SAFE PACKAGED SEAFOOD

A GUIDE TO IDENTIFYING FOOD SAFETY HAZARDS AND DETERMINING THE SHELF-LIFE OF PACKAGED SEAFOOD PRODUCTS

AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE

INTRODUCTION

Fast Facts

> This Guide has been developed to assist seafood businesses to produce safe and wholesome products that offer a return on investment.

> All seafood businesses are legally required to produce safe products.

Why are food safety and shelf-life important?

Australia has a reputation for safe, clean seafood; consumers expect that the seafood that they purchase is safe to eat and of high quality. The seafood industry must continue to evolve to meet changing consumer demands for quality and convenient packaged seafood.

Foodborne illness not only places a burden on the public health system, it also reduces consumer confidence.

Product failures and food safety incidents can jeopardise the success of new products and result in high profile media attention which may further tarnish brand and public image. The flow-on effects not only impact the seafood sector directly involved, but all seafood producers due to the reduction in overall seafood consumption and consumer confidence.

This Guide aims to assist seafood processors who are developing new packaged seafood products to understand:

> potential food safety risks

> regulatory requirements

> processing and packaging techniques

> shelf-life assessment programs.

It is important that businesses developing seafood products consult with their relevant competent authority to determine specific testing requirements and sampling regimes for their products.

What are the advantages of correct product development?

Packaged seafood that is safe and wholesome results in:

> high product quality

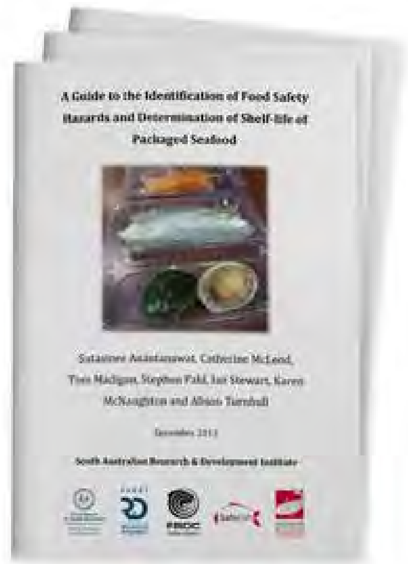
> diversified markets

> increased market share

> consumer satisfaction

> brand protection and enhanced reputation.

This Guide is a summary of a comprehensive technical document prepared by the Australian Seafood Cooperative Research Centre, available at www.safefish.com.au.



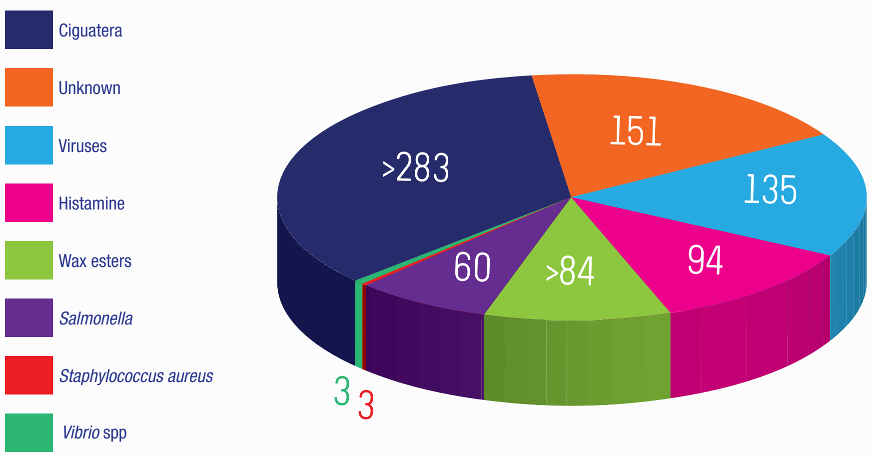
HAZARD ID

Fast Facts

- > A hazard has potential to cause harm to human health.
- > Hazard identification is a critical part of developing a food safety plan.

