of lobster is dependant upon factors above and beyond the ability of fishermen to catch lobster.

Moult stage

Lobsters are always in a state of preparing for or recovering from moulting. The new shell forms underneath the hard outer shell until it is time to moult. During moulting the hard shell splits and the very soft lobster extracts itself from the old shell. The lobster absorbs water in order to stretch the new shell. Lobsters seek shelter during the moulting process since they are defenceless whilst soft. The new shell gradually hardens and the lobster is able to grow to fill the new space before once again preparing a new shell under the hard outer shell. The peaks in lobster moulting are from April to September and lobsters are often found inshore in shallower water during these times. The moult cycle has two impacts upon those that are handling or holding live lobster. Firstly, there is a need to be aware that a soft lobster will not be very robust and will die easily; secondly, that a lobster may moult whilst in a storage facility. Lobsters are cannibalistic and will readily eat a soft lobster so regular checks are needed of tanks that hold many lobsters. Soft lobsters may be held in individual chambers until their shell has hardened but will be unsuitable for sale for some time due to their poor meat quality.

It is difficult to assess if a lobster is going to moult but assessing lobsters that have recently undergone a moult is less troublesome. A lobster should feel heavy for its size and experience will soon lead a handler to identify when a lobster is too light. The next test would again require some experience. A lobster is usually picked up by grasping it across the carapace (the head section of the shell) and in doing so the fingers naturally rest at the region of the carapace that is nearest the legs. This region of the shell is not particularly robust but will feel noticeably soft if the lobster has moulted recently.

Female lobsters will naturally be softer in this region of the shell than males.

Grading, Handling and Assessment of Quality Condition Indices

Most lobsters have a deep blue colour when they are alive, although lighter blues occur commonly, and sandy, brick-red, and even white animals may be seen rarely. Lobster should be purchased alive or freshly cooked. Only when it is cooked will the lobster turn the more familiar bright red colour.

A good healthy live lobster should be aggressive. A lobster is usually picked up by grasping it across the carapace (the head section of the shell). A lobster should feel heavy for its size; if it is too light it may have recently moulted or may have been out of water for too long. A lobster should have a firm shell and those with a soft shell should be avoided since it may not contain as much meat as expected.

A healthy lobster will react quickly to being picked up by raising its claws in a defensive posture with the tail either fully extended and/or undergoing powerful tail flicks. If the tail and claws drop limply when the lobster is picked up, and there is a white membrane showing between the carapace and the tail, then the lobster is in poor condition and should be rejected. Such a lobster needs to be put in cool well aerated seawater if it is to survive.

A fresh lobster should have a fresh smell of the sea and there should be no hint of any 'off' smells. In the past some individuals would assess the quality and liveliness of lobsters by holding the animal upside down by the tail fan; the assumption being that the animal would perform 'sit ups' if it were of good quality. Such assessment of quality is not good handling and should never be practiced. On the contrary, doing this to an animal will stress it and degrade quality.

Male lobsters tend to have larger claws (the claw meat being particularly sought after) than the females. Females may well contain roe that is dark green when fresh and bright red when cooked. The roe may be reabsorbed by the females leading to a green discoloration of the flesh visible through the membranes and whilst this is a natural process, stress may be a contributory factor.

Developing ovaries can be damaged by poor handling, which leads to the green ovarian fluid leaking into the flesh causing discolouration. Cooking removes any 'tinting'.

Further Reading

External Publications

Publication: Recommended international code of practice for lobsters.

Ref No: CAC/RCP 24-1979

Publication: The techniques and practicability of year-round production of lobsters, *Homarus gammarus* (L.), in laboratory recirculation systems.

Ref No: MAFF Fisheries Research Technical Report 79

Publication: Storage and care of live lobsters.

Ref No: MAFF Laboratory Leaflet 66

Seafish Publications

Most of these are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate reference number (e.g. SR218) or key words from the title.

Publication: Crab and lobster live holding systems.

Part I, Tanks and buildings. **Ref No:** 1990/1/SF,

Part II, Water pumps, air pumps, and pipework. **Ref No:** 1990/2/SF/AM.

Part III, Filters and instrumentation. **Ref No:** 1990/3/SF/AM

Publication: Handling, transport and storage of live crabs and lobsters.

Ref No: Seafish Open Learning Module.

Publication: Lobster hatcheries and stocking programmes: an introductory manual.

Ref No: SR552

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then please telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

4.2 Specific Guidance for Nephrops

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for the *Nephrops* should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical but ignore one aspect and see the quality fade away, along with the returns from your business.

Name: *Nephrops*

Commonly known as *Nephrops* in the UK, although local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

Country	Name (s)
UK	<i>Nephrops</i> , Prawn (Scotland), Langoustine, Dublin Bay Prawn, Norway lobster, Scampi (generally the tail portion)
Latin	<i>Nephrops norvegicus</i>
Spain	Cigala
Portugal	Lagostim
France	Langoustine
Italy	Scampo / Scampi

Legislation:

Minimum landing sizes for *Nephrops* are complex; in all areas except EU region 3, ICES areas VIa and VIIa, the MLS is a total length (excluding claws) of 85 mm or a carapace length (measured from the back of an eye socket to the back edge of the rigid head section of the shell) of 25 mm. In areas VIa, VIIa and region 3, the MLS is 70 mm TL or 20 mm CL. There are also size limits for tails, but as this sheet deals only with live, and therefore whole, product, they will not be given. Due to the complexities, fishers are advised to consult local Sea Fisheries Committees (SFCs) in England Wales, Scottish Fish Protection Agency (SFPA) in Scotland or Department of Agriculture and Rural Development Northern Ireland (DARDNI) for clarification for their area and also to check for any bylaws regarding the minimum landing sizes for *Nephrops* (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

Maximum landing sizes: none in place

Landing of females that are carrying eggs (berried): The landing and selling of female *Nephrops* carrying eggs under their tail (a condition fishermen call 'berried') is not recommended and may be prohibited in some areas (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

Live Holding and Storage

Live *Nephrops* can be caught either by the more traditional creel method or in more recent times by trawl, a method used more usually for tail and dead product. Both methods have advantages and disadvantages for conservation and quality of live product. This guidance relates to the live product so no mention is made of the fresh dead or the tail product.

In this context, the markets for *Nephrops* are almost entirely based on live export by vivier lorry or by airfreight, so correct handling is critical from the point of capture onwards. Unfortunately, high levels of mortality are not uncommon when holding *Nephrops* or during the vivier shipment from the UK to distant markets, especially during summer months. The key to reducing mortalities is to ensure that all of the generic guidance for holding live crustacea is applied to the highest standard possible.

Great importance needs to be attached to diligent grading of *Nephrops* at several stages through the handling process; emptying the creel, filling and emptying the 'tubes' or keep creels and packing for vivier transport. To be effective grading should remove any weak or soft, even slightly soft animals. The carapace of a *Nephrops* with a hard-shell will feel rigid but yield slightly when gently squeezed, especially near the legs. The carapace of a soft animal will yield when squeezed and should be rejected due their reduced likelihood of survival. The shell may also be very clean and intensely orange. Weak *Nephrops* are easily spotted because they are less aggressive, will not struggle, and flick their tails if picked up and will allow their legs and claws to hang down. A quality live prawn will be undamaged, have eight legs and two claws. The need to grade so thoroughly and frequently is very important, to remove any *Nephrops* that may die. Dead *Nephrops* remaining in a keep pot, storage system or vivier lorry will quickly affect water quality, since they will start to decompose, using up oxygen and releasing toxins. All these factors soon lead to further mortalities.

Tubes

Nephrops are often stored in a complex of individual chambers called tubes. Great care must be used when filling the tubes. A gap can often exist between the end of the tube and the tray that forms the base. The tail of a prawn may become caught under the end of the tube and be damaged as the top tray is put in place and the complex tied tightly shut. Fishers have found that elastic bands can be used to prevent any gaps forming. The orientation that tubes are stored may have a slight influence over survival and fishers are encouraged to experiment, prawns held horizontally may have the best survival.

The tubes containing smaller prawns are quickly filled and placed into a vivier tank as the days fishing progresses whereas tubes for the larger grades may take longer to fill. Inadvertently, the larger prawns may be exposed to the air for much longer, risking poor survival during storage and transport. Drying wind, cold or heat will reduce survival. It may be appropriate to provide a seawater sprinkler arrangement over the tubes as they are being filled or to consider putting partially filled tubes into a vivier tank between fishing events.

Tubes are an excellent method for storing live *Nephrops*, but they are considered to be bulky by vivier operators where space is at a premium. To overcome this issue some vivier operators ask that the catch is removed from the tubes and rubber bands applied to the claws, as with lobsters. Specific rubber bands are available with colours relating to individual grades. Banded *Nephrops* can then be packed in punnets for onward vivier transport.

Nephrops are suited to short term storage, typically no more than a week, before onward vivier transport. *Nephrops* can be stored in shore-based holding tanks or raceways. Direct aeration should be minimal since bubbles seem to cause stress to *Nephrops*. Alternative solutions may be to aerate the water elsewhere in the vivier system or consider aeration by a cascade system rather than by diffuser bubbles. Fishermen prefer to store their catch at sea until landing. Tubes containing the catch are often hung from floating buoys, vessels, or piers rather than laid on the seabed as is the practice for lobster, Velvet, and Brown crab. The storage location requires careful siting since excessive wave movement, tidal flow, freshwater run off and an unsuitable seaweed seabed may lead to choking, stress, and risk of mortality. Feeding is not deemed necessary for short term holding.

