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The Australian Animal Welfare Strategy (AAWS) – Development of welfare guidelines for restaurants and retail outlets holding live fish and shellfish in aquaria

An initiative of the Aquatic Animal Welfare Working Group of AAWS



FINAL REPORT

Paul Hardy-Smith, Panaquatic® Health Solutions Pty Ltd and Gaye Looby, Department of Fisheries, Western Australia

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Government of **Western Australia**
Department of **Fisheries**

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Researcher Contact Details		FRDC Contact Details	
Name:	Gaye Looby	Name:	Dr Paul Hardy-Smith
Address:	Dept Fisheries WA 168-170 St Georges Tce Perth WESTERN AUSTRALIA 6000	Address:	3/814 Glenferrie Road Hawthorn, Victoria, 3122
Phone:	08 9482 7202	Phone:	03 9818 5100
Fax:	Gaye.looby@fish.wa.gov.au	Fax:	03 9818 1200
Email:		Email:	paul@panaquatic.com
Web:		Web:	www.panaquatic.com
		Address:	25 Geils Court Deakin ACT 2600
		Phone:	02 6285 0400
		Fax:	02 6285 0499
		Email:	frdc@frdc.com.au
		Web:	www.frdc.com.au

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It is also hoped that the momentum created by AAWS and particularly by the Aquatic Animal Welfare Working Group in the field of fish welfare will continue, despite the funding for AAWS having ceased.

Executive Summary

This project aimed to develop information that would help promote best practice handling techniques for restaurants and retailers keeping live fish and shellfish for human consumption. This was to address one of the most common sources of public complaints (both real and perceived concerns) regarding the treatment of live fish and shellfish in these establishments across Australia.

The story behind this project goes back a number of years, beginning with the formation of the Australian Animal Welfare Strategy (AAWS) in 2005 and the AAWS Aquatic Animal Welfare Working Group (AAWWG).

The AAWS was an Australian Government initiative which aimed to protect and promote the welfare of all Australian animals, including aquatic animals. The AAWWG was one of six Working Groups formed under AAWS to progress the strategy, and was made up of representatives from the commercial capture fishing, ornamental, recreational and aquaculture sectors, State government and Not for Profit organisations (Animals Australia, RSPCA). It also had technical experts (fish health professionals).

A key initiative undertaken by the AAWWG was the development of a generic set of Overarching Welfare Principles (“Obligations”) to help guide the development of sector specific welfare Codes of Practice or guidelines. These Overarching Welfare Principles were applicable to finfish being farmed, transported, captured from the wild by both commercial and recreational fishers, or kept in aquaria in restaurants or private homes.

With respect to live fish and shellfish being held in restaurants, community concerns regarding the treatment of these animals prompted the Department of Fisheries in Western Australia in 2008 to develop and distribute to restaurant owners welfare guidelines on the holding of fish and shellfish.

The WA Fisheries document was the precursor for this project, which has produced national guidelines. Extensive consultation with suppliers of live fish and shellfish to the restaurant trade and with wholesalers, combined with a review of both scientific and grey literature and a survey of over 200 restaurants and retail outlets keeping live fish and shellfish in Melbourne, Sydney, Brisbane and Perth resulted in the first draft of the guidelines. This draft was reviewed by the AAWWG and by state regulators and organisations including the RSPCA and Animals Australia.

The review process was highly beneficial and constructive. The project team had to be diligent, though, in limiting the amount of information many suggested should be included in the guidelines. This was because consultation with wholesalers knowledgeable about the people for whom the guidelines would be most useful indicated that for the guidelines to be most effective it was important to ensure that the information was limited to a number of simple, key messages. These needed to be presented in a language that the people working with live fish and shellfish would understand. Putting too much information in the brochure may not only confuse, but could also diminish the brochure’s effectiveness. Pictures were considered highly worthwhile as an information tool.

The final version of the guidelines is therefore in the form of a brochure that contains simple, clear and concise messages, with pictures used throughout. It has been printed on waterproof paper and in three languages – English, Mandarin and Vietnamese.

Initially, relevant State and Territory regulators agreed to coordinate the distribution of the brochures within their own respective jurisdictions. However, when the Federal Government withdrew financial support for the Australian Animal Welfare Strategy momentum for improving welfare standards in

restaurants and retail outlets waned and state regulators withdrew their commitment to disseminating the Guidelines.

Fortunately, the Department of Fisheries in Western Australia has now offered to co-ordinate the national distribution of the brochure commencing in July 2015.

Keywords

Fish welfare, shellfish, welfare, restaurants, retailers, live seafood

1 Introduction

This project aimed to develop information that would help promote best practice handling techniques for restaurant owners who keep live fish and shellfish¹ for human consumption. This addresses one of the most common sources of public complaints (both real and perceived concerns) regarding the treatment of live fish and shellfish being held in aquaria in restaurants and retail outlets across Australia. Even though these animals are destined for human consumption, it is still considered important to minimise stress while they are being held live.

Many restaurant owners are not trained aquarists and currently there are no regulations regarding the quality of care given to fish and shellfish while they are being held in restaurant and retail outlets. Better consistency across the States and Territories in approaches to the welfare of fish and shellfish being held live is desirable, and is in keeping with the Australian Animal Welfare Strategy (AAWS) Aquatic Animal Overarching Welfare Principles as developed by the Aquatic Animal Welfare Working Group (AAWWG).

The story behind the development of the guidelines for restaurants and retailers keeping live fish and shellfish goes back a number of years, beginning with the formation of the AAWS and the AAWWG.

1.1 The Australian Animal Welfare Strategy

The AAWS was an Australian Government initiative which aimed to protect and promote the welfare of all Australian animals, including aquatic animals. It began in 2005 as a partnership that was developed with extensive stakeholder consultation including government, community and animal industries. It was adopted and endorsed by all State and Territory governments.

The AAWS provided a more consistent and coordinated national approach to animal welfare by developing, adopting and promoting sound standards and practices and enhancing existing animal welfare arrangements. It was developed to provide the national and international communities with an appreciation of animal welfare arrangements in Australia and to assist industries and the community in outlining directions for future improvements in the welfare of animals. Critically, the AAWS provided a framework for sustainable improvement in animal welfare outcomes based on scientific evidence and social, economic and ethical considerations.

The Aquatic Animal Welfare Working Group (AAWWG) was one of six Working Groups formed under AAWS to progress the strategy in each of the six sectors. It was made up of representatives from the commercial capture fishing, ornamental, recreational and aquaculture sectors, State government and Not for Profit organisations (Animals Australia, RSPCA). It also had technical experts (fish health professionals).

¹ The term “live seafood” was used in the original application for this project and in the initial drafts of the brochure. Review of these initial drafts indicated that a better choice of term would be “live fish and shellfish”. This term has therefore been adopted for the final version of the brochure. From time to time in this report the original term “live seafood” and the word “seafood” is used.

1.2 Aquatic animal welfare stocktake

One of the first tasks the AAWWG undertook was to undertake a review of existing fish welfare arrangements in Australia. This review², commissioned by the Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF), was essentially a stocktake of fish welfare in Australia in 2006 and contained an inventory of what was then relevant animal welfare documentation and information that had fish welfare implications and considerations. The report limited itself to welfare of **finfish** and focused on the four key fish sectors in Australia - aquaculture, ornamental, recreational and the commercial capture fishing sectors.

The report however also identified the holding of live fish and shellfish in restaurants as an area of concern. As noted in the 2006 report's Executive Summary³:

There are a number of facilities around Australia where fish are held live for human consumption. Restaurants holding live seafood for human consumption were predominately found to be Asian.

Current practices seen as desirable for reinforcing in these facilities include:

- *The NAC Fish Welfare Guidelines contain a section on fish and crustaceans in live holding facilities for human consumption*
- *The availability of other guidelines such as the Western Australia Department of Fisheries Guidelines for Restaurant Owners who hold 'live seafood' in Aquaria.*

Some perceived gaps and concerns in this sector included:

- *There did not appear to be any guidelines or specific operating procedures being followed by restaurant owners that addressed fish welfare issues*
- *While facilities are regularly audited on aspects of food safety, these do not include aspects concerning the welfare of fish.*

Following on from the stocktake review, the AAWWG then obtained further funding to organize and conduct a workshop for each of the four key fish sectors. The key objective of each workshop was to bring together a representative group of stakeholders to consider and discuss issues of fish welfare workshop process. This was not only in keeping with the AAWS, but was also based on the underlying principle regarding fish welfare i.e. what constitutes minimum "acceptable" fish welfare should be the same irrespective of whether that fish is farmed or kept in a household aquarium or captured wild from the sea.

The holding of live fish and shellfish in restaurants was not specific to any one of the four key fish sectors though. Live fish and shellfish being held in these facilities were sourced from both the commercial capture and aquaculture sectors, and the equipment used to hold the fish (e.g. tanks, aerators) is often sourced from the ornamental sector.

1.3 Overarching Welfare Principles

A number of initiatives were then undertaken through the AAWWG in the area of fish welfare. This included running a series of workshops for the aquaculture, commercial capture and ornamental

² A Review of Current Welfare Arrangements for Finfish in Australia, Panaquatic Health Solutions Pty Ltd, 19 September, 2006.

³ The complete Executive Summary of the 2006 stocktake report is included in Appendix A.

sectors. Following on from these workshops, a key initiative in 2008 was the development of a generic set of *Overarching Welfare Principles* (“Obligations”) to help guide the development of sector specific welfare Codes of Practice or guidelines. These Overarching Welfare Principles were applicable to finfish being farmed, transported, captured from the wild by both commercial and recreational fishers, or kept in aquaria in restaurants or private homes (Appendix B).