What are the common hazards associated with seafood?

Hazards to human health can occur anywhere in the food chain, from pre-harvest through to consumption. These hazards can result in short-term immediate illness or chronic (long-term) effects. Hazards that have resulted in confirmed seafood associated illness in Australia are shown below (collated from OzFoodNet data 2001-2010).



Pathogenic viruses

A virus is an organism that infects the cells of other animals. Some viruses enter the marine environment by human pollution. Filter feeding animals such as oysters, can accumulate viruses from the environment if the growing area has been contaminated by faecal contamination. In addition, seafood can become contaminated with viruses during processing. Some viruses can lead to severe gastrointestinal illness in humans. Examples of viruses that can be associated with seafood include norovirus (formerly Norwalk virus) and hepatitis A.

Histamine

Histamine is a toxin formed by bacteria during post-harvest storage. Histamine poisoning, also known as scombroid fish poisoning, is caused by ingestion of the toxin. It is often associated with scombrid fish (tunas and mackerels) and in Australia it has also been associated with anchovies, sardines, Yellowtail Kingfish, Amberjack and Australian Salmon. Histamine poisoning can result in symptoms including gastrointestinal illness and allergic reactions. Death does not usually occur and symptoms usually resolve within 24 hours.

Wax esters

Wax esters are fatty acid components of certain types of fish (e.g. Escolar and Oilfish). Wax esters can not be digested by humans and cause a condition known as steatorrhoea or, more specifically, keriorrhoea. This condition is characterised by anal leakage where an oily residue occurs, sometimes accompanied by abdominal cramping, nausea and vomiting.

HAZARD ID

Pathogenic bacteria

While the majority of bacteria are not harmful to humans, some can cause infection leading to illness or even death; these bacteria are referred to as pathogenic bacteria. Some pathogenic bacteria occur naturally in seafood, whilst others can contaminate seafood either in growing waters or during processing. Symptoms of illness from pathogenic bacteria can range from mild gastrointestinal illness through to septicaemic infections that result in mortality. Examples of pathogenic bacteria that can occur in seafood include *Clostridium, Escherichia, Listeria, Salmonella, Staphylococcus* and *Vibrio*.

Parasites

Parasitic worms and flukes, or their eggs, can be present in the gills, guts or flesh of fish and other marine animals. Some parasites can persist in humans following consumption of contaminated seafood. This can result in conditions such as gastrointestinal illness or allergic reactions and in some instances, complications can lead to death. Examples of fish parasites that can cause illness in humans include *Gnathostoma* and *Anisakis*.

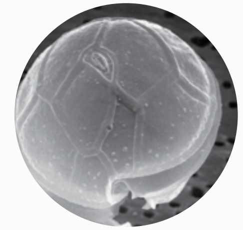
Toxic metals

Toxic metals are substances that are distributed throughout the environment and come from both natural sources and as a result of human activity. Exposure to highly contaminated sources can cause acute illness; however, the hazard in seafood is normally associated with long-term dietary intake of trace amounts. Pregnant women and children are particularly susceptible to the effects of mercury and lead, as these toxic metals can adversely affect neurological development. Cadmium and arsenic are known carcinogens.

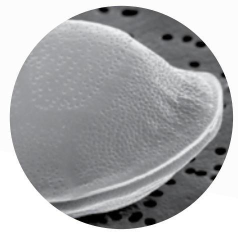
Marine biotoxins

Biotoxins are potent toxins produced by some types of marine algae. Under certain conditions, these algae can bloom, producing biotoxins which can accumulate in filter feeding marine animals such as oysters and mussels. For this reason, biotoxins are sometimes referred to as shellfish toxins. Biotoxins are also known to accumulate in fish (e.g. ciguatera normally found in predatory fish in tropical areas) and in the hepatopancreas (the mustard or tomalley) of crustaceans such as crabs and lobsters (e.g. paralytic shellfish toxins). These toxins can be harmful to humans and can result in a range of conditions from gastrointestinal illness, respiratory distress and in severe cases, death.