Nephrops are not suited to dry holding (i.e. out of seawater) for any more than the minimum possible time and consideration should be given as how to avoid the need. Vessels stability and vehicle axle weight may make dry transport unavoidable. During dry storage, tubes should be orientated so that the prawns are head up and therefore retain any water that is in the gill chamber. Conditions should be kept damp by covering with soaking carpet or ideally spraying the stock with seawater from a sprinkle bar. *Nephrops* should also be kept in the cool. Temperatures in an unchilled vehicle during the summer are too high; however, the dry air from a chiller can be a serious problem in itself. The gills would become damaged irreparably if allowed to dry, leading to 'mortalities' during onward transport.

Inappropriate Storage Conditions

Live *Nephrops* should not be iced directly because the cold will kill them. Indirect icing, such as floating seawater ice in a vivier tank, may be used to keep a catch cool during high summer temperatures.

Live *Nephrops* should never be dipped in sodium metabisulphate or similar products that are used to preserve the appearance of fresh-dead, frozen whole animals or tail meats. The chemicals will kill them.

Trawl-Caught Nephrops

Live *Nephrops* that have been caught by trawling require particular diligence by the crew if the reputation of the product is to be maintained.

Fishing over particularly soft sediments should be avoided since fine sediments risk choking the gills of the catch. Rough ground should also be avoided since boulders in the cod end will cause damage that will affect survival.

There appear to be a series of stressful events during trawling and ameliorating action should be taken to ensure a quality product. *Nephrops* are believed to be stressed whilst trying to escape the towed gear, tumbling down the belly of the net, being hauled in, during transfer to and within the hopper and then during sorting of the catch. Periods of recuperation are believed to occur when stored in the tubes in a vivier tank. As such, the best towing regime would appear to be short tow duration, and not too much bulk in the cod end since this will extend handling time on the deck. Skippers will have some idea as to the bulk that a tow will yield, but tows should not exceed 2hrs.

Good, careful handling practices for trawl caught *Nephrops* commence with a slow and gentle haul so as not to 'shake up' the contents of the cod end. Low bulk in the cod end will allow more control of the net as it is handled; it can more easily be prevented from slamming into the gunwale and it is easier to control as it is emptied into the hopper. These actions will help to reduce damage to the catch by crushing. High volume sprinkle bars over the hopper will ensure that the catch is protected from the environment, will rinse the animals and help the gills to continue working.

Grading by the crew needs to be of the highest standard to prevent damage whilst removing stock from the hopper. Each animal will need to be checked for liveliness (see notes on grading weak and soft prawns) before placing them into tubes. Tubes should have high volume sprinklers over them. Once tubes are filled, they should be placed in a vivier tank containing seawater or a high volume sprinkle system. The value of the vivier tank cannot be overstated since it is a place of recovery for the catch and they should be in there for as long as possible before landing. If there is a large haul, the crew will have to make a decision as to when the animals in the hopper become unsuitable for live sale and would be better sent to the fresh market. A short tow at the end of the day, followed by a short time in the vivier tank before landing and transport to a shore-based storage tank, is likely to lead to low survival. A morning tow, followed by the whole day in the on board vivier tank, gives the *Nephrops* catch time to recover and will lead to greater survival.

Clearly, the storage of live trawl caught *Nephrops* requires high volumes of pumped seawater. Skippers have found that this has two further implications. Firstly, the water needs to be of the highest quality, so it should be drawn from deep down on the hull. In addition, they have to be careful to avoid areas where freshwater contamination may occur. Often, skippers will stop the pumps as they come into harbour to avoid pumping in contaminated seawater. Secondly, existing pumps, such as mechanical deck washes that can

also operate as a bilge pump, are not suited to vivier use because of contamination from bilge water and their dependence on engine revs to provide enough volume and pressure. Separate electrical pumps can provide a constant pressure and dedicated, clean pipe work.

Additional Issues for the Survival of Nephrops

Nephrops have two diseases that affect survival. Adopting best handling and storage practices can help to reduce the impact that these diseases have upon quality.

Tail rot or necrosis is caused by a bacterium (called a *Vibrio* species) that is not normally found in the blood of healthy animals. The stress of capture, exposure to air, wounding and handling leads to a failure of the immune system in *Nephrops* and the *Vibrio* bacteria then exploit the sugar-rich abdominal muscles to grow. The net result of this is that the head section is fully alive but the tail portion of the animal is no longer edible with a definite 'off' smell. Signs of this disease are often difficult to see because tubes of prawns may appear to be alive, with pincers and legs moving, but the tails are useless and cannot be eaten. On examination, the underneath of the tail will be opaque and have white streaks, the tips of the paddles under the tail will be reddened, and the shell will be soft and spongy. This disease has been identified and researched by Glasgow University and the Marine Station at Millport.

Fishermen and staff responsible for shore-side handling can help to reduce the impact of tail necrosis by reducing stress (see general handling). In particular, temperature should be kept low and prawns should be placed into tubes of the correct size, since forcing large prawns into small tubes may accelerate the process.

Hematodinium is a dinoflagellate parasite that infects *Nephrops* leading to a watery texture and 'off' flavours of the tail meat. *Hematodinium* changes the behaviour of *Nephrops*, leading to them being out of the burrow at the wrong time of day and they have reduced capacity to swim, so they have a greater chance of capture. Peak occurrence in catches from the Firth of Clyde is during spring (March-April), when 25-30% of the population is infected, although some areas can be worse than others. Infection is highest in small *Nephrops*, around 28-30mm carapace length, and females have a greater prevalence of *Hematodinium* infection than males. The parasite has also been reported from the Fladden Grounds, Iceland, and Sweden. Stocks have a reduced incidence of the parasite from June to November. This disease has been identified and researched by Glasgow University and the Marine Station at Millport. They are currently trying to develop a dipstick method to identify *Hematodinium* because infection cannot be easily identified other than by subtle changes to the paddles under the tail and an altered colouration and translucency of the carapace.

Further Reading

External Publications

Publication: Recommended international code of practice for lobsters.

Ref No: CAC/RCP 24-1979

Seafish Publications

Most of these are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate reference number (e.g. SR218) or key words from the title.

Publication: Live handling and transport of crustacean shellfish: an investigation of mortalities.

Ref No: SR280

Publication: The prawn, *Nephrops norvegicus*, as a candidate for vivier transport – a feasibility study.

Publication: Assessment of stress and mortality of the prawn (*Nephrops norvegicus*) during live handling from vessel to market.

Ref No: SR424

Publication: Good manufacturing practice guidelines for *Nephrops* fishermen.

Ref No: SR559

Publication: A traceability and responsible fishing demonstration in the *Nephrops* supply chain.

Ref No: SR560

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then please telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

4.3 Specific Guidance for Brown Crab

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for brown crab should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical but ignore one aspect and see the quality fade away, along with the returns from your business

Name: Brown crab

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

Country	Name (s)
UK	Brown crab otherwise known as Partain, edible crab
<i>Latin</i>	<i>Cancer pagurus</i>
Spain	Buey de Mar
Portugal	Sapateira
France	Toutteau

Legislation:

The Brown crab has varied minimum landing size around the UK. The measurement is across the widest span of the carapace, the rigid head, and body section of the shell. Local Sea Fisheries Committees (SFCs) in England and Wales; Scottish Fish Protection Agency (SFPA) in Scotland or Department of Agriculture and Rural Development Northern Ireland (DARDNI) may have bylaws regarding the minimum landing sizes for Brown crab so they must be consulted for each area that is fished (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

The landing of Brown crab claws is largely prohibited with a few exceptions for those vessels that use static tangle net gear (see legislative areas for those enforcement organisations that can provide definitive guidance for your area). Those that handle and store live Brown crabs should therefore be aware of these restrictions if removing claws from weak brown crabs.

Landing of berried hen Brown crab

The landing and selling of female Brown crabs that are carrying eggs under their tail (a condition fishermen call 'berried') must not occur. Do not physically remove the eggs from females. It is bad practice and is prohibited in some areas (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

Background information

A Brown crab takes about five years to reach the minimum landing size although local populations may vary.

Live Storage and Handling

Brown crabs are often regarded by fishers to be one of the hardiest crustaceans, but handling does produce mortalities. They cannot withstand rough and inappropriate handling; it leads to high levels of mortality during onward transport to distant markets and these are damaging the reputation of UK landings. It is recognised that prices for Brown crab are low so there is temptation to treat them with the minimum care and as a bulk commodity. They do still require the same due care and attention that any crustacea should be given. Brown crab should be treated in accordance with the general handling guidance if they are to survive and be sold as premium quality crabs.

Fortunately, there are several markets for Brown crab so that fishers and shellfish dealers can consider where their landings are best targeted;

- vivier transport to European markets for live produce
- local cooking for picked meat product
- local cooking for a whole frozen or vacuum packed product
- air freight to distant markets

All these markets need a vigorous live Brown crab with eight legs and two claws. Those in the UK processing industry are finding that profit from their business is largely derived from the white claw meat so it is not appropriate to attempt to sell inferior quality brown crab for processing.