A number of the Overarching Welfare Principles apply to the holding of live fish and shellfish by retailers and restaurants particularly:

1. *For fish held in captivity, the key parameters (temperature, salinity, pH, dissolved oxygen, & metabolites) of the aquatic environment in which fish are maintained should be within the species’ natural range of tolerance.*
2. *For fish held in captivity, the holding unit in which they are normally housed should provide*
 - *safety from predators,*
 - *refuge from environmental extremes beyond their natural range of tolerance,*
 - *appropriate space,*
 - *appropriate space and/or water flow to avoid chronic degradation of water quality parameters referred to in point 1 above. (Note 4)*
3. *For fish held in captivity the feed supplied should meet known nutritional requirements, and be distributed in a manner and frequency which avoids starvation for periods longer than the species natural range of tolerance.*
4. *For fish held in captivity, any visibly damaged or sick fish should be assessed and either treated appropriately or promptly removed for killing by humane means suitable for the species.*
5. *During any handling of live fish,*
 - *care should be taken to avoid any damage to the fish*
 - *for prolonged handling of fish out of water (e.g. health checks, vet treatment, artificial reproduction, etc), an anaesthetic appropriate for the species and frequent irrigation of skin and gills is essential*
 - *fish intended to remain alive should be returned to the water promptly.*
6. *Any fish selected for harvest should be killed as rapidly as possible, by humane means suitable for the species*

1.4 Development of guidelines for restaurants and retail outlets holding live fish and shellfish

Community concerns regarding the treatment of ‘live seafood’ in restaurants prompted the Department of Fisheries in Western Australia in 2008 to develop and distribute welfare guidelines on the holding of fish and shellfish to restaurant owners. This document was the precursor for the national project.

As indicated in the preceding sections, the issue of the welfare of live fish being held by restaurants and retailer outlets had always been a significant concern to the Aquatic Animal Welfare Working Group of AAWS.

The national project was subsequently proposed by the AAWWG in 2012 to address this concern. As noted in the project proposal:

This project will address one of the most common sources of public complaints (both real and perceived concerns) regarding the treatment of “live seafood” held in aquaria in restaurants.

Many restaurant owners are not trained aquarists and this project will greatly assist in providing them with better understanding of the needs of the live seafood they are holding.

The project seeks greater consistency across the states and territories in approaches to animal welfare.

This proposal was successful and this report details how the project was carried out.

2 Objectives

The original wording of the key objective for this project was:

To deliver a national set of guidelines on best welfare practices to all restaurant owners involved in the keeping of live seafood in aquaria for retail.

The revised wording of the key objective, which was influenced by the extensive consultation conducted through the project, was:

To deliver a national set of guidelines on best welfare practices to restaurants and retailers keeping live fish and shellfish for retail sale.

The development of the brochure titled “Guidelines for restaurants and retailers keeping live fish and shellfish”, available in English, Mandarin and Vietnamese for distribution to key States and Territories has achieved this objective.

3 Methodology

3.1 Development of Overarching Welfare Principles

The Aquatic Animal Welfare Working Group of the Australian Animal Welfare Strategy (AAWS) successfully developed the Aquatic Animal Welfare Overarching Principles in 2008. These Principles applied to finfish only. They establish that the overall aim of the aquatic sector, including fish that are farmed, being transported, kept in aquaria, captured from the wild both commercial and recreational, or in aquaria in restaurants, should be to minimise suffering⁴ within the constraint of practices inherent to that sub-sector.

It is not only finfish that are kept live by retailers and in restaurants. For this reason, this is the first project initiated by the AAWS Aquatic Animal Welfare Working Group that also included aquatic animals besides fish i.e. shellfish.

The Overarching Welfare Principles underpinned the development of the Guidelines for restaurants and retailers keeping live fish in this project. Additional information was reviewed to assist in the development of specific guidelines for live shellfish.

3.2 Literature and information review

Initially, both the scientific and grey literature were reviewed to determine what information was available to restaurant owners on the holding of live fish and shellfish for consumption. In doing this, the Project Team considered the specific circumstances related to holding live fish and shellfish in restaurants, in particular the varied water quality requirements of the wide range of fish, crustacean, and shellfish species together with humane handling and killing methods. The Project Team also enquired through its international networks (for example, The World Aquatic Veterinary Medical Association) to determine if there were guidelines available in other jurisdictions.

3.3 Restaurant survey

Personal observation and preliminary research conducted using Google⁵ and Urbanspoon⁶ (a restaurant information site) determined that menus containing live fish and shellfish were predominantly served by restaurants specializing in Asian cuisines, and in particular Chinese restaurants.

It was therefore decided to specifically survey restaurants specialising in Asian cuisine in key urban centres (Melbourne, Sydney, Brisbane and Perth) to ascertain:

1. The proportion of restaurants holding live fish and shellfish destined for human consumption; and
2. Which species of live fish and shellfish were commonly being held.

⁴ The term “suffering” has been used in the context of the stress imposed on fish, although it is a subjective term and there is still ongoing debate in the scientific community regarding whether or not fish feel pain and can “suffer”.

⁵ <https://www.google.com.au/>

⁶ <http://www.urbanspoon.com/>

It was acknowledged that there could be some variation in which species of fish and shellfish are commonly held at different periods of the year. This issue was however discussed with wholesalers when considering the actual species to be included in the final brochures.

The initial survey was conducted in Melbourne and was done in two ways:

1. Phone calls were made to restaurants identified in *The Age Good Food Guide* and *The Age Cheap Eats* to determine whether they sold live seafood; and
2. Restaurants in selected areas of Melbourne were surveyed by visiting each restaurant and visually checking for the presence of fish tanks and live seafood.

Restaurants in selected areas of Sydney and Brisbane were surveyed by visiting restaurants and visually checking for the presence of fish tanks and live seafood. A number of restaurants in Perth were also assessed by reviewing information on live fish importation. In each case, the total number of restaurants surveyed, number of restaurants holding live seafood, and the species held were recorded. Survey data were used to identify the main fish and shellfish species held live in restaurants around Australia.

3.4 Live seafood wholesalers

In addition to the restaurant surveys, meetings were held with live fish and shellfish wholesalers who sell directly to the public and to restaurants in both Melbourne and Sydney. Discussions during these meetings were aimed at identifying issues that could affect the welfare and quality of live fish and shellfish before it reaches the restaurants, and to better understand the industry.

The wholesalers held a wide range of seafood species from fresh and salt water, and from warm and cold water. Species held included Murray cod, barramundi (fresh and salt water), silver perch, jade perch, coral trout, parrot fish, morwong, southern rock lobster, mud crabs, snow crabs, prawns, abalone, and oysters. It was found that the wholesalers had themselves regular issues with water quality related to the high turnover of fish and shellfish. This was an important finding as these wholesalers are supplying much of the live fish and shellfish going out to restaurants.

3.5 Live fish and shellfish suppliers

Suppliers of live fish and shellfish to restaurants and retailers include fish farmers (e.g. for barramundi, abalone, silver perch, oysters) and commercial capture fishers (e.g. for coral trout, lobsters, mud crabs). A number of fish farmers and commercial capture fishers were contacted to ascertain their views on what water quality parameters they considered optimal for the holding of their fish and shellfish in aquaria in restaurants and retail outlets. Ultimately, it is in the best interest of the suppliers of restaurants and retail outlets for the fish and shellfish they supply to be well looked after.

3.6 Consultation with Stakeholders

Extensive consultation was conducted both within the AAWS Aquatic Animal Welfare Working Group and with each of the State and Territory regulators.

During the development stages of the brochure each of the State and Territory regulators responsible for fish welfare indicated their strong support and enthusiasm for the development of

these guidelines. Many commented that there was a real need for such guidelines and they all agreed to take responsibility for the distribution of the brochure within their jurisdiction. A list of the regulators involved is included in Appendix D.

The final proof for the English, Mandarin and Vietnamese versions were sent out in September 2014 outlining the proposed printing costs and seeking an indication of the number of copies required.

3.7 Development of a brochure containing simple, clear and concise messages

The key output of this project was the development of a “user friendly” brochure for distribution to restaurants and retailers holding live fish and shellfish. The planning and development of the brochure was undertaken using information gathered from the restaurant surveys conducted in Melbourne, Sydney, and Brisbane, discussions with farmers producing fish and shellfish for the fish and shellfish trade, and discussions with live seafood wholesalers. It also utilized the expertise of Panaquatic Health Solutions Pty Ltd, a company specialising in fish health and fish production medicine.

The fish and shellfish species included in the brochure were selected for their high prevalence among restaurants in all three cities. Water temperatures and salinities recommended in the brochure were based on known tolerance parameters of the species as well as the conditions that fish were acclimated to the live seafood wholesale supply chain.

A considerable number of drafts of the brochure were developed. A key consideration for the brochure was to ensure a limited number of simple, key messages were presented and in a language that the people working with live fish and shellfish would understand. Putting too much information in the brochure would not only confuse readers, but could also diminish the brochure’s effectiveness.

The layout of the brochure also went through multiple drafts. There was considerable discussion on the type of paper the brochure would be printed on. A waterproof material was finally decided on.