Under the Microscope



Alexandrium minutum



Gambierdiscus gillespie

Dinophysis acuminata

Gymnodinium catenatum

Mixed algal sample

Micrographs courtesy of Professor Gustaaf Hallegraeff and Penny Ajani

REGULATORY REQUIREMENTS

What is the Food Standards Code?

The Food Standards Code is developed by Food Standards Australia New Zealand (FSANZ) in consultation with other government agencies and stakeholders. It aims to prevent illness that may arise from the consumption of contaminated food, including seafood.

The Code sets the standards for primary production, food labelling, food safety and hygiene standards for all States and Territories throughout Australia and New Zealand.

The Code is enforced by the relevant competent authority; i.e. Local, State and Territory Government departments within Australia and the relevant food agencies in New Zealand.

Fast Facts

- > The Food Standards Code is available at http://www.foodstandards.gov.au.
- > The Primary Production and Processing Standard for Seafood is given in Standard 4.2.1.
- > International requirements for food safety purposes are available at www.frdc.com.au/trade.
- > A list of accredited laboratories is available at www.nata.asn.au.

What are food safety programs?

"Relying on regulations alone is not enough to ensure food safety."

The development of food safety programs based on Hazard Analysis Critical Control Point (HACCP) principles is the best means of ensuring food safety. While microbiological criteria and associated guidelines can help identify a process failure, industry needs to develop strict internal controls and benchmarks specific to their business for the hazards identified by their HACCP plan.

All incoming seafood and other raw materials should be sourced from third party accredited HACCP approved suppliers who follow either the practice of the Australian Government Department of Agriculture, the Codex Alimentarius Commission or ISO 22000. The history of the incoming product, including time-temperature profiles and physical handling from harvest through to processing will impact the appearance, shelf-life and overall acceptability of the end product.

Pre-requisite programs (PRPs), also known as Good Manufacturing Practice (GMP), are support programs to the overall Food Safety Program that can be validated, monitored and verified. They control common hazards that can occur at each processing step. Example PRPs that could be applied are good hygiene practice, cleaning and sanitation, equipment calibration and maintenance, and pest control programs.

Under Standard 3.2.1 of the Food Standards Code, seafood companies may be required to implement a HACCP plan, depending on local requirements for their product type (check with your competent authority). Nevertheless, the HACCP process identifies potential hazards and describes measures for their control to ensure the safety of seafood products and should be employed by all businesses.

REGULATORY REQUIREMENTS

What are the regulated hazards for finfish?

Finfish that contain either microbiological or chemical hazards could have been contaminated either in their habitat, by their diet or during harvest or processing. The HACCP process will identify which hazards food businesses should include in their testing regime.

Food safety criteria	Product type	Step where risk occurs	Reference to FSANZ Standard
Mercury	All fish	In-water	1.4.1
Arsenic *(inorganic)*	All fish	In-water	1.4.1
Lead	All fish	In-water	1.4.1
Listeria monocytogenes	Processed fish	Processing and storage	1.6.1
Histamine	Fish and fish products	Harvest through to end product	1.4.1
Polychlorinated biphenyls (PCBs)	All fish	In-water	1.4.1
Veterinary chemicals *(benzocaine, florfenicol, isoeugenol, oxytetracycline, praziquantal, trichlorfan, tylosin)*	All fish	In-water	1.4.2
Agricultural chemicals *(aldrin and dieldrin, BHC, chlordane, DDT, hexachlorobenzene, heptachlor, lindane)*	All fish	In-water	1.4.2
Tin	All canned fish	Canning stage	1.4.1

Notes: Agricultural and veterinary chemicals that are not listed in Standard 1.4.2 of the Food Standards Code should have no detectable residues.