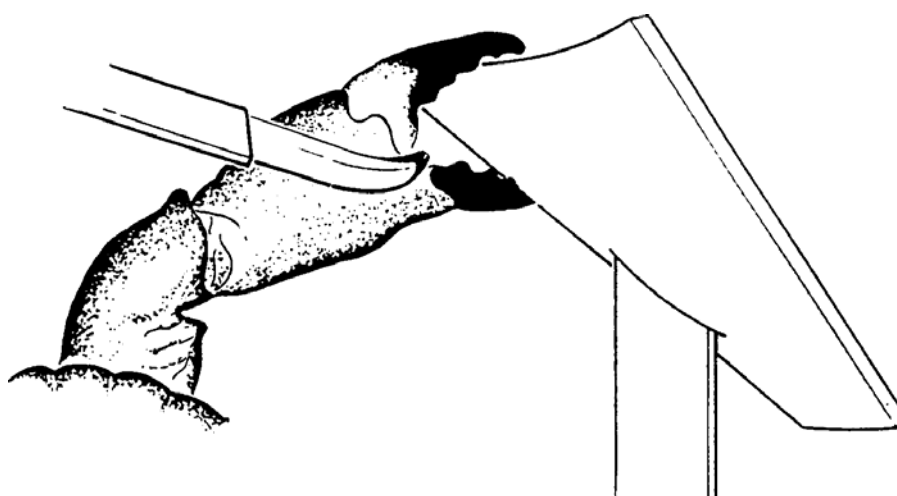
Inactivating Brown Crab Claws, Nicking the Claws

Brown crabs have extremely powerful claws that present a problem for the care of the catch and for those that handle the animals. Immediate protection can be afforded by using sacking or carpet to keep the catch separate. Brown crabs should quickly settle in dry/wet storage, with minimal damage due to fighting, provided that gentle handling and storage practices are adopted. Such careful practices are often beyond the time and facility constraints when operating with commercial activity. If the crabs are to be stored for any longer than a few hours, then 'nicking' may be necessary and should be done sooner rather than later. However, great care has to be taken, as any break in the exoskeleton or connecting membranes exposes the animals to the risk of pathogenic disease, with consequent high mortalities. This risk of loss has to be balanced against the expediency (for the fisher) of 'nicking'. Nicking of the claws is a skill that needs crew training since it can lead to claw loss, and hence loss of value if done incorrectly. The two techniques for nicking claws are referred to as the French and English (traditional) nick. Both rely upon the fisherman applying the lightest cut to a ligament that then breaks under the strain of the powerful muscle in the claw. Care in nicking is very important; if it is done badly there will be excessive bleeding. Even with careful nicking the

crab will bleed slightly and so it is important to return the crab to seawater in order that the blood may clot and the wound seal. However, if placed in poor quality seawater (as can be the case onboard a vessel), infection can result and mortalities occur. For this reason, some merchants consider that nicked crabs are unsuitable for long-term storage or dispatch to distant markets.

The French nick

In this procedure a knife is used to cut the tendon between the two black pincers. The French method of nicking is preferred since it results in less bleeding. Fishermen often have a 'nicking bar' consisting of two wedges made of steel that they use to force the claw open enough to get the knife in the correct location. Nicking prevents damage that may occur if the animals were able to fight.



The French nicking technique using a nicking bar

It is important to know that a nicked crab is vulnerable to infection. It is likely that bacterial infection is a major cause of mortality in stored 'nicked' Brown crab. Keeping nicked crabs in store pots for too long (e.g. more than 10 days) means that the claw meat starts to blacken, indicative of infection and necrosis, and quality suffers. All 'nicking' weakens the crab to some extent, but currently most operators consider that there is no commercially viable alternative.

Damaged Limbs and Casting the Limb

Brown crabs are particularly susceptible to damage to the tips of the walking legs that can bleed and reduce survival. Such injuries are easily caused as creels are emptied and as bongos or keep creels are moved around the deck. A damaged limb should be made to cast by putting the point of a knife into one of the joints and, if necessary, twisting it a little. The crab will then naturally cast the limb at a point close to the body that will heal quickly with a minimum of blood loss.

Grading

Great importance needs to be attached to diligent grading of Brown crabs at several stages through the handling process; emptying the creel, filling and emptying the storage/keep creels or ponds and when handing over to vivier transport. To be effective, grading should remove any weak or soft, even slightly soft crabs. Brown crab catches should be carefully graded for soft-shelled crabs that have recently undergone a moult. The shell is often very clean especially the areas of white. A Brown crab should feel heavy for its size and experience will soon lead a handler to identify when a crab is too light. The underneath of the shell near where the legs join the body is the area of the shell that should be tested by gentle squeezing. If the shell yields at all, giving a soft, pliable feeling, then the crab should be returned to the sea where it will harden given time. However, if the squeezing is done roughly or vigorously, the shell will be cracked and the animals are likely to have a poor prospect of survival when returned to the sea. Be gentle at all times. Weak crabs are easily spotted because they are less aggressive, will not struggle if picked up and will allow their legs and claws to hang down. The need to grade so thoroughly and frequently is very important so as to remove any crabs that may die. Any dead crabs in a keep pot, storage system or vivier lorry will quickly start to decompose, affecting water quality; oxygen levels will be depleted, toxins released, and all these factors soon lead to further mortalities in a domino effect.

Short Term Storage

There are a number of options from the low technology to the intense facility. Options are to use a keep creel (creel/pot with no entrances) laid on or just above the seabed suitable seabed, floating crates, seawater ponds, shore based holding tanks with through-flow of seawater, right through to ponds with refrigerated recirculating seawater. Any storage location at sea or point of seawater extraction will require careful siting. It must have a good tidal flow to ensure a good through-flow of sea water to provide oxygen to animals packed in the middle of a keep creel or holding pond. Locations to be avoided include areas with excessive wave movement, tidal flow, and freshwater run off, an unsuitable soft smothering or sea weedy seabed that may lead to choking, stress, and risk of mortality. There is no requirement to feed Brown crabs in short term storage especially as a period of starvation is good practice prior to onward transport.

Long Term Storage

Experience has indicated that Brown crabs should not be held in storage for more than a week even under ideal conditions since loss of condition will lead to mortality during onward transport.

Dry Storage

Brown crabs are not suited to dry holding (i.e. out of seawater) for any more than the minimum possible time (hours) and consideration should be given as how to avoid the need. It is accepted that dry transport of brown crabs is widespread in the industry, but so too are high levels of mortality before the product arrives at the consumer. Dry transport is stressful for brown crabs and their ability to survive leads to the build up of metabolic by-products that

can taint the flavour to the meat. Crabs will release these metabolic by-products when returned to seawater, creating water quality problems for shore side holding tanks and vivier lorry operators.

If high quality crab were conditioned carefully prior to dry shipment, it could be revived successfully after journeys of up to 48 hours if transferred to high quality, carefully controlled, and monitored vivier tanks upon arrival at its destination.

Vessel stability and vehicle axle weight may make dry transport unavoidable. During dry storage, brown crabs must be kept the 'right way up', and kept in damp conditions by covering them with soaking carpet or ideally sprayed with seawater from a sprinkle bar. Brown crabs should also be kept in the cool; the temperatures in an unchilled vehicle during the summer are often too high. The dry air from a chiller can be a serious problem in itself. Crab gills are irreparably damaged if allowed to dry, leading to 'mysterious mortalities' during onward transport. Even the short time that a keep creel can rest on the deck before landing or packing can be a problem as crushing of the gills can occur without the support of the water.

Further Reading

External Publications

Publication: Recommended international code of practice for crabs.

Ref No: CAC/RCP 28-1983

Seafish Publications

Most of these are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate reference number (e.g. SR218) or key words from the title.

Publication: Live handling and transport of crustacean shellfish: an investigation of mortalities.

Ref No: SR280

Publication: An assessment of damage and mortality of the Brown crab during vivier transport.

Ref No: SR294

Publication: Novel methods for restraining the claws of the Edible crab (*Cancer pagurus*).

Ref No: SR423

Publication: Handling, transport and storage of live crabs and lobsters.

Ref No: Seafish Open Learning Module.

Publication: Brown crab
Ref No: CR145

Publication: Crab and lobster live holding systems.
Part I, Tanks and Buildings. **Ref No:** 1990/1/SF.
Part II, Water pumps, air pumps, and pipework. **Ref No:** 1990/2/SF/AM.
Part III, Filters and instrumentation. **Ref No:** 1990/3/SF/AM

Publication: Handling crabs for the live market.
Part I, from fishing to exporter. **Ref No:** 1987/1/SF.
Part II, Vivier transport. **Ref No:** 1990/4/SF

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

4.4 Specific Guidance for Spider Crab

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for Spider crab should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical but ignore one aspect and see the quality fade away, along with the returns from your business.



Name: Spider crab

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

Country	Name(s)
UK	Atlantic spinous spider crab
Latin	<i>Maja brachydactyla</i> (Previously <i>M squinado</i> – which now refers to the Mediterranean species)
Spain	Centollu del país
Portugal	Santola
France	Araignée de mer euroéenne

Legislation

Minimum landing sizes (MLS) within the EU (EC regions 2 and 3, ICES areas IV and VII) is 120mm for both sexes but within England and Wales the MLS for males is higher at 130mm. MLS is the carapace length as measured from the frontal fork to the base of the shell.

Local Sea Fisheries Committees in England and Wales may have bylaws that may restrict the fishing method, fishing season or the landing of females that are carrying eggs (berried) berried, so they must be consulted for each area that is fished (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

Background information

Recently, scientists separated the Spider crab into two separate species. The Atlantic Ocean species was renamed *Maja brachydactyla* whilst the species found in the Mediterranean remained as *Maja squinado*. This may cause some confusion within the industry. In addition to splitting the species, the genus (first part of the Latin name) was redefined from *Maia* to *Maja* (the current genus) sometime ago. However, the similarity between the spelling of the two genera, particularly when viewed in some typefaces, still creates confusion within the industry.

Spider crabs are typical of many crabs in their predatory and scavenging feeding habits, eating small crustaceans, molluscs, and fish. They inhabit the sub-tidal zone along the south coast of England, and their distribution is thought to reflect their preferred temperature range of 7–20°C and inability to tolerate aerial exposure.