4 Results

4.1 Literature and information review

Most of the available scientific literature relating to seafood is focused on the aquaculture and commercial fishing industries, while much of the grey literature focusses on the keeping of ornamental fish species in home aquaria. There is very little readily available information that draws together the elements of each of these areas that are applicable to the holding of live seafood for consumption.

4.1.1 The issue of pain and suffering in fish

This project concerns the issue of fish welfare, and understandably whether fish⁷ can suffer and are sentient beings with conscious perception are questions that are central to this issue. Davie and Kopf (2006) noted that in order to suffer, an animal must possess a sensory system able to detect noxious stimuli and importantly the brain must consciously perceive the stimuli as negative. If fish do not suffer then there are no welfare issues with capturing and killing or releasing fish.

However, there is considerable debate in the scientific literature regarding the ability (or not) of fish to “suffer” or feel pain. Rose *et al.* (2014), in their review of the issue of whether fish feel pain, concluded that they were unlikely to. These authors also concluded that the rationale and supportive evidence for the existence of consciousness in fishes was not compelling, nor neurologically feasible. Other authors do not agree with these conclusions, arguing that there is growing evidence that teleost fish can feel pain (for example see Torgersen *et al.* 2011) with Lund *et al.* (2007) stating that sentience in fish cannot be ruled out based on review of the scientific literature. Huntingford *et al.* (2006) notes that as the neocortex is lacking in fish it may be argued that fish cannot suffer. The author points out, however that an alternative view is that complex animals with sophisticated behaviour, such as fish, probably have the capacity for suffering, though this may be different in degree and kind from the human experience of this state. Brown (2014), in his review of the current state of knowledge on fish cognition and the evidence for pain perception, concludes that the evidence strongly suggests fish are sentient and capable of feeling pain.

It does though become quite clear when reading through the literature on this topic that the debate involving scientific and philosophical arguments is sometimes confused by emotional responses, to paraphrase Turnbull (2010).

Ongoing scientific debate about whether or not fish can feel pain could be used to justify a delay in examining welfare issues of fish being kept for human consumption in restaurants and retail outlets around Australia. The ambiguity in the science certainly means that any considerations should be taken cautiously.

But people’s attitudes (and for “people” we are talking about the general public who either pay to eat the fish being held live, or observe the conditions in which the fish and shellfish are kept) are not necessarily based on science and Lund *et al.* (2007) argues that the immediate question is an ethical

⁷ This section discusses the issue of pain and suffering in finfish only and not in shellfish. While the information on which to assess the potential for pain and suffering in finfish is limited, there is even less on which to assess the potential for pain and suffering in shellfish.

one - we must consider how probable sentience in fish must be shown to be before we feel obliged to act. As Bekoff (2007) noted, it is important to blend ‘science sense’ with common sense. The AAWS Aquatic Animal Welfare Working Group believes this is reflected in the Overarching Welfare Principles.

Of course, as noted in Kaiser and Huntingford (2009) (and as the AAWS Aquatic Animal Welfare Working Group has been arguing since 2005) product quality is important and commercial drivers that simultaneously improve product quality and welfare offer a clear win-win situation.

Currently, the majority of public complaints about fish welfare concern the treatment of live fish and shellfish in restaurants and retail outlets. Improving the welfare of live fish and shellfish being kept will primarily benefit the fish and shellfish being held alive. In addition, improving the community acceptance of this practice will assist in ensuring restaurants and retail outlets that look after the live fish and shellfish they keep will enjoy a social license to operate.

4.1.2 Popularity of live fish and shellfish

Live seafood is a popular component of Asian, and in particular Chinese, cuisine served in restaurants in many parts of the world. For example, in 1999 it was estimated that between 30,000 to 35,000 tonnes of live reef food fish were imported into Hong Kong for sale in restaurants and live fish markets, with an estimated 50-60% of these fish re-exported into China for the live seafood market there (McGilvray and Chan 2001).

In Australia in 2010-2011, just over 7,600 tonnes of live seafood valued at almost \$34 million were exported to overseas markets (Skirtun *et al.* 2012).

A 2006 survey on the live seafood market in the north-eastern United States of America reported that live seafood was a popular item in “ethnic” markets and restaurants in “urban areas catering to persons of east-Asian descent” (Myers *et al.* 2007). The survey of markets and restaurants from Boston to Washington DC found that over half of the 193 live seafood markets surveyed sold more than 500 pounds of live seafood per week, with “freshness” and “quality” the major consumer considerations when purchasing live seafood.

4.1.3 Appropriate holding conditions for live fish and shellfish

Despite the size of the live seafood market worldwide, there is relatively little information available to restaurants or retailers on appropriate holding conditions for the species that they sell, and the few available documents containing guidelines for handling and holding live seafood are not typically directed at the restaurant industry specifically. As such, much of the information available is, in general, more applicable to live seafood markets and not readily accessible to restaurants serving live seafood.

Discussion with a number of wholesalers and fish farm operators providing live fish and shellfish to restaurants and retail outlets confirmed that there was little in the way of readily available information for these establishments to guide them in their keeping of live fish and shellfish. Indeed, in many of the establishments the Project Team visited the set up of the tanks and how they were managed on a day to day basis appeared to be through a trial and error approach. In Melbourne it was also evident that some were using local retail outlets selling live ornamental fish as a source of information.

The Aquatic Animal Welfare Guidelines (Johnston and Jungalwalla 2004) published by the National

Aquaculture Council in Australia provide information on factors potentially affecting the welfare of seafood in aquaculture and live holding systems, and includes relevant Australian state and federal legislation. The section on live holding systems contains useful information on transport, humane killing, and holding of live seafood, including specific water conditions for commonly held species such as barramundi, Murray cod, rock lobster, and crabs.

A similar document produced by the British Columbia Centre for Disease Control (Food Protection Environmental Health Services 2013) contains a large amount of information on holding live seafood for retail, including general information on water quality requirements, and stocking densities for some common species groups.

Two Australian publications, The Safe Seafood Guide (Food Standards Australia New Zealand 2006) produced by Food Standards Australia New Zealand and the New South Wales Food Authority Guidelines for Seafood Retailers (New South Wales Food Authority 2007) both contain brief, general information on holding of live seafood. Both of these documents focus on food safety and therefore place an emphasis on the safety of the seafood for human consumption rather than on the welfare of the 'live seafood' itself, and do not contain much in the way of specific information for restaurants.

Two other important documents identified were the "Guidelines for restaurant owners who hold 'live seafood' in aquaria" brochure produced by the Western Australian Department of Fisheries, and the "Guidelines on aquatic animal welfare for the aquaculture industry in Western Australia" (Bennison 2000) for the Aquaculture Council of Western Australia. Bennison (2000) provides comprehensive information on handling, anaesthesia humane killing, and recommended storage conditions for several commonly held species of live fish and shellfish. The Western Australia Department of Fisheries brochure "Guidelines for restaurant owners who hold 'live seafood' in aquaria" (Looby 2011, included in its entirety in Appendix B) is the only information identified that is specifically applicable and targeted to live seafood in restaurants. The brochures includes the importance of obtaining quality seafood, general information on holding live seafood including specific water parameters for commonly held species, and information on humane killing of live seafood for human consumption.

4.1.4 Specific water quality parameters for fish and shellfish species commonly held

After identifying the most commonly held species of live fish and shellfish, literature was reviewed for specific water quality parameters for these species, primarily temperature, salinity, dissolved oxygen, and ammonia level. Of these parameters, the most important to consider for short term holding of seafood in restaurants are dissolved oxygen, temperature and salinity.

There are three documents identified that provide temperature and salinity recommendations for seafood species commonly held in restaurants: the Aquatic Animal Welfare Guidelines (Johnston and Jungalwalla 2004), the "Guidelines for restaurant owners who hold 'live seafood' in aquaria" brochure (Looby 2011), and the "Guidelines on aquatic animal welfare for the aquaculture industry in Western Australia" (Bennison 2000) however there are some notable differences among the three. Although the recommendations for finfish are consistent across the three documents, there is some variation in the recommendations for crustaceans. For example, guidelines for restaurant owners brochure suggests that southern rock lobster be kept at 20-22 °C, while the Aquatic Animal

Welfare Guidelines and guidelines for the aquaculture industry in Western Australia both recommend a much lower water temperature range of 6-10 °C for this species. Similarly, the Aquatic Animal Welfare Guidelines and the guidelines for restaurants brochure both recommend a salinity of 35 ppt for southern rock lobster, western rock lobster, and tropical rock lobster, but the guidelines for the aquaculture industry in Western Australia states that salinity of the water in holding tanks for these species is “usually about 3 ppt”. A more general statement on temperature is provided by the Safe Seafood Australia guidelines, which state that live seafood “should be kept as cool as is tolerant to the species to reduce the need for oxygen, lessen appetite, prevent cannibalism where seafood is in crowded conditions and minimise the risk of the live seafood dying”.

There is also considerable information available on-line that provide guidance on water quality parameters for a number of the live fish and shellfish species commonly kept in restaurants and retail outlets. A number of these were written to provide information for those interested in potentially farming the species (aquaculture). For example, the NSW government has information available on eels⁸ and silver perch⁹, the Queensland government has information available on jade perch¹⁰ and the Victorian government has information available on-line on Murray cod¹¹.

In general, the temperature and salinity recommendations provided in the final versions of the brochure were arrived at in part through review of the literature pertaining to water quality requirements for each of the commonly held fish and shellfish species that feature in the brochure (to ensure that what was recommended would be tolerated by each of the species), but importantly also by discussing with both suppliers of live fish and shellfish and with wholesalers what temperatures and salinities each species were commonly being held at. Often these values had been arrived at by trial and error.