REGULATORY REQUIREMENTS

What are the regulated hazards for molluscs?

Molluscs include bivalves (oysters, mussels, clams and cockles), gastropods (abalone) and cephalopods (squid and octopus). Because of their filter feeding nature, bivalve molluscs can accumulate algal toxins, pathogenic bacteria and viruses. For this reason, bivalves are a much higher food safety risk than other seafood species. All bivalve mollusc producers must be licensed or accredited and operate in accordance with the Shellfish Safety Programs operated by their relevant State or Territory agency.

Food safety criteria	Product type	Step where risk occurs	Reference to FSANZ Standard
Mercury	All molluscs	In-water	1.4.1
Arsenic *(inorganic)*	All molluscs	In-water	1.4.1
Lead	All molluscs	In-water	1.4.1
Cadmium	All molluscs (excluding dredge/bluff oysters and queen scallops)	In-water	1.4.1
Paralytic Shellfish Toxins *(Saxitoxin equivalent)*	Bivalve molluscs	In-water	1.4.1
Diarrhetic Shellfish Toxins *(Okadaic Acid equivalent)*	Bivalve molluscs	In-water	1.4.1
Neurotoxic Shellfish Toxins *(Brevetoxins)*	Bivalve molluscs	In-water	1.4.1
Amnesic Shellfish Toxins *(Domoic Acid equivalent)*	Bivalve molluscs	In-water	1.4.1
Listeria monocytogenes	Bivalve molluscs that have undergone processing other than depuration	Processing and storage	1.6.1
Escherichia coli	Bivalve molluscs other than scallops	In-water and processing	
Veterinary chemicals *(benzocaine)*	Abalone	In-water	1.4.2
Agricultural chemicals *(aldrin and dieldrin, BHC, chlordane, DDT, hexachlorobenzene, heptachlor, lindane)*	Molluscs	In-water	1.4.2
Tin	All canned molluscs	Canning stage	1.4.1

Notes: Agricultural and veterinary chemicals that are not listed in Standard 1.4.2 of the Food Standards Code should have no detectable residues.

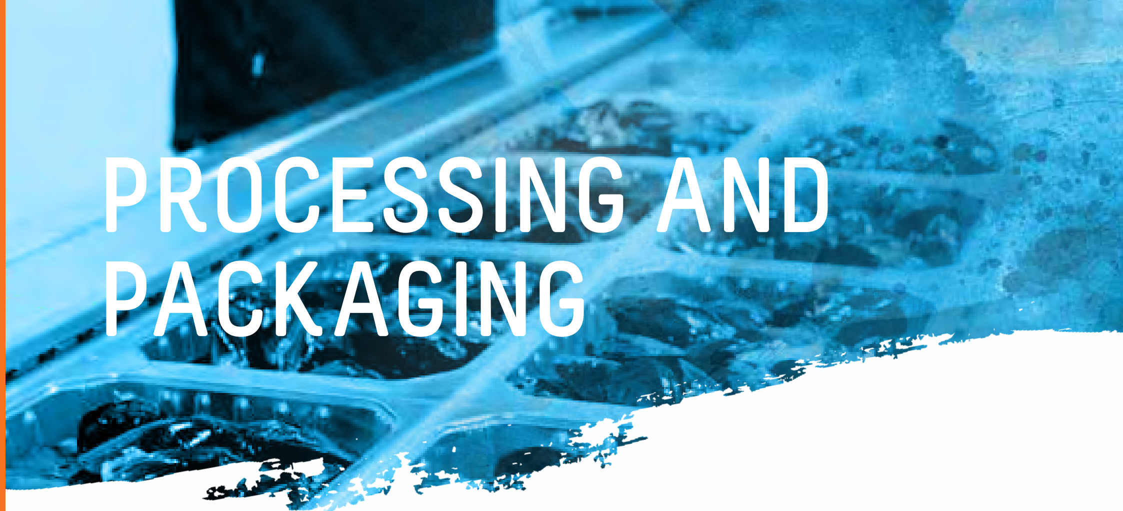
REGULATORY REQUIREMENTS

What are the regulated hazards for crustaceans?