Mature crabs undertake seasonal migrations, over-wintering in deep offshore waters. Offshore fisheries occur during early spring (February) as animals migrate from their over-wintering grounds towards shore, whereupon around May the fishery becomes an inshore operation.

Markets

The markets for Spider crab are based almost entirely on exporting live animals by vivier lorry so correct handling is critical from the point of capture onwards. High levels of mortality can be common when holding Spider crab and during vivier shipment from the UK to distant markets, especially during extremes of temperature, i.e. summer months and cold winters. Spider crab can be caught typically from February to August but are targeted mainly at Easter for European markets.

Live Holding and Storage

Spider crab needs careful handling throughout the capture and storage process. They are difficult to keep alive due to their susceptibility to stress and fragile nature. They are believed to be intolerant of temperature extremes, suffering mortality at temperatures below 6° C and they are extremely sensitive to wind and aerial exposure, especially during the summer months. They require full salinity seawater during immersed storage and are very sensitive to rough handling. Recently moulted animals are especially

prone to mortality and should not be targeted; captured individuals should be returned to the sea.

Onboard the Vessel (initial handling by fishermen)

Spider crab is targeted using mainly tangle, trammel, or gill nets that entangle live animals, or traps. Removing animals from netting is difficult and rough handling can cause limb shedding and reduced value. To minimise damage during hauling entangled crabs should not be allowed to go over or around the net hauler as the animals come aboard. They should be placed into a pile or put into a large container on deck, to protect them from the wind, sun, and rain. The remainder of the netting should be placed into a separate pile.

While individual animals are being removed from the netting, the pile/container of crabs should be soaked frequently with seawater and covered with wetted carpet to protect them from wind and drying out.

Two methods of removing crabs from nets have been identified. Crabs should be removed from the netting manually, using the hands to pull meshes over the crab and down the legs starting with the rearmost legs. Alternatively, a right angle hook (a picker) can be used to 'tease' the meshes over the crab and down the legs. Great care must be taken to ensure that the nylon monofilament of the nets does not cut into the tendons at the joints of the legs and claws since spider crabs are prone to dying from bleeding.

Selection

Selection should remove any weak or soft, even slightly soft, animals, identified by gently squeezing the carapace. If the shell is not solid, i.e. it gives or cracks etc, the crab should be rejected. Weak crabs are recognised easily because they are less aggressive, do not struggle, or fight if picked up and will allow their legs and claws to hang down. Egg carrying females should also be returned to the sea. Recently moulted animals are especially prone to mortality and should not be targeted, and captured individuals should be returned to the sea. Animals that show damage of any sort, e.g. damaged or lost limbs, cut tendons, cracked carapace, bleeding etc, should not be retained as they will not survive.

Dry storage

Spider crabs are not suited to being stored out of seawater and this situation should be avoided whenever possible. Animals that have to be stored dry must be kept the 'right way up' and damp. Onboard the vessel, crabs should be placed carefully into large storage bins and covered with carpet soaked with seawater, or, ideally, sprayed with seawater from a sprinkle bar to prevent them from drying out. When being transported in a vehicle, animals need to be kept cool and covered, especially during high summer temperatures. Dry air, especially from wind or chillers, can be very damaging since crabs' gills are irreparably damaged if allowed to dry, and this can cause 'mortalities' further along the transport chain.

Immersed Storage

Vessel: Crabs must be immersed in full salinity seawater on the vessel. They should be placed gently into large storage containers that should be filled with good quality seawater that must be allowed to drain away continuously to waste so that animals do not suffocate.

Keep pots: Spider crab stored at sea should be kept in full salinity seawater for no more than 1-2 weeks. Animals should be stored in suitable containers (e.g. boxes, bags constructed from old trawl netting or wire mesh baskets) that are attached to floating buoys or piers. Alternatively, the Spider crab can be placed into a keep-pot and then lowered to, or near, the seabed. Containers should be located, ideally, above the seabed so that animals at the bottom can access good quality seawater from underneath the cage. Containers should be filled no more than 75% capacity so that crabs can move around easily. Full containers can lead to 50% mortality after 2 weeks storage.

The storage location must have a good tidal flow to ensure a good through-flow of full salinity seawater to provide oxygen to animals in the middle of the store pot. The location of the store pot is critical since excessive wave movement, tidal flow, freshwater run off and an unsuitable soft smothering or sea weedy seabed may lead to choking, stress, and risk of mortality.

Holding and vivier tanks: If access to store pots is not possible then animals must be placed into full salinity seawater in live holding tanks as soon as possible. Spider crab cannot tolerate low oxygen concentrations in the seawater and will behave unnaturally in seawater that is low in oxygen; animals will climb one on top of each other in an attempt to escape. To help maintain high oxygen levels it is advisable not to overload the storage tanks and ensure high levels of water circulation. Direct aeration with airlines should be undertaken carefully since excessive direct aeration causes high levels of stress and risks mortality.

Spider crab tend to congregate together to form large clumps in tanks. These clumps should be sorted daily in summer and every other day in winter to remove dead individuals. These often occur mainly in the centre of the clumps and will cause rapid mortality of the remaining animals unless removed quickly.

Water temperature should not drop below 6°C or rise above 20°C since Spider crab cannot tolerate temperature extremes, and when animals are being transferred between containers the temperature of the seawater in both containers need to be as close as possible.

Further Reading

External Publications

Publication: Recommended international code of practice for crabs.

Ref No: CAC/RCP 28-1983

Seafish Publications

Most of these are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate reference number (e.g. SR218) or key words from the title.

Publication: Tangle Net Fishery for Spider crabs (*Maia squinado*)
Ref No: SR 499

Publication: Crab and lobster live holding systems.
Part I, Tanks and Buildings. **Ref No:** 1990/1/SF.
Part II, Water pumps, air pumps, and pipework. **Ref No:** 1990/2/SF/AM.
Part III, Filters and instrumentation. **Ref No:** 1990/3/SF/AM

Publication: Handling crabs for the live market.
Part I, from fishing to exporter. **Ref No:** 1987/1/SF
Part II, Vivier transport. **Ref No:** 1990/4/SF

Publication: Handling, transport and storage of live crabs and lobsters.
Ref No: Seafish Open Learning Module.

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then please telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

4.5 Specific Guidance for Velvet Swimming Crab

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for the velvet swimming crab should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical but ignores one aspect and sees the quality fade away, along with the returns from your business.

Name: Velvet swimming crab

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

Country	Name (s)
UK	Velvet swimming crab otherwise known as fiddler, Kerry witch, lady witch, swimmer, velvet, velvet fiddler, velvet swimmer,
<i>Latin</i>	<i>Necora puber</i> although it may also be called by previous Latin names <i>Macropipus puber</i> or <i>Liocarcinus puber</i> .
Spain	Necora
Portugal	Navalheira, Navalheira felpuda
France	Crâb à laine, Etrille commune

Legislation

Minimum landing sizes: UK wide 65mm carapace width measured excluding the teeth on the edge of the shell i.e. the inside edge of the teeth on the shell. There is no minimum landing size for Velvet crabs in Northern Ireland. Local Sea Fisheries Committees (SFCs) in England and Wales; Scottish Fish Protection Agency (SFPA) in Scotland may have bylaws regarding the minimum landing sizes for velvet swimming crab so they must be consulted for each area that is fished (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

There are no maximum landing sizes in place.

V-Notching: V notching is not used on Velvet swimming crabs. (See the booklet relating to lobster for further information regarding V-notching).

Landing of females that are carrying eggs (berried): Females should not be landed when there are eggs under their tail, a purple or brown sponge-like mass, referred to as a 'berried female'. There is currently no national law to

prevent the landing of berried females although local bylaws may differ. Consult with the local enforcement agencies.

Background information

Velvet crabs are typical of many crabs in their predatory and scavenging feeding habits, but, unusually, they can also feed on kelp seaweeds (up to 40% of the diet) although trials indicated that animal material is preferred.

Live Handling and Storage

Velvet swimming crabs are extremely difficult to keep alive due to their susceptibility to stress. The markets for Velvets are almost entirely based in live export by vivier lorry so correct handling is critical from the point of capture onwards. Unfortunately high levels of mortality are not uncommon when holding Velvets and during the vivier shipment from the UK to distant markets, especially during summer months. Velvet crabs are seen to be a high risk species by those in the industry. The key to reducing mortalities with Velvet swimming crabs is to ensure that all of the generic guidance for holding live crustacea is applied to the highest standard possible.

Grading

Great importance needs to be attached to diligent grading of Velvet crabs at several stages through the handling process; emptying the creel, filling and emptying the storage/keep creels and packing the 9kg boxes for vivier transport. To be effective, grading should remove any weak or soft, even slightly soft crabs. Soft crabs are easily identified by gently squeezing the carapace shell. If the shell is anything other than solid, i.e. it yields under light squeezing, cracks etc, and then the crab should be rejected and returned to the sea. Weak crabs are easily spotted because they are less aggressive, will not struggle, and fight if picked up and will allow their legs and claws to hang down. The need to grade so thoroughly and frequently is very important, to remove any crabs that may die. Any dead crabs in a keep pot, storage system or vivier lorry will quickly start to decompose affecting water quality, use up oxygen, release toxins, and will result in further mortalities.