Sudden changes in either temperature or salinity can be extremely stressful to fish and shellfish. Ensuring consistency in the quality of water live fish and shellfish were being held in down the supply chain was considered important for this reason.

Oxygen is the most important water quality factor for proper fish health, but it is also poorly soluble in water (Noga, 2010). There are differences between different species of fish and shellfish in the minimum level of dissolved oxygen they require. It is also possible to have too much dissolved oxygen, for example where the water becomes supersaturated.

When considering how to get across a clear and simple message for dissolved oxygen in the brochure, having “plenty of air bubbling through tanks” was thought to be reasonable. In their review of restaurants, the Project Team identified that aeration in tanks was achieved through the use of air (approximately 20% oxygen) and did not find any evidence the pure oxygen (100%) was being used (pure oxygen is commonly used in the intensive aquaculture industries). It is difficult to super saturate water in an aquarium type tank with oxygen if air (approximately 20% oxygen) is

⁸ <http://www.dpi.nsw.gov.au/fisheries/aquaculture/publications/species-freshwater/eels-aquaculture-prospects>

⁹ <http://www.dpi.nsw.gov.au/fisheries/aquaculture/publications/species-freshwater/silver-perch---aquaculture-prospects>

¹⁰ <http://www.business.qld.gov.au/industry/fisheries/aquaculture/aquaculture-species/jade-perch-aquaculture/cultural-environment-jade-perch>

¹¹ <http://www.dpi.vic.gov.au/fisheries/aquaculture/murray-cod-aquaculture-research/fish-health-management>

being introduced through air stones.

4.2 Killing method

The issue of the killing of fish and shellfish by restaurants was considered by this project. There is no legislation or regulations which specifically address the issue of killing of fish and shellfish in restaurants or retail outlets. It is of concern though from a welfare point of view.

The Overarching Welfare Principles state that the overall aim of the aquatic sector (fish that are farmed, being transported, kept in aquaria, captured from the wild both commercial and recreational, or in aquaria in restaurants) should be to minimise suffering within the constraint of practices inherent to that sub-sector. Principle #7 specifically states that:

7. *Any fish selected for harvest should be killed as rapidly as possible, by humane means suitable for the species*

For finfish, both percussive stunning and spiking through the brain are considered quick, effective and humane killing methods. There is however still considerable ambiguity in the scientific literature regarding what constitutes “humane” killing of shellfish. In early drafts of the guidelines brochure a statement was included indicating that fish needed to be killed as soon as it was taken out of the tank by either stunning or spiking. No comment was included about the killing of shellfish.. Comments from reviewers highlighted this gap and requested that the brochure include killing methods suitable for shellfish.

It is though important that any information included in the brochure is defensible scientifically. Currently, there is debate scientifically about what constitutes “humane” killing of shellfish. . Hence the Project Team was careful regarding the wording used in the final brochure pertaining to the killing of shellfish in restaurants and retail outlets, acknowledging the comments made by reviewers on this issue.

4.3 Restaurant survey results

4.3.1 Melbourne

A total of 130 restaurants were surveyed in Melbourne, of which 28 restaurants (21.5%) had live seafood (Table 1). There were 6 species of finfish found to be relatively commonly held in restaurant fish tanks. The most common species was barramundi (22 locations), followed by Murray cod (10), morwong (6), parrot fish (6), coral trout (5), and jade perch (barcoo grunter) or silver perch (3). In addition to finfish, several restaurants also held live lobster (13 locations), crab (7), abalone (3), eel (2), and prawns (1) (Table 1).

Table 1 - Summary of Melbourne Restaurants specialising in Asian Cuisine

Source	No. of restaurants surveyed	No. of restaurants with no tanks	No. of restaurants with tanks for holding live seafood	No. of restaurants with live fish for consumption*
The Age Good Food Guide	14	9	5	5
The Age Cheap Eats	12	7	5	5
Glen Waverley	10	5	5	3
Chinatown Melbourne	62	46	16	11
Box Hill	32	24	8	4
TOTAL	130	91	39	28
PERCENTAGE		70%	30%	21.5%

* Locations where fish were sighted or confirmed by phone call.

4.3.2 Sydney

A total of 66 restaurants were surveyed in Sydney, of which 19 restaurants (29.7%) had tanks to hold live seafood (Table 2) and 18 restaurants (28.1%) actually had live seafood for human consumption. There were 7 species of finfish found to be held for consumption in restaurant fish tanks in Sydney. The most common species was barramundi (12 locations), followed by coral trout (6), silver perch or jade perch (4), morwong (3), parrot fish (2), Murray cod (1), and wrasse (1). In addition to finfish, several restaurants also held live lobster (12 locations), crab (9), abalone (4), prawns (1), and pipis (1).

Table 2 - Summary of Sydney Restaurants specialising in Asian Cuisine

Source	No. of restaurants surveyed	No. of restaurants with no tanks	No. of restaurants with tanks for holding live seafood	No. of restaurants with live fish for consumption*
Hurstville	27	20	7	7
Chinatown Sydney	36	24	12	11
TOTAL	64	44	19	18
PERCENTAGE			29.7%	28.1%

* Locations where fish were sighted or confirmed by phone call.

4.3.3 Brisbane

A total of 21 restaurants were surveyed in Brisbane, of which 6 restaurants (28.6%) had live seafood (Table 3). There were 7 species of seafood found to be held for consumption in restaurant fish tanks in Brisbane’s Chinatown region. Species being held at the time of the survey were silver perch, coral trout, Giant Crabs (*Pseudocarcinus gigas*), Giant Mud Crabs (*Scylla serrata*), Southern rock lobsters and abalone.

Table 3 - Summary of Brisbane Restaurants specialising in Asian Cuisine

Source	No. of restaurants surveyed	No. of restaurants with no tanks	No. of restaurants with tanks for holding live seafood	No. of restaurants with live fish for consumption*
Fortitude Valley	21	14	7	6
TOTAL	21	14	7	6
PERCENTAGE			33.3%	28.6%

* Locations where fish were sighted.

4.3.4 Perth

Six restaurants were reviewed in Perth. The live seafood being imported into these restaurants includes Golden perch, jade perch, short finned eel, coral trout, goldspotted rock cod, flowery rock cod, sleepy cod, Murray cod, parrot fish, banded morwong, blue throat wrasse and spanner crabs.

4.3.5 Live seafood wholesalers

To better understand the industry the Project Team consulted with live fish and shellfish wholesalers who sell directly to the public and to restaurants holding live fish. This consultation has revealed much about the industry, and the problems encountered by these business owners when supplying restaurants and retailers with live fish and shellfish. The wholesalers hold a wide range of seafood species from fresh and salt water, and from warm and cold water. Species held included Murray cod, barramundi (fresh and salt water), silver perch, jade perch, coral trout, parrot fish, morwong, southern rock lobster, mud crabs, snow crabs, prawns, abalone, and oysters. The wholesalers had themselves regular issues with water quality related to the high turnover of seafood. This was an important finding as these wholesalers are supplying much of the live seafood going out to restaurants.

The wholesalers have assisted in the review of a number of the drafts of the brochure.

4.4 Development of the “*Guidelines for restaurants and retailers keeping live fish and shellfish - from a welfare perspective*” brochure

Restaurant owners are traditionally experts in the preparation of seafood but not in holding fish and shellfish live in tanks. Consultation with the wholesalers who supply live fish and shellfish to restaurants and retail outlets reinforced the important need that has been addressed by this project, and that is the need for the education of restaurant owners and chefs on how to maintain aquaria.

It also became clear from discussions with wholesalers and with restaurant owners and staff that the responsibility for maintenance of the tanks and looking after the live fish and shellfish is often left to one of lower paid staff at the restaurant and not necessarily the chef or the manager.

Provision of advice on basic aquarium setup and ongoing maintenance, including provision of basic water quality parameters for common restaurant species, was identified as a real need by the wholesalers and hence the development of the brochure focused on this need. During its review process, there were multiple requests to include more detailed information on many of the aspects of water quality covered. The intention had always been to produce a standard DL (dimension length wise) sized brochure. There is only so much room on such a brochure, especially when the text needed to be of a font size that was clearly readable.

It was also quickly determined through the review of restaurants that English was a second language for most of the restaurant staff maintaining the tanks in which live fish and shellfish were being held. Critical to this project was the ability to communicate clear, simple and concise messages. For this reason pictures of the different shellfish and fish species were seen as important for the brochure. Originally, a single brochure with the text appearing in both English and Chinese (Mandarin) was devised. This limited the amount of text on the brochure and also resulted in a somewhat cluttered appearance. It was therefore decided that separate brochures be produced, each in a dedicated language. Vietnamese was included as a third language, to compliment the English and Chinese (Mandarin) versions.

There was considerable variation in the overall layout of the information contained in the brochure. One of the wholesalers who reviewed early versions of the brochure is to be thanked for the suggestion of having the particular details of all the fish and shellfish species on one side of the brochure. The idea is that in a restaurant the brochure can be affixed to a wall in the vicinity of the tanks (or to the back of the tanks themselves) for ready reference. With this application in mind, the final brochure was printed in waterproof material.

A copy of all three versions of the final brochure, in English, Vietnamese and Mandarin, is attached (Appendix D).