Crustaceans are a subgroup of invertebrate arthropods that have an exoskeleton. The most common examples in seafood are prawns, lobsters and crabs. Crustaceans are perishable and are often sold live; lobsters and crabs in particular. The HACCP process will identify which of these hazards food businesses should include in their testing regime.

Food safety criteria	Product type	Step where risk occurs	Reference to FSANZ Standard
Mercury	All crustaceans	In-water	1.4.1
Arsenic *(inorganic)*	All crustaceans	In-water	1.4.1
Standard plate count	Raw	In-water	1.6.1
Standard plate count	Cooked	Processing	1.6.1
Coagulase-positive Staphylococci	Raw	In-water	1.4.1
Coagulase-positive Staphylococci	Cooked	Processing	1.4.1
Salmonella	Raw	In-water	1.6.1
Salmonella	Cooked	Processing	1.6.1
Veterinary chemicals *(oxytetracycline)*	All crustaceans	In-water	1.4.2
Agricultural *chemicals (aldrin and dieldrin, BHC, chlordane, DDT, hexachlorobenzene, heptachlor, lindane)*	All crustaceans	In-water	1.4.2
Tin	All canned crustaceans	Canning stage	1.4.1

Notes: Agricultural and veterinary chemicals that are not listed in Standard 1.4.2 of the Food Standards Code should have no detectable residues.



PROCESSING AND PACKAGING

Fast Facts

Processing and packaging techniques can:

> Increase shelf-life.

> Introduce texture and flavour.

> Provide convenience.

> Assist with branding and labelling.

Why use modified atmosphere packaging?

Modified atmosphere packaging (MAP) is a technique where food is sealed in a package and the atmosphere inside the package is altered. This can be achieved either by applying a vacuum or by replacing normal air with a single gas type or a mixture of gases. MAP is useful as it slows the growth of microorganisms responsible for spoilage resulting in an increased shelf-life. In addition, the low oxygen environment can minimise the development of rancidity of fish during storage.

Are there any increased food safety risks with MAP?

Some pathogenic bacteria, such as *Listeria monocytogenes* and *Clostridium botulinum*, can grow in MAP formats where there is no oxygen. Therefore, these pathogens need to be considered when developing new MAP products. Other control steps, such as storage temperature, need to be taken to ensure control of such microorganisms.

Are there any quality issues that can arise from MAP?

The main quality issues that arise from the use of MAP relate to the use of carbon dioxide. This gas is frequently used in MAP as it can suppress microbial growth and extend shelf-life. It is more soluble at lower temperatures so MAP treatments using CO_2 are usually more effective at lower temperatures. Concentrations of CO_2 approaching 100% can result in pack collapse and increased drip loss which is probably due to a slightly lowered pH. Also in some products, such as fatty fish and oysters, high levels of CO_2 can impart a sherbet-like flavour to the product.

Why use smoking?

Cold smoking involves smoking food products at low temperatures (usually less than 32°C). Hot smoking involves warmer temperatures (internal temperature of 70-80°C) resulting in a product that is essentially cooked. Smoking is used to achieve different textures and flavours and to extend shelf-life.

Are there any increased food safety risks from smoking?

The low temperatures used in cold smoking are not sufficient to significantly reduce the concentration of any pathogens. Therefore cold smoking requires extra steps to reduce risk (e.g. pH adjustments, salt concentration and drying). The major post-harvest hazards associated with cold-smoked products are *Listeria monocytogenes* and *Clostridium botulinum* type E.