Immersed Storage

Velvet crabs do not keep well in shore based holding tanks or raceways, so fishers tend to catch and store at sea for no more than a week. Two methods of storage seem to be preferred by fishermen. Firstly, Velvet crabs can be packed into boxes or net bags and attached to floating buoys or piers. Alternatively, Velvet crabs are placed into a keep creel/pot (creel/pot with no entrances) and then lowered to, or near, the seabed. There are two schools of thought for packing densities; some fishers prefer high stock densities in keep creels and bags so that there is limited space to fight. The storage location must have a good tidal flow to ensure a good through-flow of sea water to provide oxygen to those packed in the middle. Alternatively, the Velvet crabs can be put into the bag or keep creel at lower densities to allow them the opportunity to move about. Both storage methods keep creel or suspended bags; require careful sitting since excessive wave movement, tidal flow, freshwater run off and an unsuitable soft smothering seabed or seaweed may lead to choking, stress, and risk of mortality. A small amount of feeding

may be appropriate but it has to be balanced against the risk that rotting food will adversely affect water quality in land-based systems. Experience has indicated that Velvet crabs should not be held in storage for more than a week even under ideal conditions since loss of condition will lead to mortality during onward transport.

Dry storage

Velvet crabs are not suited to dry holding (i.e. out of seawater) for any more than the minimum possible time and consideration should be given as how to avoid the need. Vessel stability and vehicle axle weight may make dry transport unavoidable. During dry storage, Velvet crabs must be kept the 'right way up', and kept in damp conditions by covering with soaking carpet or ideally sprayed with seawater from a sprinkle bar. Velvet crabs should also be kept in the cool; the temperatures in an unchilled vehicle during the summer are too high. The dry air from a chiller can be a serious problem in itself. The gills are irreparably damaged if allowed to dry, leading to 'mysterious mortalities' during onward transport. Even the short time that a keep creel can rest on the deck before landing or packing can be a problem as crushing can occur without the support of the water.

Packing

Velvet crabs are normally packed tightly in 9kg boxes for onward vivier transport. This task often causes considerable damage to the catch; broken legs and claws that protrude from the box, even cracked carapace shells with over zealous packing. These 9kg boxes are however useful in reducing fighting damage between crabs and the crates pack conveniently into vivier tanks. However, the tight packing of crabs and crates can lead to poor availability of oxygen for animals in the middle of the stack. Thorough aeration of the seawater in the vivier tanks is essential. Some operators have adopted an alternative packing box that is made of plastic mesh such that legs and claws cannot protrude and the mesh allows a more thorough through flow of seawater and aeration bubbles.

Further Reading

External Publications

Publication: Recommended international code of practice for crabs.

Ref No: CAC/RCP 28-1983

Seafish Publications

Most of these are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate report or reference number (e.g. SR218) or key words from the title.

Publication: Fishery for Velvet swimming crab (*Necora [Macropipus] puber*)

Ref No: SR218

Publication: A study of mortality rates of the Velvet crab during holding and transport

Ref No: SR259

Publication: Opportunities in the UK crab fisheries resources - process technology - markets - new products.

Ref No: SR267

Publication: Live handling and transport of crustacean shellfish: an investigation of mortalities.

Ref No: SR280

Publication: Crab and lobster live holding systems.

Part I, Tanks and Buildings. **Ref No:** 1990/1/SF.

Part II, Water pumps, air pumps, and pipework. **Ref No:** 1990/2/SF/AM.

Part III, Filters and instrumentation. **Ref No:** 1990/3/SF/AM

Publication: Handling crabs for the live market.

Part I, from fishing to exporter. **Ref No:** 1987/1/SF.

Part II, Vivier transport. **Ref No:** 1990/4/SF

Publication: The transport chain of velvet crabs from Orkney, the Western Isles, and Northumberland to Spain. A preliminary review.

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then please telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

4.6 Specific Guidance for Common Prawn

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for the Common prawn should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical but ignore one aspect and see the quality fade away, along with the returns from your business.



Name: Common / Rose prawn

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

Country	Name (s)
UK	Prawn, rose prawn, glass shrimp, English prawn
<i>Latin</i>	<i>Palaemon serratus</i>
Spain	Cameron comun
Portugal	Camarao-do-rio
France	Crevette rosé, Bouquet commun

Legislation

There is no UK minimum landing size for shrimps and prawns. Some areas may have technical restrictions, such as minimum mesh sizes for creels or restricted access for towed gear, to control fishing effort. Local Sea Fisheries Committees (SFCs) in England and Wales; Sea Fish Protection Agency (SFPA) in Scotland or Department of Agriculture Rural Development Northern Ireland (DARDNI) may have bylaws that may restrict the fishing method or

fishing season, so they must be consulted for each area that is fished (see legislative areas for those enforcement organisations that can provide definitive guidance for your area).

Landing of Berried Prawns

Landing and selling female prawns carrying eggs under their tail (a condition fishermen call 'berried') is not recommended from the perspective of the conservation of the stocks. Berried females, however, might represent a large proportion of a catch.

Background information

Several species of prawn and shrimp can be found in UK waters, but to date, only the common prawn (*Palaemon serratus*) has an established fishery for live animals. The UK fisheries for brown shrimp *Crangon crangon* and *Crangon allmani*, pink shrimps, *Pandalus borealis* and *Pandalus montagui*, are based on catch that is cooked at sea or frozen. *Palaemon serratus* eat small crustaceans and molluscs, and algae and take about five years to reach full size, although local populations may vary. Females can grow to twice the size of the males.

Palaemon serratus tends to be common around the south and west coasts of England and Wales although the range of the species extends north to the west coast of Scotland. The seasonality of the fishery for *P. serratus* varies around the coast of the UK, even on very local fishing grounds) because animals make seasonal migrations, overwintering offshore, with large animals returning inshore during early spring (March–May). Summer fisheries tend to be close inshore amongst the seaweeds, whilst winter fisheries usually occur further offshore on muddy substrates.

Markets

The Common prawn is probably the most valuable live crustacean to be caught from the seas around the UK. Their high value demands that they are in pristine condition for the main markets that are based almost entirely on exporting live animals by vivier lorry to Europe (Spain and Portugal). Animals are targeted typically around August and December (Christmas).

Live Handling and Storage

P. serratus must be handled carefully throughout the handling process even though they are not difficult to keep alive due to their hardy nature and ability to tolerate varying environmental conditions. They survive well within the temperature range 9-25°C, but are believed to be intolerant of temperature extremes, suffering mortality at temperatures below 4°C and above 30°C. They prefer well-oxygenated, full salinity water, but can tolerate reduced salinity (27–34ppt) and reduced levels of dissolved oxygen (50% saturation / 3ml/l) during immersed storage.

They are regarded as fairly robust with regard to handling and transportation, if sensible precautions are taken, but are particularly sensitive to crushing and exposure to air and wind, especially during the summer months. Recently moulted animals should not be targeted as they are particularly prone to damage and cannibalism during storage in seawater.

Onboard the Vessel (Initial handling by fishermen)

P. serratus is targeted using mainly barrel pots or traps. The catch from all pots on a string should first be emptied carefully into fish boxes (or shallow trays), to a **recommended depth of no more than 25mm** (one inch), and covered immediately a cover (fish box or similar) to protect the animals from wind, rain and light (especially sunshine).

Selection and Grading

When the whole string has been hauled, the catch should be selected by hand to remove unwanted species and debris. Prawns have a sharp tip to the horn on the head section of their shell (the rostrum) and this can easily puncture the shell of another prawn. Selection should remove all damaged animals. Recently moulted animals are especially prone to damage and mortality through cannibalism and should not be targeted, all such individuals should be returned to the sea

If riddles are used to remove (grade out) the smallest prawns they should be used in water and either shaken by the crew or left immersed in seawater so that the catch can grade itself.

Dry storage

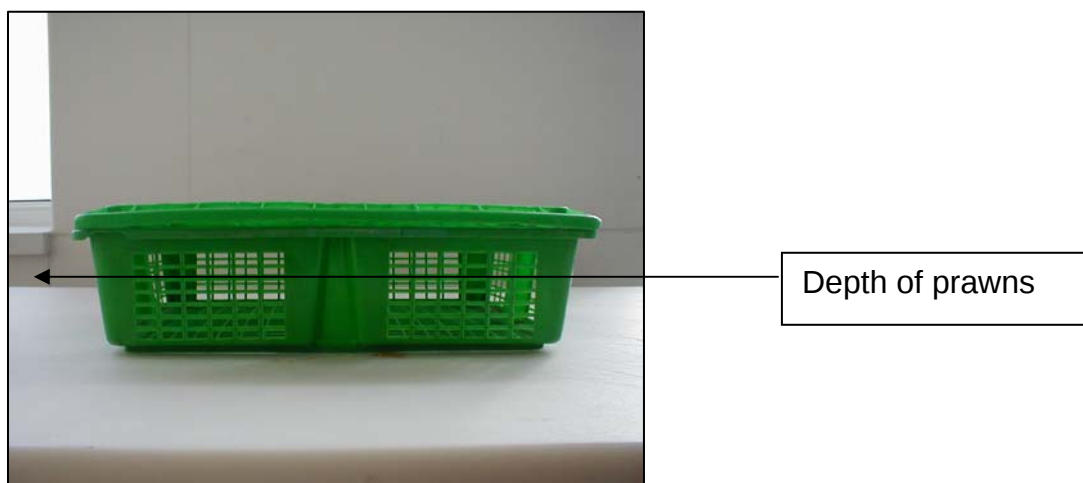
Although *P. stratus* can tolerate short times out of water this situation should be avoided whenever possible. Animals that have to be stored dry must be kept dark and damp and stored in **layers no more than 25mm (one inch) deep**. Onboard the vessel, approximately 2kg of animals should be placed inside each mesh basket measuring approximately 40 x 30 x 10cm.



Baskets should be located inside containers and covered with a fish box or carpet soaked with seawater. When being transported in a vehicle, animals need to be kept cool and covered, especially during high summer temperatures.