5 Discussion

The holding of live fish and shellfish in restaurants in a number of Asian countries including China, Vietnam and South Korea is relatively common. There is a high demand in these countries for these live animals. In a number of the more populated cities in Australia, the practice of holding live fish and shellfish in restaurants is also increasing. There are also areas in cities such as Melbourne and Sydney where it is possible to purchase live fish and shellfish from retailers. There are, however, no regulations or guidelines that govern the conditions in which live fish and shellfish must be kept in these facilities in Australia, as far as the authors of this report are aware.

The Aquatic Animal Welfare Working Group of the AAWS acknowledged that fish should be afforded the same treatment irrespective of whether they are kept in a tank, farmed in a cage or caught in a net or on a line. A set of Overarching Welfare Principles was developed by the group that could be applied to fish across all four sectors and has been applied in this project. These Overarching Welfare Principles (Appendix C) embraced a respect for the fish but also included measures that brought together animal welfare and product quality, realising that the two were intimately linked in those sectors where fish are harvested for food. The Overarching Welfare Principles stated clearly that the overall aim of the aquatic sector should be to minimise suffering from capture to slaughter within the constraint of practical application inherent to each sector.

This project has developed a basic set of best practice husbandry methods for restaurants and retailers involved in the holding and selling of live fish and shellfish. It addresses one of the most common sources of public complaints regarding the treatment of 'live seafood' held in aquaria in restaurants or in shops selling live fish and shellfish.

Whilst not dismissing the potential of fish to be sentient beings capable of perceiving pain, this project recognises the scientific ambiguity and debate surrounding the issue of perception of pain in fish. It acknowledges comments made by Rose *et al.* (2014) with respect to the "*benefit of doubt*" issue regarding fish welfare. Rose *et al.* (2014) consider that a consequence of giving fish the "*benefit of the doubt*" regarding pain has been to mandate policy as if the matter was resolved in favour of fish pain interpretation, a manoeuvre these authors say exempts valid science from policy and does not increase fish welfare. The science regarding what constitutes stress in fish is however not ambiguous. There is also a changing social environment relating to fish welfare based on ethical considerations which this project acknowledges. The findings of this project provide practical guidelines on the responsible behaviour of restaurants and retailers in the keeping of live fish and shellfish on their premises.

This project does not mandate policy changes, but has produced guidelines to assist restaurants and retail outlets keeping live fish and shellfish in continually improving aspects of fish welfare in their day to day operations. It seeks to get better consistency across the States and Territories in approaches to the welfare of fish and shellfish being held live in restaurants.

Many restaurant owners and staff are not trained aquarists. Hence the information presented in the brochures has been kept simple in order to ensure a clear and concise message which focuses on the most critical of husbandry and water quality factors.

6 Conclusion

The Project Objective for this project was to deliver a national set of guidelines on best welfare practices to restaurants and retailers keeping live fish and shellfish for retail sale.

This project has achieved this objective by the development of a simple, concise brochure titled “Guidelines for restaurants and retailers keeping live fish and shellfish” for national distribution. The brochure is available in English and has also been translated into Mandarin and Vietnamese. It provides uniform and species-specific guidelines relating to the humane treatment of the key species of fish and shellfish being held live in restaurants and retail outlets in major cities in Australia.

It is believed that such guidelines will be acceptable to the broader community as well as to the restaurant and retail community who keep live fish and shellfish, and may serve as a model for consideration of fish welfare in Australia.

The three versions of the brochure are in Appendix E.

7 Recommendations

This project has developed a brochure, available in three languages, for establishments keeping live fish and shellfish for human consumption. The brochures contain simple, clear and concise messages, with pictures used throughout to better promote best practice handling techniques for the live fish and shellfish that are being held live.

Initially, relevant State and Territory regulators agreed to coordinate the distribution of the brochures within their own respective jurisdictions. However, when the Federal Government withdrew financial support for the Australian Animal Welfare Strategy momentum for improving welfare standards in restaurants and retail outlets waned and state regulators withdrew their commitment to disseminating the Guidelines.

Fortunately, the Department of Fisheries in Western Australia has now offered to co-ordinate the national distribution of the brochure commencing in July 2015.

While considerable time and effort has gone into the development (and translation) of the brochure, it is acknowledged that even with the generous offer of facilitating distribution by the Department of Fisheries some further assistance may be required to promote the information contained in the brochure and convince restaurants and other establishments holding live fish and shellfish for human consumption that adhering to the guidelines will not only benefit the fish and shellfish, but will also benefit them.

Hence, following on from the distribution of the brochures, it is recommended that a second project be embarked upon to assist in promoting the brochures and to evaluate how well they are received and in particular how widely the information in the brochures is adopted.

8 Extension and Adoption

The final three version of the “Guidelines for restaurants and retailers keeping live fish and shellfish from a welfare perspective”, in English, Mandarin and Vietnamese (Appendix E) have been through a wide review process. This has included consultation with restaurants and wholesalers holding live fish, and with state regulators and organisations such as the RSPCA and Animals Australia. The final version of the brochure and this report have been reviewed by members of the Aquatic Animal Welfare Working Group of the Australian Animal Welfare Strategy (AAWS).

Initially, the project proposal involved each of the relevant State and Territory regulators (listed in Appendix D) co-ordinating the distribution of the Guidelines within their own respective jurisdictions. However, since the withdrawal of Federal Government financial support for the AAWS in 2014, the momentum for improving welfare standards in restaurants and retail outlets waned with state regulators withdrawing their commitment to disseminating the Guidelines. In response to the request for printing copies for the brochure no orders were received. As a consequence, the Department of Fisheries in Western Australia has now offered to co-ordinate the national distribution of the brochure commencing in July 2015.

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Appendix A: Executive Summary of “A Review of Current Welfare Arrangements for Finfish in Australia” (Panaquatic, 2006)

The Australian Animal Welfare Strategy (AAWS) is an agreed blueprint for animal welfare in Australia that aims to enhance welfare outcomes for all animals. Six broad working groups have been established as part of the strategy, one of these being the Aquatic Animal Welfare Working Group (AAWWG). AAWWG has the responsibility to develop and implement the action plan for the aquatic animal sector.

The first stage of this project was to compile an inventory of current relevant animal welfare documentation and information that has welfare implications and considerations with respect to finfish (‘fish’) sectors in Australia. Relevant animal welfare arrangements for crustaceans and molluscs were not considered in this stage. Panaquatic® Health Solutions Pty Ltd (‘Panaquatic’) was contracted by the Department of Agriculture, Fisheries and Forestry to compile this inventory.

The four key fish sectors in Australia are the aquaculture, ornamental, recreational and wild capture sectors. The movement and handling of live fish for human consumption was also considered in this first stage.

Defining what constitutes fish welfare is difficult. Broadly, animal welfare deals with the humane treatment of animals and most of the principles of animal welfare have emerged primarily through terrestrial animals. Fish on the other hand are complex and importantly are poikilothermic, meaning that their internal body temperature is not maintained at a constant temperature as in terrestrial animals. Fish also occupy a diverse range of habitat and ecological niches.

Fish welfare is being considered internationally at a number of levels and by many organisations and associations. Some of those that are relevant to fish sectors in Australia include:

- The World Animal Health Organisation (OIE). This OIE is important with respect to international trade and the health of animals including aquatic animals. The OIE currently has two ad hoc Working Groups developing guidelines for fish welfare, these being welfare guidelines for live transport of fish and welfare guidelines for the slaughter of fish for consumption. The draft introduction to these guidelines states that there is a critical relationship between aquatic animal health and aquatic animal welfare.
- The Fisheries Department of the Food and Agricultural Organisation (FAO). FAO is the largest autonomous agency within the United Nations system with 180 Member Nations plus the European Community (Member Organisation). The mission of the Fisheries Department of FAO is to facilitate and secure the long-term sustainable development and utilisation of the world’s fisheries and aquaculture. FAO has developed a *Code of Conduct for Responsible Fisheries*. Within the framework of the Code, international plans of action (IPOA’s) have been developed which focus on specific areas of concern. One of these areas is sharks. As far as could be determined there is little reference to welfare issues in either the Code or plans.
- The World Society for the Protection of Animals (WSPA). WSPA is an international animal protection organisation working to raise the standards of animal welfare throughout the world. WSPA believes that an international agreement on welfare standards should become a key goal for the animal welfare movement in the 21st Century. This would include fish in the definition of animals.
- The Royal Society for the Prevention of Cruelty to Animals (RSPCA). RSPCA is active in areas of fish welfare, exemplified by a document it has developed titled ‘Welfare Standards for Farmed Atlantic Salmon’ which gives details as to what standards the Society believe should be adhered to in the farming of Atlantic salmon. These standards include the requirement for each salmon farm to have a written Veterinary Health Plan and access to a designated fish veterinarian.

- People for the Ethical Treatment of Animals (PETA). PETA is an international animal protection organisation and has over a million members. PETA believe that animals are not ours to eat, wear, experiment on, or use for entertainment. This includes fish.
- The Marine Aquarium Council (MAC). MAC is an international, not-for-profit organisation that brings marine aquarium animal collectors, exporters, importers and retailers together with aquarium keepers, public aquariums, conservation organisations and government agencies. MAC's aim is to conserve coral reefs and other marine ecosystems by creating standards and certification for those engaged in the collection and care of ornamental marine life from reef to aquarium.
- Europe. The European Commission approved a five-year plan to improve animal welfare in January 2006. This plan includes the welfare of fish. This five year plan is to cover many aspects of animal welfare and is comprehensive. The establishment of a European Union label for animal welfare is an option being explored.
- United Kingdom (UK). The UK passed the Animal Welfare Bill in October 2005. This Bill brings together and modernises welfare legislation relating to farmed and non-farmed animals. It only applies to inland waters and does not apply to the sea or to anything which occurs 'in the normal course of fishing.'
- United States (US). Existing US health regulations for fish do not directly address welfare, but health is considered one measure of welfare.
- The People's Republic of China (China). China has recently conducted press conferences and issued statements about the country's progress with respect to animal welfare. Specific mention has been made of the restocking of sturgeon fry and of the conservation of sharks. There is no specific mention made of the welfare of fish used for farming or other commercial purposes.