Hot smoking is generally sufficient to kill most bacteria and parasites. It is important to note that the cooking profile of the hot smoking process is a Critical Control Point and failure to adhere to the profile could result in a potentially dangerous product. Hot-smoked products can also provide a suitable medium for bacterial pathogens to grow after smoking as there is little competition from other bacteria. It is also important that products are packaged only after they have been adequately cooled. Products that have not been adequately cooled can form condensation in the packet which may be conducive to the growth of pathogens during storage.

PROCESSING AND PACKAGING

Why use canning?

Canning is a heat treatment process that usually incorporates a temperature of 121°C for a set period of time. The time-temperature profile is sufficient to inactivate microorganisms within the canned product. Canning can be a cost-effective way to preserve food as it can offer a product shelf-life of up to five years at ambient temperature.

Are there any increased food safety risks from canning?

The spore-forming bacteria *Clostridium botulinum* is known to survive when suboptimal time-temperature profiles are applied in a canning process. For this reason, it is critical to achieve a time-temperature profile that will ensure inactivation of bacterial pathogens and this is a Critical Control Point in any canning operation.

Storage temperature, pH and water activity are also important in controlling *Clostridium botulinum* in canned product. Tin residues from defective canning materials can contaminate seafood content especially if the contents possess a pH value or if the can was stored open to the air for a period of time. However, this is now rare due to improved technology, such as enamel layers used in the cans.

Potential food safety hazards that could be increased by processing or packaging

As mentioned previously, some risk from microbiological hazards can increase when different packaging or processing styles are used; the most likely pathogens for different processing steps are shown below.

Processing/packaging type	Hazard	Potential control measure in addition to PRP
MAP seafood	*C. botulinum*	Cold storage (< 3°C); include oxygen in gas flushed packs
	L. monocytogenes	Storage temperature control (< 5°C); limited shelf-life; organic acids
Smoked seafood	*C. botulinum*	Cold storage (< 3°C); include oxygen in gas flushed packs
	L. monocytogenes	Storage temperature control (< 5°C); limited shelf-life; organic acids
Canned seafood	*C. botulinum*	Adequate heating profile identified and controlled

Notes: Hazards can be specific to a particular processing practice in an individual company. Food producers should carefully consider their particular potential hazards as part of their HACCP program.

SHELF-LIFE DETERMINATION

How is shelf-life assessed?

The Food Standards Code sets a requirement to date mark most packaged products under Standard 1.2.5. Date marking provides consumers with a guide to the shelf-life of the food.

750g NET
Use by
14 Feb 14
9 336261 000017

A 'best-before' date is used if shelf-life ends due to spoilage or quality issues. A 'use-by' date is used when packaged food may become unsafe for consumption prior to noticeable spoilage. Products that are date marked should specify optimum storage conditions.

All foods begin to deteriorate following harvest for a number of reasons, including microbial, enzymatic and chemical reactions and other factors such as storage conditions. While the definition of shelf-life can vary, it can generally be defined as being from the point of harvest to the point of spoilage.

Organoleptic spoilage is the point when a food product becomes unsuitable for consumption due to objectionable odours or flavours, colour loss, changes in texture, formation of slime or gases or other physical changes.

Fast Facts

- Seafood processing companies must label packaged products with either a use-by or best-before date.
- Shelf-life assessment should consider product quality and food safety.
- The process of assessing shelf-life will vary for every product.

1. Identify potential spoilage mechanisms and food safety risks
2. Determine appropriate testing methods
3. Design and implement a shelf-life study
4. Determine and monitor the shelf-life

SHELF-LIFE DETERMINATION

Step 1: Identify potential spoilage mechanisms and food safety risks

Microbiological spoilage

During storage, some of the bacteria that are initially present grow, leading to undesirable sensory qualities such as off odours or formation of slime. These bacteria are referred to as specific spoilage organisms (SSOs).

Chemical spoilage

The most common type of chemical spoilage is oxidation. In particular lipid oxidation can lead to rancidity (development of off flavours and odours), texture changes, discolouration and nutritional losses. Another chemical reaction is Maillard browning, which can result in the detrimental formation of brown coloured compounds.