Immersed Storage

Vessel: Approximately 2kg of animals should be placed gently into each mesh basket (40 x 30 x 8-10cm) to a depth of approximately 25mm.



Baskets must be placed into a vivier tank containing full salinity seawater that needs to drain away (overflow) continuously to waste so that animals do not suffocate from oxygen starvation.

Keep pots: *P. stratus* stored at sea should be kept in full salinity seawater. Mesh baskets half-filled with animals (approximately 25mm depth) should be stored inside suitable containers (wire mesh baskets 1m x 1m x 1m) that are anchored to the seabed. The location of the store pot is critical since excessive wave movement, tidal flow, freshwater run off and an unsuitable soft smothering seabed may lead to choking, stress, and risk of mortality. Animals should be stored for no more than a week; otherwise high mortality can occur, especially under poor weather conditions (e.g. high wind, water turbidity, rain and excessive wave action).

Recently moulted animals are especially prone to mortality through cannibalism and should not be stored.

Holding and vivier tanks: Animals that cannot be stored in keep pots should be placed into full salinity seawater (in baskets) within a live holding facility as soon as possible. Although *P. serratus* can tolerate low oxygen concentrations in the seawater, it is advisable to maintain high oxygen levels. This can be achieved by not overloading the holding facility, ensuring high levels of water circulation, or by direct aeration, which is reported not to cause mortality in this species. Water temperature should be kept between 6°C and 27°C, since *P. serratus* cannot tolerate temperature extremes, and when animals are, being transferred between containers the temperature of the seawater in both containers needs to be as close as possible.

Tiered raceway systems rely upon water entering into the top tier of the raceway and then cascading down through the raceways underneath. They are an extremely effective method of storing prawns, since they allow easy

access to the stock and provide a large surface area, but experience has highlighted the need to monitor diligently water quality in the lower levels.

For onward transportation in vivier tanks, animals should be maintained in plastic mesh baskets that can be stored in a 3 x 3 x 6 matrix, and provided with well oxygenated, full salinity seawater.

Further Reading

External Publications

Publication: Recommended international code of practice for shrimps and prawns.

Ref No: CAC/RCP 17-1978

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then please telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

4.7 Specific Guidance for Squat Lobsters

Introduction

This is one of a series of Seafish and Seafood Scotland booklets that cover good practice for the handling and storage of live crabs, lobster, and shrimps (crustacea). Fishermen, buyers, and vivier lorry operators have been asking for these guidelines to encourage high standards of care throughout the businesses that handle and store live crustacea. This specific guidance for squat lobsters should be read in conjunction with section 3 that explains the general principles of care for live crustacea. None of the ideas is new or radical but ignore one aspect and see the quality fade away, along with the returns from your business.

Squat lobster tails are a prized dish on the west coast of Scotland where they may be eaten as an alternative to *Nephrops* due to their flavour. Small fisheries exist, but the apparent abundance of the catch places them in a prime position for consideration in respect of diversification of effort, should supply chain and markets be developed.

Name: Squat Lobster

Local or common names vary around the coastline and between countries. To avoid confusion each animal has a Latin name that is used universally. Traceability legislation will require fishery products to be labelled with the Latin name.

Country	Name (s)
UK	squat lobster, squatties
Latin	There are two main species from UK fisheries <i>Munida rugosa</i> and <i>Munida sarsi</i>
Spanish	Unknown
Portugal	Unknown
France	Unknown

Legislation

There is no minimum landing sizes, however, females can become berried at 16mm carapace length (measured from the back of an eye socket to the back edge of the carapace, the rigid head section of the shell). This size would be rejected by fishermen or consumers because it would be too small to process. The largest males reach 40mm carapace length, so a workable minimum economic landing grade, based on consumer acceptability and allowing stocks a chance to breed before entering the fishery, would be perhaps 25mm carapace length. There is no maximum landing size.

Landing of females that are carrying eggs (berried)

The landing and selling of female squat lobsters carrying eggs under their tail (a condition anglers call 'berried') is not recommended as good practice, but is not subject to specific law.

Background information

There are two species of squat lobster caught whilst fishing for *Nephrops*. Identification of the two species is important because *Munida rugosa* is much more resilient to live handling and storage than *Munida sarsi*. It is advised that *Munida rugosa* would be most suited to any live sales. The two species of *Munida* can be easily overlooked, but with some practice, and exposure to both the species, identification is easy.

- *Munida rugosa* has a uniformly red/brown coloured carapace and rostrum, small black eyes and the spines on the 2nd, 3rd and 4th abdominal segments are arranged 4:4:0. Very common throughout the Scottish west coast
- *Munida sarsi* can be recognised by the white tip to the rostrum and a white stripe that extends across the head behind the eyes. The carapace is generally lighter in colour (almost orange) than *M. rugosa*. The black eyes are much larger than those of *M. rugosa* and may appear to be iridescent orange in daylight on freshly caught *M. sarsi*. *M. sarsi* tends to be found in areas of higher tidal flow.

There are other species of squat lobster in UK waters. Most are very small (less than 10mm carapace length); however, there is a species (about 20mm carapace length) with bright red and blue coloration that may be caught whilst creel fishing along the shore. This species, *Galathea strigosa*, is not suitable for a commercial fishery due to its very limited availability and unpleasant taste. Squat lobsters have scavenging feeding habits.

Live Handling and Storage

Live squat lobster can be caught either by creel or by trawl, employing the same methods as used for live *Nephrops*. Both methods have advantages and disadvantages for the quality of live product.

The markets for squat lobsters may be based upon a tail only product, although the claws of the larger males also contain high quality meat. Live export by vivier lorry or by airfreight may develop so correct handling is critical from the point of capture onwards to reassure developing markets that the product is of a high and reliable quality.

The live storage and handling requirements of *Munida* are believed to be similar to those of *Nephrops* or Velvet swimming crab, so readers are encouraged to read these guides. Unfortunately high levels of mortality are not uncommon when holding *Munida* and during vivier shipment from the UK to distant markets, especially during summer months. The key to reducing mortalities with *Munida* is to ensure that all of the generic guidance for holding live crustacea is applied to the highest standard possible, especially keeping animals in cool and well-oxygenated seawater. Live squat lobsters should not be iced directly because the cold will kill them. Indirect icing, such as floating seawater ice in a vivier tank, may be used to keep a catch cool during summer heat.

Fishers note that squat lobsters caught from soft muddy seabed types have a tendency to blacken in the air. Although the reasons are unknown, it could be due to oxidation of sulphur compounds. Blackening renders the catch worthless. It appears as though some of the discoloration is attributable to superficial water that blackens in air and gathers in the exoskeleton. The reasons for this effect are unknown. Seawater washing of the catch can reduce, but does not alleviate, the condition. Animals from hard, rocky substrata are not as susceptible to blackening. *Munida* should, therefore, be kept in clean seawater, possibly with gentle aeration.

Great importance needs to be attached to careful grading of squat lobsters at the several stages through the handling process; emptying the creel, filling and emptying 'tube matrices' (as used for *Nephrops*) or keep creels and packing for vivier transport. To be effective, grading should remove weak, soft, or even slightly soft animals. The carapace of a squat lobster with a hard-shell will feel rigid, but yield slightly when gently squeezed, especially near the legs. The carapace of a soft animal will yield when squeezed and it should be rejected due to their reduced survival. The shell may also be very clean. Weak stocks are identified easily because they are less aggressive, will not struggle if picked up and will allow their legs and claws to hang down. A quality live animal will be undamaged, with six legs and two claws. The need to grade so thoroughly and frequently is very important, in removing any squat lobsters that may die. Any dead animals in a keep pot, storage system or vivier lorry will quickly start to decompose affecting water quality, use up oxygen, and release toxins. All these factors soon lead to further mortalities in a domino effect.

Tubes

Nephrops are often stored in a complex of individual chambers, called tubes, and these seem to be ideally suited for storing live squat lobsters. Great care must be used when filling the 'tubes'. A gap can often exist between the end of the 'tube' and the tray that forms the base. The legs may become caught under the end of the tube and be damaged as the top tray is put in place and the complex tied tightly shut. Fishers have found that elastic bands can be used to prevent any gaps forming. The orientation of stored tubes may have a slight influence over survival and fishers are encouraged to experiment. Prawns held horizontally may have the best survival. Squat lobster claws are not as powerful as those on other crustacea so they may be suited to storage in keep creels or punnets.

Munida have a parasite that forms an egg sack under the tail, which should not be confused with the egg mass of a berried female. The parasite's egg sack is kidney shaped and yellow or orange in colour and can be seen easily if the tail is extended. *Munida* with the parasite are not suited for onward sale due to consumer unacceptability.

Anecdotal evidence also suggests that *Munida* may be prone to tail rot / necrosis as seen in *Nephrops*.

Further Reading

Seafish Publications

Most of these are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate report or reference number (e.g. SR218) or key words from the title.

Publication: Live handling and transport of crustacean Shellfish: an investigation of mortalities.

Ref No: SR280

Further Information

This booklet is part of the Good Manufacturing Practice (GMP) guide for live crustacea issued by Seafish and Seafood Scotland. If you are seeking greater detail than is available in this document, then telephone Seafish to speak to one of our experienced staff.

Please contact Seafish Tel: 01482327837 Fax: 01482223310

5. Further Information

5.1 Seafish Reports

Most of the Seafish Reports are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp>. Please type in the appropriate report or reference number (e.g. SR218) or key words from the title.