With respect to going forward, a watching brief over these international arrangements and liaison with international stakeholders should be maintained where possible.

Closer to home, there are a number of arrangements with respect to fish welfare in both the private and public sector and in many fish sectors in Australia.

At the national level, 'Model Codes of Practice for Animal Welfare' for the livestock industries are produced and reviewed on behalf of the Primary Industries Ministerial Council by the Animal Welfare Working Group, which reports through Animal Health Committee. Current Model Codes do not though include any that are relevant to the aquatic animal sectors.

The Commonwealth Government (specifically the Minister for the Department of Agriculture, Fisheries and Forestry) is advised by the National Consultative Committee on Animal Welfare (NCCAW). The NCCAW considers and then makes recommendations to the Minister on animal welfare matters of national significance. There is currently no NCCAW position statement that specifically refers to aquaculture, commercial fishing and the ornamental fish sector, but there is a position statement on the animal welfare aspects of recreational fishing.

Responsibility for the management of fisheries in Australia is shared between the Commonwealth and the States. Overall and unless special arrangements are in place, States and Territories are responsible for managing fisheries inside 3 nautical miles, and the Commonwealth is responsible for seas between 3 and 200 nautical miles offshore.

Historically the Commonwealth has limited its jurisdiction to commercial (wild capture) fishing with States and Territories assuming responsibility for recreational fishing. There are only a few sections in Commonwealth Acts relevant to fisheries that indirectly relate to fish welfare. No sections relate directly to fish welfare.

A review of current State and Territory government arrangements with respect to fish welfare indicates the significant variation in different Acts and Regulations pertaining to fish welfare and indeed variation in the definition of 'animal' i.e. whether or not 'fish' are defined as 'animals' under the various legislation.

Perceived gaps identified in government arrangements with respect to fish welfare were the variation between States and Territories' legislation and the uncertainty surrounding what is considered welfare as it pertains to fish.

Welfare groups in Australia with a position on fish welfare include the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and Animals Australia (AA).

- RSPCA Australia develops all RSPCA Policies and Position Papers which are then endorsed by the individual State RSPCA organisations. Under jurisdictional Prevention of Cruelty to Animals (POCTA) or equivalent Acts, full-time officers of the RSPCA are delegated by the responsible Minister in each state and territory to enforce the Act. The bulk of prosecutions are undertaken by RSPCA officers. RSPCA has several Policy Papers with fish sections – Policy A refers to Companion Animals, Policy B which refers to aquaculture, Policy C which refers to recreational fishing and Policy E on Wildlife (which covers wild capture fishing).
- AA is a body representing some 38 animal advocacy organisations. AA has a number of documents and fact sheets referring to fish welfare.

Further research into humane farming of fish was identified as an important need by welfare groups.

The Australian Veterinary Association is the professional organisation representing veterinarians across Australia and has a policy on recreational fishing. The AVA also intends to develop a policy on aquaculture but has no plans for the wild capture fishery or on keeping of fish in the ornamental sector.

With respect to the aquaculture sector, the National Aquaculture Council (NAC) is the peak body representing the aquaculture industry across Australia. NAC has produced the *Fish Welfare Guidelines* which provide guidelines on welfare of fish and crustaceans in aquaculture and in live holding facilities for human consumption. In addition, some of the other fish aquaculture industry sectors either have or are in the process of developing their own Codes of Practices which specifically address fish welfare concerns.

Current practices seen as desirable for reinforcing in this sector include:

- The use of humane killing techniques (e.g. percussion stunning and Aqui-S®)
- The NAC *Fish Welfare Guidelines*
- Specific industry Codes of Practice.

Some perceived gaps and concerns in this sector included:

- The absence of specific welfare guidelines in some of the individual industries
- The extent to which Codes of Practices and guidelines have been disseminated and are known about and are then being used
- The concern regarding Codes of Practices becoming gazetted and then used for regulatory purposes

A need for more scientific research in the area of fish welfare to support the development of minimum standards was also strongly noted by this sector.

The commercial wild capture fishing industry in Australia is diverse and covers many methods of fishing and many species of wild fish. The Australian Fishing Zone (AFZ) extends 200 nautical miles offshore and covers about 10.3 million square kilometres giving an indication of the vastness of area in which wild capture fishers may operate. Some methods of fishing in this sector mean that fish are dead by the time they arrive aboard the fishing vessel.

No guidelines, codes of practice/conduct or management strategies that specifically focus on the welfare aspects of wild captured fish were identified in the preparation of this report. There were two specific issues that the commercial wild capture fisheries are currently focussing on which have welfare implications. These are the reduction of bycatch and the improvement in fish quality. By addressing these issues the wild capture fisheries are, to a certain extent, also addressing some welfare issues.

Documented methods of addressing important issues in different wild capture fisheries include Codes of Conduct (Practice) and Environmental Management Plans or Systems (EMP's or EMS's). Some of

these documents were found to contain reference to how the fishery is tackling welfare issues e.g. the keeping of captured fish healthy until bycatch has successfully been released.

Current practices seen as desirable for reinforcing in this sector include:

- Codes of Practice or Environmental Management Systems which are industry driven, over which industry has ownership and which are dynamic ‘living’ documents
- Addressing of bycatch and fish quality issues where fish welfare is also improved
- Production of manuals that specifically address Best Practices.

Some perceived gaps and concerns in this sector included:

- That many fishers perceive ‘fish welfare’ as an issue that is far less important than other issues such as the sustainability of various fisheries.
- That many fishers are not aware that they are actually addressing welfare issues with many of their current practices.

Recreational fishing Australia is the peak national body for recreational and sport fishing in Australia. The *National Code of Practice for Recreational and Sport Fishing* was written in 1995 after much consultation with members of Recreational Fishing Australia and the various State and Commonwealth Fishery agencies. The Code is voluntary and addresses four main areas of fishing responsibility, one of which is ‘treating fish humanely’. Other organisations, individuals and associations are actively involved in research on improving fish welfare in this sector particularly in catch and release techniques that aim to increase survivability of fish after release.

Current practices seen as desirable for reinforcing in this sector include:

- The Recreational Fishing National Code and its awareness
- The continued research into improving survival of fish being released by recreational fishers
- Advertising to raise awareness of issues in the recreational fishing sector
- Tournament accreditation schemes.

Some perceived gaps and concerns in this sector included:

- The problem of disseminating information to anglers due in part to the fact that recreational fishing licences are not required in all States or Territories and hence the opportunity to pass on information at the time of licence purchase is not always available.

The ornamental fish sector primarily uses the Code of Practice for Aquarium Operations developed by Pet Industry Association of Australia (PIAA) as its guidelines. Most retail ornamental fish businesses do not have their own written guidelines.

Current practices seen as desirable for reinforcing in this sector include:

- The National industry Code of Practice (PIAA Code of Practice)
- The increased use of captive bred versus wild caught fish.

Some perceived gaps and concerns in this sector included:

- PIAA Code of Practice lacks detail with regard fish welfare and applies to retail aquarium facilities and not to commercial aquarium producers
- The small size of containers that fish can be sold in and the potential welfare issues associated with this
- The lack of availability of captive bred (aquacultured) fish versus wild caught fish
- The concern regarding fish caught using cyanide coming from overseas.

In general, teaching and research institutions and facilities around Australia have Animal Ethics Committees (AEC’s) monitoring any teaching or research that involves fish. These AEC’s generally follow the Australian Government’s National Health and Medical Research Council’s (NHMRC) guidelines *Australian code of practice for the care and use of animals for scientific purposes* when considering applications.

The Seafood Industry Training Package and the Animal Care and Management Training Package are the two National Training Information Service approved Training Packages with relevance to the fish sector.

Current practices seen as desirable for reinforcing which address fish welfare concerns in teaching and research institutions include:

- Animal Ethics Committees (AEC) overseeing research in fish
- The NHMRC guidelines overall
- Specific guidelines such as the NSW Fisheries *Guide to acceptable procedures for Aquaculture and Fisheries Research*.

Some perceived gaps and concerns in relating to fish welfare in this area included:

- The limited information regarding fish welfare in the NHMRC guidelines
- That with the exception of aquacultures courses, very few TAFE institutions were providing the commercial fishing, recreational fishing or companion animal services courses at their institution.

There are a number of facilities around Australia where fish are held live for human consumption. Restaurants holding live seafood for human consumption were predominately found to be Asian.