Enzymatic spoilage

Enzymes are proteins that can help speed up chemical and biochemical processes and can make nutrients contained within food available for growth. After death (usually the point of harvest), some enzymes remain active and can cause discolouration, a breakdown in texture, and flavour and aroma issues.

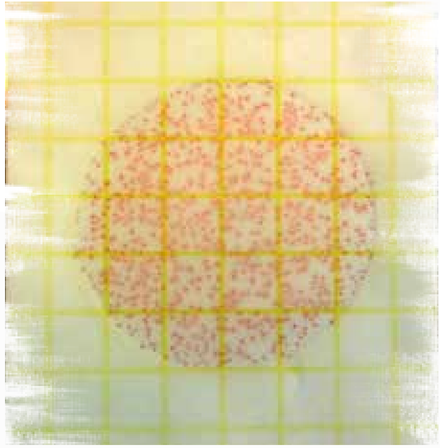
Effect of temperature on shelf-life

Temperature control is critical in both packaged and non-packaged seafood. A rise in temperature from 0 to 4°C doubles the rate of deterioration and thus halves the shelf-life, while at 10°C the rate of change is four times as fast and shelf-life is only one quarter of what it could have been at 0°C.

When sourcing raw materials, it is important to consider the temperature history of the product. A calculation of the number of icedays (equivalent to the number of days on ice) is often used for this purpose. For example, the attributes related to freshness of raw materials stored at 4°C for six days are equivalent to 12 days at 0°C or three days at 10°C.

Evaluation of food safety risks

Some processing and packaging formats can lead to an increased food safety risk (see discussion under packaging formats). *Listeria monocytogenes* and *Clostridium botulinum* have been specifically highlighted as potential risks associated with processed products. However, the particular pathogen-product combinations that need to be considered can be specific to individual processors. Therefore, businesses should apply the principles of HACCP to identify the potential hazards in their specific product.



Microbial culture plate (Petri-film)

SHELF-LIFE DETERMINATION

Step 2: Determine appropriate testing methods

Selecting methods for shelf-life can be complex as multiple approaches can be used to measure the same aspects of spoilage; e.g. changes in colour and texture can be assessed either using sensory analysis or using specialised equipment. Methods selected are usually dictated by the product style, available budget and access to equipment. Laboratories used for seafood testing should be experienced in analysis of the specific hazard and seafood type to be tested. Specialist advice and skills may be needed to advise approach.

Sensory analysis

Sensory analysis is a tool that can yield specific information on not only shelf-life, but consumer perceptions. Sensory examinations can include odour, flavour, texture, colour/discolouration and appearance. They can be based either on objective testing using a trained panel or subjective testing, which usually involves either in-house testing or a consumer panel.

Colour

The visual characteristics of a product are usually the first sensation that a consumer perceives and colour can be paramount to product acceptance by consumers. Colour can be assessed using:

- Sensory
- Colour charts
- Specialised handheld instruments
- Analysis of digital images

Texture

The texture of seafood is a major factor in its appeal and depends on several parameters. These include the type of fish (species), its age, size, biological condition, method of catch, and storage and processing conditions. A variety of methods can be used to assess texture:

- Sensory
- Penetrometers
- Highly specialised instruments and analysis

Measurement of microbial spoilage

- Microbiological culture
- Assessment of volatile compounds associated with bacterial action
- Predictive models
- Sensory analysis

Measurement of enzymatic spoilage

- Analytical techniques can show the enzymatic degradation pathways
- Sensory analysis
- Colour assessment
- Texture assessment

Measurement of chemical spoilage

- Specialised handheld instruments
- Analytical equipment
- Sensory analysis
- Texture assessment

SHELF-LIFE DETERMINATION

Step 3: Design and implement a shelf-life study

The shelf-life of seafood products can be estimated by undertaking controlled storage trials. The robustness that is built into these assessments can provide confidence in shelf-life and increased brand protection. Planning a shelf-life study can be complex and the following aspects should be addressed:

> **Food safety risks.** These should be determined on an individual basis by HACCP. Some pathogens may be sporadic and it may be necessary to undertake challenge testing by artificially contaminating products with known pathogens to measure growth.