Report No.	Report Title	Author
SR218	The Fishery for the Velvet Swimming Crab – <i>Necora puber</i>	P. H. MacMullen
SR259	A Study of Mortality Rates of the Velvet Crab during Holding and Transport	S. Wyman R. Uglow P. MacMullen
SR280	Live Handling and Transport of Crustacean Shellfish: An Investigation of Mortalities	R. F. Uglow D. A. Hosie I. T. Johnson P. H. MacMullen
SR294	An Assessment of Damage and Mortality of the Brown Crab during Vivier Transport	P. H. MacMullen R. F. Uglow D. A. Hosie
SR423	Novel Methods for Restraining the Claws of the Edible Crab (<i>Cancer pagurus</i>)	M. Jacklin W. Lart
SR424	Assessment of Stress and Mortality of the Prawn (<i>Nephrops norvegicus</i>) during Live Handling from Vessel to Market	M. Jacklin
SR444	Exploratory Fishing for <i>Chaceon (Geryon) affinis</i> on Rosemary Bank	G. P. Course W. Lart
SR499	Tangle Net Fishery for Spider Crabs (<i>Maia squinado</i>)	G. Dunlin
SR537	Fish Waste Production in the United Kingdom	M. Archer
SR549	The Evaluation of Ghost Fishing Preventors for Shellfish Traps	J. Swarbrick K. Arkley

SR552	Lobster Hatcheries and Stocking Programmes: An Introductory Manual	C. Burton
SR559	Good Manufacturing Practice Guidelines for <i>Nephrops</i> Fishermen	M. Myers J. Combes
SR560	A Traceability and Responsible Fishing Demonstration in the <i>Nephrops</i> Supply Chain	M. Myers J. Combes
SR570	The Transport Chain of Velvet Crabs from Orkney, the Western Isles and Northumberland to Spain	Dr. A. R. Hearn
1990/1/SF	Part 1 (Tanks and Buildings) Crab and Lobster Live Holding Systems	
1990/2/SF	Crab and Lobster Live Holding System – Part II (Water Pumps, Air Pumps and Pipework)	
1990/4/SF	Handling Crabs for the Live Market – Part II Vivier Transport	
Seafish Open Learning Module	Handling, Transport and Storage of Live Crabs and Lobsters	
Seafish Guidance Document	Legislative Requirements for the Disposal of Seafood Waste (Seafish website)	

5.2 External Reports

	The Prawn, <i>Nephrops Norvegicus</i> as a Candidate for Vivier Transport – A Feasibility Study	R. F. Uglow
Laboratory Leaflet No 39	Artificial Sea Water for Shellfish Tanks	P. C. Wood P. A. Ayres
Laboratory Leaflet No 66	Storage and Care of Live Lobsters	T. W. Beard D. McGregor
Fisheries Research Technical Report No. 79	The techniques and practicability of year round production of lobsters, <i>Homarus gammarus</i> (L.), in laboratory recirculation systems	T. W. Beard P. Richards J. F. Wickins
Codex Alimentarius	Recommended International Code of Practice for Shrimps or Prawns	

6. Identifying and Controlling Food Hazards

6.1 Introduction

You need to know about controlling food hazards because of the EU Regulation 853 /2004 on the hygiene of foodstuffs. This regulation says that people who handle live crustacea (you) **should** identify and control food hazards to help ensure that consumers are not presented with food that is contaminated, and therefore potentially unsafe to eat. It applies to live crustacea even though live crustacea do not represent high risk because they are almost always cooked.

As such, you will have to put in place some procedures for identifying and controlling food hazards in your operation. Any procedures should be based on based on **Hazard Analysis and Critical Control Points (HACCP)** principles, which aim to help ensure that consumers are not presented with food that is contaminated, and therefore potentially unsafe to eat.

It is important to say that that this regulation recognises the need for a simple and flexible approach when these principles are applied. The competent authority needs to take account of the nature and size of your business; in some cases, good hygiene practices will suffice. As such, *it is important you contact your local EHO* at an early stage, establish the level of risk involved in your operation and agree the structure of any documents that you might need to produce.

Examples of the different hazards are as follows:

- Physical hazards include dangerous or unwanted foreign bodies such as slivers of glass, splinters of wood, rust, bits of netting, or flakes of paint.
- Chemical hazards include diesel, oils, or greases, detergents, and cleaning chemicals.
- Sources of bacterial hazards include dirty fish rooms, equipment, boxes, and poor hygiene standards on the part of your crew.

In the context of handling live crustacea, examples of general hazards that should be into account are summarised in the table overleaf, together with measures needed to control them.

Examples of general food hazards and control measures associated with handling live crustacea

General Hazards	Control measure
Contamination from diesel.	Clean up any diesel spillages.
Contamination from cleaning fluids.	Correctly label all cleaning fluids and store chemicals away from crustacea handling and storage areas.
Contamination from glass and small metal objects.	Identify and dispose of glass and small metal objects. Store such objects away from crustacea handling and storage areas.
Contamination from rotten bait.	Identify and dispose of rotten bait in an hygienic manner.
Contamination from staff and operatives.	Ensure high level of operatives' hygiene.
Bacterial contamination from dirty containers and storage areas.	Regularly clean containers and storage areas.
Contamination from dirty landing areas.	Clean landing areas; unload in different area.
Bad quality seawater and non-potable water.	Ensure that seawater used is of good quality. Obtain potable water from an approved source.
Contamination from dead animals.	Identify and dispose of dead animals hygienically.
Contamination from waste and litter.	Identify and dispose of waste and litter hygienically.
Contamination from vermin.	Carry out effective pest control measures.

You must think about the hazards and how you will control them at each stage of handling, for example: aboard vessel; during storage ashore and during transportation in a 'vivier' truck.

Identifying hazards and controlling food hazards in this way (**Hazard Analysis**) is useful in promoting good hygienic practices and is consistent with 'good practice guidance'.

The HA scheme normally does not require you to write anything down. However, some circumstances might require some writing, for example, if customers want to see evidence that proper cleaning has been carried out, e.g. via cleaning schedules (see [Appendix I](#)).

It should be emphasised that the various tables or forms are a general guide. You can modify these forms, possibly in conjunction with your customers, your Environmental Health Officer and Seafish, to make them more relevant to your operation - it is up to you.

7. Appendices

Appendix I - Cleaning Schedules

Appendix II - Traceability

Appendix I

Cleaning Schedules

Appendix I - Cleaning Example 1

Area	Frequency and Method		Date	Signed	Approved
Exterior Yard	Daily/as necessary e.g. after unloading	Clear debris and hose down			
Reception Area	Daily/as necessary e.g. after unloading	Clear debris and hose down			
Staff Areas					
Toilets	Daily/as necessary	Clean with chemicals and hose down			
Changing Room	Daily/as necessary	Clean with chemicals and hose down			
Canteen	Daily/as necessary	Clean with chemicals and hose down			
Shellfish Handling and Storage Areas					
Walls, Doors	Daily/as necessary	Clean with chemicals and hose down			
Floors	Daily/as necessary	Clean with chemicals and hose down			
Ceiling	As necessary	Remove loose debris			
Drains	Daily	Remove waste and thoroughly wash			

Area	Frequency and Method		Date	Signed	Approved
		through with clean water and chemicals			
Equipment					
Storage Tanks	As necessary	Clean and rinse out			
Workbenches	Clean as you go and at end of day	Clean with chemicals and hose down			
Chill Store					
Floors/Walls/Doors	As necessary	Clean with chemicals and hose down			
Drains	Daily	Remove waste and thoroughly wash through with clean water and chemicals			

NB: This example shows what a 'typical' cleaning schedule can look like. YOU can CHANGE the schedule to make it more suitable for the conditions of your particular operation.

NB: Guidance on suitable chemicals can be obtained from chemical suppliers. All chemicals used for cleaning must be approved by your local competent authority.

Appendix I - Cleaning schedule - Example II

Cleaning Schedule

1. All cleaning materials are to be stored in a lockable cupboard away from food production.
2. All containers of cleaning solutions are to be clearly and conspicuously marked to ensure that they cannot be inadvertently used for anything other than for what they are intended.
3. Cleaning solutions are to be made up in accordance with the manufacturer's instructions.
4. Cleaning solutions are to be made up as required and any made up solution left at the end of the cleaning is to be disposed of by carefully pouring down the drain.
5. Protective clothing is to be worn as directed by the manufacturers of the cleaning solutions.
6. Only chlorine-based disinfectants or sanitisers will be used on any surfaces on which food comes into contact.
7. Phenol based disinfectants will only be used in toilet areas, drains etc.
8. All cleaning equipment is to be maintained in a clean condition.
9. A **“clean as you go policy”** will be maintained in all working areas to ensure that there is no build up of waste and waste material in any of the working areas.
10. All staff involved in the cleaning regime will be given proper training in the use of any chemicals and equipment.

Personal Hygiene for Crew

Crew on board fishing vessels are classed as food handlers. As a food handler, they have both legal and moral responsibility in handling live crustacea to prevent its contamination.

Food handlers may be classed according to the level of risk associated in the handling of a particular type of food. Fishermen are involved at the very start of the food supply chain; they harvest a natural resource and bring it ashore for further processing. The food safety risks in handling the fish at this stage are considered low. The Chartered Institute of Environmental Health, (CIEH) have classified food handlers according to this level of risk. Most fishermen would be considered as a Category A (2) food handler. This is defined as a person who is involved in working with produce which is subject to basic grading and washing but which will be subject to further processing prior to consumption.

Crew must be aware that they have their role to play in assuring the quality of the product. Good personal hygiene awareness should form the basis of a pre-work hygiene induction, and new crew should not be allowed to start handling fish until the skipper or master is happy that they understand and accept the rules.