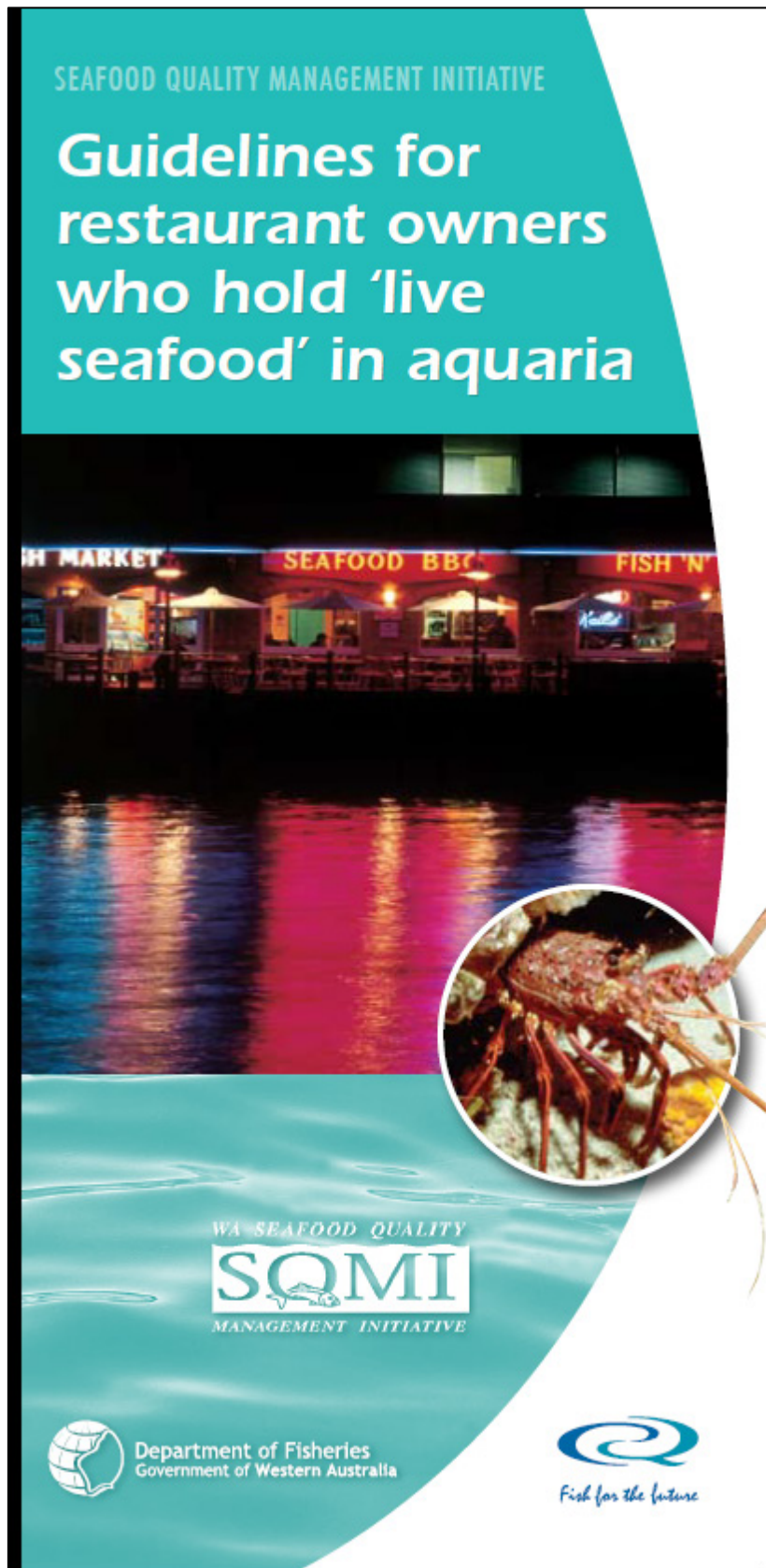
Current practices seen as desirable for reinforcing in these facilities include:

- The NAC Fish Welfare Guidelines contain a section on fish and crustaceans in live holding facilities for human consumption
 - The availability of other guidelines such as the Western Australia Department of Fisheries *Guidelines for Restaurant Owners who hold 'live seafood' in Aquaria*.

Some perceived gaps and concerns in this sector included:

- There did not appear to be any guidelines or specific operating procedures being followed by restaurant owners that addressed fish welfare issues
- While facilities are regularly audited on aspects of food safety, these do not include aspects concerning the welfare of fish.

Appendix B – Department of Fisheries WA Guidelines for restaurant owners who hold “live seafood” in aquaria



Good fish welfare means good quality eating

The Department of Fisheries is responsible for matters relating to the prevention of cruelty to fish, as well as providing for fish welfare, safety and health. In response to community concerns, the Department has developed these guidelines to assist restaurant owners who hold live seafood in aquaria and process this seafood for consumption.

Special care should be taken with all live seafood that are held to avoid unnecessary stress or discomfort during handling, storage and display. Stress not only affects the wellbeing of the finfish and shellfish, but also the ultimate quality of the food prepared from them.

It is recommended that all live seafood displayed in restaurant aquaria with the intention of being later prepared for human consumption should:

- comply with government regulations (i.e. minimum size limits, ensuring they are not a restricted species, etc); and be subject to additional approvals where required;
- be safe for human consumption;
- be in good health; and
- be displayed, handled and processed using 'best practice'.



Doing it right

It is up to restaurant owners to ensure that:

- The live seafood purchased is of a high quality.
- The live seafood purchased is always transported under the least stressful conditions.
- The aquarium set-up inside the restaurant is suited to live seafood being stored, by ensuring the following:
 - The aquarium should not contain more stock than it is designed to hold.
 - Live seafood should not be subject to inappropriate restraint.
 - Aquaria should be of a size large enough to prevent any physical damage to the live seafood contained in them.
 - Each aquarium should be kept at temperature, salinity, pH and dissolved oxygen levels (as controlled by aeration) that do not stress the live animals contained in it.
 - The aquarium is cleaned regularly to prevent a build-up of algae.
 - There is adequate continuous water exchange or appropriate filtration to control the build-up of waste products within the aquarium.



- The live seafood should be kept out of bright light if possible, as this may cause stress and reduce survival rates.
- The use of chemicals in the aquarium should be minimised, as these may leave levels of residual chemicals in the seafood that would not be permitted by law and may render them unfit for human consumption.
- The aquarium should be checked regularly (at least daily) and weak, damaged or dead animals removed.
- Different species that require different water qualities and stocking requirements should not be stored in the same aquarium.

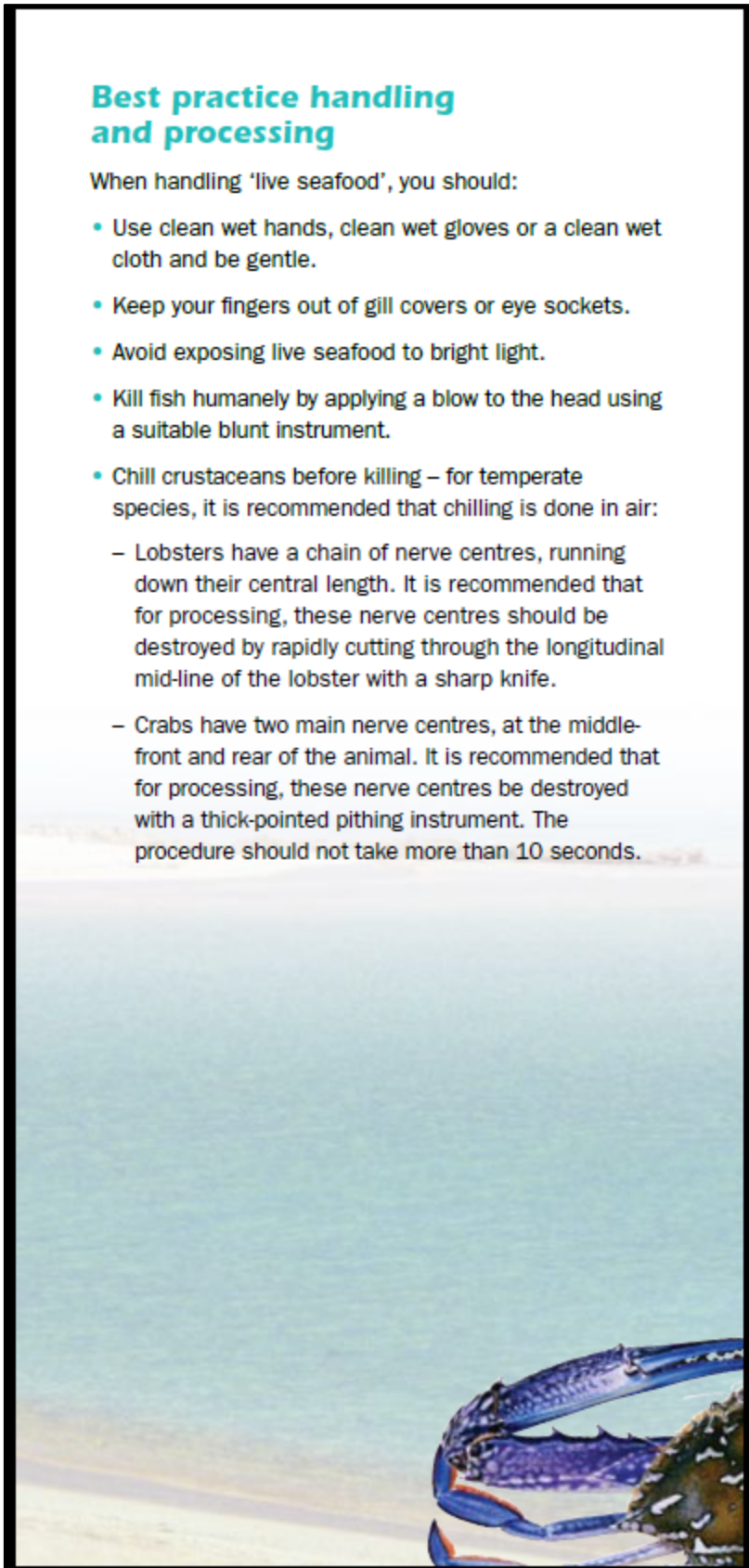
If you are unsure about the optimum conditions to hold specific species of live seafood intended to be eaten, consult your supplier, the *Australian Seafood Users Manual* or the more detailed Department of Fisheries' *Guide for Restaurant Owners who hold Live Seafood in Aquaria* which can be downloaded from the Department of Fisheries website at: www.fish.wa.gov.au/sqmi