> **Freshness attributes.** This assessment is dictated by the nature of the product. For example, rancidity can be particularly important for frozen fatty fish (such as salmon), yet of little importance in refrigerated lean fish (such as whiting).

> **Shelf-life trials.** These should be undertaken using the storage temperature and conditions that will ideally be used for the product. The impact of potential temperatures that may occur during transport and retail storage can also be assessed.

In the planning stage for all of these assessments:

> Storage time should be sufficient to ensure that the point of spoilage is captured.

> Sampling intervals are usually in days, weeks or months. This depends on the product and the interval can be varied if there is prior knowledge of the product.

> Suitable replication should be used to account for variation in results. Ideally, samples should be collected from individual packets to show variation between packs or units. It is generally considered that at least three replicate samples should be collected.

> Repeat studies should be undertaken. This can account for variation in in-coming product and seasonal changes in the biological condition and microbiological profile. Repeat studies are also used to confirm the consistency of processing.

> Samples for microbiological analysis should be stored at <10°C and analysed within 24 hours.

SHELF-LIFE DETERMINATION

Step 4: Determine and monitor the shelf-life

Results of the storage trial can be used to determine the time point that would result in rejection by a consumer. This could be due to factors such as loss of flavour, unappealing physical attributes or the emergence of spoilage odours and flavours.

Results of food safety testing should also be assessed to determine a time point that can safely be achieved without posing a risk. It is important to note that the safe shelf-life may be different to the organoleptic shelf-life; shelf-life is determined by whichever period is shortest.

The stated shelf-life of the product should incorporate a suitable safety margin to account for variances in storage temperature and other factors that can occur in the supply chain. Repeat experiments modelling these variations can be used to build confidence in the extent of this margin.

Ongoing monitoring of shelf-life should be undertaken as part of brand protection activities and HACCP. If a firm relationship is established between microbial or chemical data and the sensory scores, it may be possible to use these as indicators in lieu of ongoing sensory assessments.

Successful products

- ☑ Safe
- ☑ Lasting quality
- ☑ Consumer preference
- ☑ Positive brand awareness
- ☑ Improved market access

$$$ Increased sales
$$$ Return on investment

SafeFish

SafeFish is a partnership of seafood experts that assist the industry to resolve technical trade impediments, especially in relation to food safety and hygiene.

SafeFish provides rapid technical response to maintain free and fair access to key markets and underpins the safety and hygiene of seafood sold commercially.

Visit SafeFish at www.safefish.com.au or contact Alison.Turnbull@sa.gov.au

Useful resources

A Guide to the Identification of Food Safety Hazards and Determination of Shelf-life of Packaged Seafood:
www.safefish.com.au

Food Standards Code:
www.foodstandards.gov.au

Seafood Packing Technologies:
www.seafood.net.au/downloads/HTG_003a.pdf

Export Standards:
www.daff.gov.au/biosecurity/export/fish

A Guide to Calculating Shelf-life of Foods:
www.foodsafety.govt.nz/elibrary/industry/guide_calculating-contains_background.pdf

Important Notice

Although SARDI has taken all reasonable care in preparing this report, neither SARDI nor its officers accept any liability arising from the interpretation or use of the information set out in this document. Information contained in this document is subject to change without notice.

References to the Australia New Zealand Food Standards Code and other third party material contained in this Guide are current only as of December 2013.

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Primary Industries and Regions SA

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South Australian Research and Development Institute

FRDC
Fisheries Research & Development Corporation

SafeFish

Australian Seafood Cooperative Research Centre