Following the initial induction training onboard, it is recommended that fishermen gain an Introductory Food Hygiene Certificate. Contact your local Seafish Group Training Association for more details. Training has been proved to be beneficial for crew morale and efficiency, and trained crew require less supervision and will handle fish properly, leading to improved quality and prices.

A basic list of good hygiene rules for all persons handling fish onboard and during landing operations is illustrated on the following page. The skipper or master should ensure that all crew are fully aware of these rules and that they adhere to them when handling, packing, storing and landing the catch.

Crew Hygiene Work and Work Rules

The hygiene rules below will apply to all crew when handling, storing and landing fish:

- All crew must wear protective clothing and keep it clean.
- Hats should be worn which cover the hair.
- Crew must only eat, drink, or smoke outside the handling and storage areas.
- Crew must wash and dry their hands before handling fish, and particularly after visits to the toilet.
- Gloves used for handling fish must be washed frequently.
- Crew must not, blow noses, cough, sneeze or spit over fish when handling it.
- Waterproof plasters must be used to cover cuts and grazes.
- Crew must inform the skipper if they are suffering from vomiting, diarrhoea or other stomach upsets.

Appendix II

Traceability

Traceability

The Meaning of Traceability

There are several definitions, but in this context 'traceability' is effectively the ability to determine the movement of particular goods through a distribution chain. Traceability has to work in two directions: it has to work back through a chain from particular end-products sold to consumers in order to determine their origins, and it has to work forward through a chain from particular raw materials to determine their end-product destinations. Also, for food and particularly for perishable food, traceability should sensibly include knowing what has happened to it in the chain, i.e. its processing history, as well as where it has been and who was responsible for it. In this context, the 'processing history' also includes conditions of storage and transport.

The demands for traceability are both legal and commercial.

To achieve traceability, goods need to be labelled or otherwise identified and information recorded on their movement through the chain (and on their processing history if required). This can necessitate the generation and holding of a considerable amount of data, only some of which can feasibly be put on a label (e.g. the species and catch area).

It should be noted that traceability concerns only the ability to access this information. The information does not necessarily have to be with the goods or be generally available.

The Legal Requirements

There are explicit legal requirements for traceability and a number of further legal requirements that relate to traceability. The explicit requirements are for reasons of product and food safety: to help identify the cause of any problem and to enable product recall if necessary.

Directive 2001/95/EC on general product safety applies to all products intended or likely to be used by consumers, except second hand products. It requires that producers recall any products found to be unsafe. It specifically requires that products are labelled to identify them and their producer, and that distributors keep records to enable tracing of origin. Fish processors are clearly 'producers' of products, but other businesses in the supply chain whose activities may affect the safety of products are also deemed to be 'producers'. The Directive took effect from 15 January 2004 but does not apply where there is more specific EU legislation, as will soon be the case for food.

Regulation EC/178/2002 laying down the principles and requirements of food law requires the traceability of food through all stages of production, processing and distribution. Specifically, it will require food to be labelled or identified to facilitate its traceability and that food businesses will have to keep records of persons who have supplied them with food and of businesses they

supply food to. Compliance with this basic 'one up, one down' traceability should be relatively straightforward. A fisherman typically puts a tally on each box to identify the vessel and then supplies to an agent, the next food business, who will then bear the responsibility of recording the individual buyers of the fish. Fish processors already have to identify their products with an establishment number and, for obvious commercial reasons, already record whom they receive from and supply to. However, it should be noted that the legislation also applies to intermediate food businesses, such as haulage companies and cold store operators, who must also record who they receive from and supply to. The Regulation does not require 'internal traceability' within each business, i.e. the ability to trace particular products dispatched to particular raw materials received, and neither does it require records of processing history.

Further legal requirements that also relate to traceability include labelling and record keeping requirements within a wide range of fisheries management, fish marketing and food legislation. For instance, they include skipper's log book and reporting requirements, the system of first sale notes and the forthcoming registration of first sellers and buyers and their responsibility to keep records, the labelling of fish species, production method and catch area and the requirement for lot marking.

Exporters to the United States of America have to comply with the US Bioterrorism Act of 2002 that requires electronic prior notification of consignments arriving in the US, including specified traceability information.

The Commercial Requirements

There is considerable pressure from the corporate food industry for traceability through their supply chains. This is to maximise their operating efficiency, to assure their product safety and quality, to support their claims in product labelling and, most importantly, to protect their brand image. The commercial consequences of a food safety or mis-labelling issue for a multiple or manufacturer's brand can be enormous. Similarly, food safety problems have, at times, necessitated massive product recalls and even the closure of businesses when traceability has not been in place. With traceability, it is possible to identify, isolate and deal with the specific part of the business or the particular supplier causing the problem. A level of internal traceability within businesses and knowledge of production history are crucial in meeting these commercial requirements, which are well beyond the basic legal requirements.

These commercial requirements are, in many instances, the real drivers for change. Put in stark terms, if the increasingly important large food businesses cannot get the information they want from their existing suppliers, they will source elsewhere. Suppliers can choose to view this as a threat or as an opportunity to help secure a place in the market.

The ethical aspects of food production are also becoming of increasing concern to consumers and hence to the businesses that sell to them. This

means that important aspects of production history can include the sustainability of the fisheries and the use of responsible fishing techniques. Indeed, for businesses wishing to capitalise on responsible fishing, product quality or regional origin schemes, traceability is a basic requirement to support and protect their claims.

Furthermore, the general experience of businesses that have introduced effective traceability into their operations is that they have also found considerable efficiency benefits in stock control, production planning, quality assurance and office systems, etc.

Traceability Developments

As fisheries controls are being tightened, the tools for traceability are being put in place and they are being increasingly adopted, in the UK and abroad.

Most large food businesses have some form of internal traceability, but achieving chain traceability has been a problem, particularly in the seafood industry. The EU funded Tracefish project has addressed this problem.

Tracefish is a set of internationally agreed specifications for a scheme of chain traceability for the fish industry. Participation in the Tracefish scheme is voluntary, but there are considerable commercial advantages. Fish distribution chains are commonly 'disorganised', but the scheme provides a set of common standards that each business can adopt in the knowledge that its traceability system will be compatible with the other players in the industry, hence enabling chain traceability. It is based on the electronic storage and transfer of data. It is supported by CEN, the European standards body, and by EAN International, the article numbering body. The scheme specifies how units traded within the distribution chains are to be identified with EAN numbers and the information on those units that is to be recorded by each of the businesses that produce process or handle them through the chains, from catchers to retailers. Information on processing history is included as well as the information required by law. The information generated by each business remains in the ownership of that business, but can be rapidly accessed through the chain when required, either to address a food safety problem or by commercial agreement. The scheme requires internal traceability to be recorded, but the precision of that internal traceability remains a commercial decision for each business. Seafish played a leading role in developing the philosophy of the scheme and in drafting the information specification for captured fish distribution chains. Tracefish is now being implemented in a number of countries including the UK.

For seafood, traceability has to start at sea. Weighing, labelling and information systems for vessels, originally developed some years ago by Seafish and commercial partners, can meet this need. Tracefish compliant systems for vessels are now produced commercially in the UK and are being increasingly adopted. These systems provide the vessels with marketing benefits and also generate the necessary fisheries control data.

Sorting at sea and the use of weighing, labelling and information systems are not considered feasible on small inshore vessels. However, for vessels making short trips to local grounds these functions can be carried out on landing, with little loss of traceability. Seafish helped the port of Looe (Cornwall) develop a system in which the data is input on landing via a touch screen coupled to electronic scales and a label printer. This one set of data is then used for a multiplicity of electronic sales, billing and other purposes in the port's back-office software, with considerable benefits in efficiency. A Tracefish compliant port system has now been developed commercially in the UK and the first is being installed at Newlyn (also in Cornwall) together with links to its satellite ports. Further ports are showing interest in the system. It seems likely that future developments will be mixed vessel and port based systems that are Tracefish compliant and hence compatible.

Tracefish compliant business systems for aquaculture production, for processors and other businesses in the distribution chains have been under development by system providers in a number of countries. A system for merchants and processors, based on the technology of the port system and with similar efficiency benefits, has been developed in the UK.

EAN numbers in the form of bar codes are used throughout the world to identify items traded. They are machine readable and have the capacity to carry basic information on the item as well as identify it. The next stage of technological development is the use of RFID (radio frequency identification) tags as the data carriers. These can be read remotely and have the capacity to carry more information. This technology is developing rapidly and its cost is falling. Read/write tags have the capacity for adding information as items pass through a distribution chain. RFID tagging of fish boxes is already used in some French ports and has the further benefit of helping box pool operators keep track of their boxes. In the UK, a RFID enabled weighing and labelling at sea system has been under development. The major multiples are actively trialling RFID systems and one of the largest has specified that its top 100 suppliers must be using RFID by January 2005 and the remainder of its suppliers must be using the system by January 2006.

Further sources of information

Further information on Tracefish can be found on the Seafish website www.seafish.org.uk (search for Tracefish).

The Food Standards Agency has been preparing general guidance on traceability for the food industry and Seafish has contributed to the drafting of this. The guidance recommends best practice on traceability, not merely compliance with the limited requirements of the law.

'Directive 2001/95/EC on general product safety' and 'Regulation EC/178/2002 on the principles and requirements of food law' can be downloaded from www.europa.eu.int/eur-lex.

Seafish Reports

Most Seafish Reports are available from the Seafish website under the 'publications' page at <http://www.seafish.org/resources/publications.asp> Please type in the appropriate report or reference number (e.g. SR538) or key words from the title.

Publication: Development of an integrated weighting, labelling and forward information system for fishing vessels.

Ref No: SR538

Publication: An integrated traceability, marketing and back-office system for inshore ports.

Ref No: SR553