Best practice handling and processing

When handling 'live seafood', you should:

- Use clean wet hands, clean wet gloves or a clean wet cloth and be gentle.
- Keep your fingers out of gill covers or eye sockets.
- Avoid exposing live seafood to bright light.
- Kill fish humanely by applying a blow to the head using a suitable blunt instrument.
- Chill crustaceans before killing – for temperate species, it is recommended that chilling is done in air:
 - Lobsters have a chain of nerve centres, running down their central length. It is recommended that for processing, these nerve centres should be destroyed by rapidly cutting through the longitudinal mid-line of the lobster with a sharp knife.
 - Crabs have two main nerve centres, at the middle-front and rear of the animal. It is recommended that for processing, these nerve centres be destroyed with a thick-pointed pithing instrument. The procedure should not take more than 10 seconds.



Aquarium waste disposal

Dead or unwanted fish and crustaceans and aquarium effluent should be disposed of in an appropriate manner:

- Do not prepare live seafood for eating that looks unwell or seafood that has died while being stored. Your customers may become sick.
- If you are unsure of the cause of death, you may want to telephone the Department of Fisheries' Fish Health Unit on (08) 9368 3357 for more information.
- Dead animals should be removed from aquaria and immediately disposed of in a landfill waste area.
- Aquarium water should be disposed of in accordance with the requirements of the relevant authority. For a property connected to a sewer, contact the Water Corporation (131 395). Alternatively, for non-sewered properties, contact your local government authority.

Get the right skills

Please ensure that your staff are trained in aquarium maintenance, handling, humane killing and disposal. You may need to hire someone that has the right experience.

For more information, contact the Department of Fisheries on (08) 9482 7333.

Disclaimer: Please note that the recommendations provided in these guidelines are undertaken with professional care and diligence but neither the Department of Fisheries, nor its servants or consultants, shall be liable to you for any loss or damage, including business loss, loss of profits or other consequential loss or damage arising out of or incidental to these guidelines and your use thereof.



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MAR 2008

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Appendix C - Overarching Welfare Principles

In the context of Aquatic Sector of the Aquatic Animal Welfare Working Group under the Australian Animal Welfare Strategy (AAWS), only vertebrate finfish are considered Aquatic Animals; other aquatic vertebrates are considered under other Sectors of AAWS. **(Note 1)**

The approach taken with animal welfare to date within the Aquatic Animal sector has been to establish overarching Principles against which sub-sectors can build their specific best practice guidelines to achieve animal welfare. **(Note 2)**

The overall aim of the aquatic sector (fish that are farmed, being transported, kept in aquaria, captured from the wild both commercial and recreational, or in aquaria in restaurants) should be to minimise suffering within the constraint of practices inherent to that sub-sector. **(Note 3)**

Specific measures include:

8. For fish held in captivity, the key parameters (temperature, salinity, pH, dissolved oxygen, & metabolites) of the aquatic environment in which fish are maintained should be within the species' natural range of tolerance.
9. For fish held in captivity, the holding unit in which they are normally housed should provide
 - safety from predators,
 - refuge from environmental extremes beyond their natural range of tolerance,
 - appropriate space,
 - appropriate space and/or water flow to avoid chronic degradation of water quality parameters referred to in point 1 above. **(Note 4)**
10. For fish held in captivity the feed supplied should meet known nutritional requirements, and be distributed in a manner and frequency which avoids starvation for periods longer than the species natural range of tolerance.
11. For fish held in captivity, any visibly damaged or sick fish should be assessed and either treated appropriately or promptly removed for killing by humane means suitable for the species.
12. During any handling of live fish,
 - care should be taken to avoid any damage to the fish

- for prolonged handling of fish out of water (e.g. health checks, vet treatment, artificial reproduction, etc), an anaesthetic appropriate for the species and frequent irrigation of skin and gills is essential
 - fish intended to remain alive should be returned to the water promptly.
13. Any fish selected for harvest should be killed as rapidly as possible, by humane means suitable for the species
14. For fish harvested from the wild timely handling from capture to death is essential to minimise suffering. **(Note 5)**
15. Capture methods should be designed to minimise the capture of unwanted fish.

Explanatory Notes

Note 1: The duty of care principles are couched within the Australian Animal Welfare Strategy under which these specific aquatic animal principles will be applied.

Note 2: As a code there is no legislative basis. Words such as ‘must’ hold no relevance. Animal Welfare legislation is the place for definitives and the code assists operators to meet those definitives through words such as ‘should’.

Note 3: Suffering is inclusive of pain and other issues of animal welfare.

Note 4: This principle when read with principle 1 covers all aspects. The detail of parameters such as water flow, stocking density, behavioural aspects and space will be in the sub-sector code themselves depending on operational method and species.

Note 5: ‘Capture’ as defined in sub-sector codes.

Appendix D- Key State and Territory regulators contacted during the development of the brochure

State	Contact
NSW	Diane Ryan Animal Welfare Advisory Committee
NT	Mel Froucheger Animal Welfare Unit
QUEENSLAND	Greg McDougall Senior Policy Officer, Biosecurity Unit
SA	Shane Roberts Fish Health
TASMANIA	Rod Andrewartha Chief Veterinary Officer
VICTORIA	Mhairi Roberts Animal Welfare Policy Research Assistant RSPCA
WESTERN AUSTRALIA	Gaye Looby Senior Policy Officer Department of Fisheries

Appendix E “Guidelines for restaurants and retailers keeping live fish and shellfish” – final version of the brochure in English, Mandarin and Vietnamese.

Live seafood must be looked after to ensure good quality!

Firstly, make sure the fish and shellfish you buy from your supplier is healthy as they will be easier to keep healthy in your tanks.

Don't overstock tanks but stock according to species requirements and holding capacity of your system!

Good water quality is essential for healthy fish and shellfish. This brochure provides some basic welfare information to better help you look after your fish and shellfish. For more information please refer to your respective State government website.

- Have plenty of air bubbling in your tanks. The more fish and shellfish, the more air is needed but make sure they can move away from the bubbles, if they want to.
- Bubbling air ensures that there is enough oxygen in the water and also helps remove carbon dioxide (CO₂), which is released by the fish and shellfish. Too much CO₂ can affect water quality.
- Clean your tanks and filters regularly. Water in tanks should always be clear and clean.
- Most fish can go a week without food however some shellfish, (e.g. prawns) may show signs of aggression if not fed. If you need to feed your fish and shellfish, make sure that waste products do not build up in your tanks which could lead to fish and shellfish becoming sick.
- Ideally, the pH (which is a measure of how acid or alkaline your water is) should be similar in your tanks to the water your fish originally came from. The pH level in your freshwater tanks should never fall below 6.
- Check your tanks daily and remove any sick, injured or dead fish or shellfish immediately.

- Tank water and dead fish and shellfish must be disposed of in accordance with local government requirements.
- Do NOT put any chemicals into your tanks when you have live fish or shellfish in them.

Different species of fish and shellfish need different water and none like sudden changes!

- Different species of fish and shellfish have different temperature requirements. Some like warm water, some like cold - please see reverse.
- Likewise, some species of fish and shellfish like freshwater and some like saltwater. Some are happy in between - please see reverse.
- No fish or shellfish like sudden changes in temperature and salinity. Make sure the temperature and salinity in the tank are correct BEFORE putting the live fish and shellfish in the tank.

Kill Fish and Shellfish Humanely!

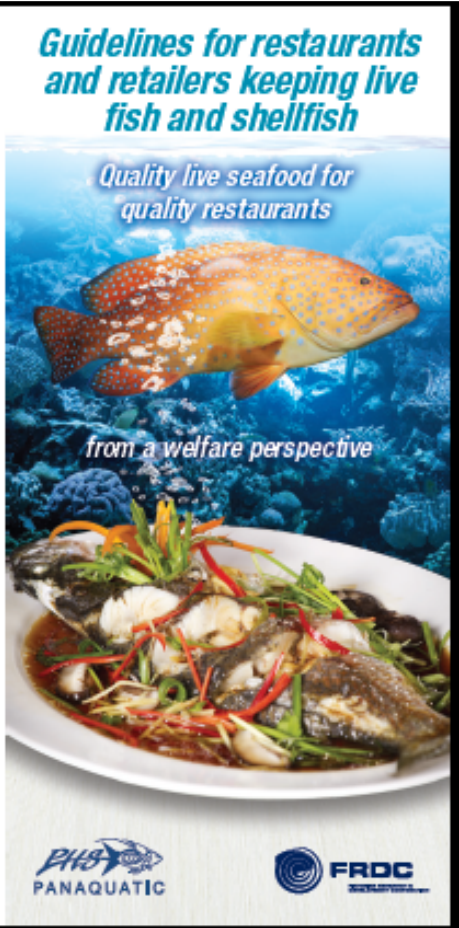
- Kill fish and shellfish as soon as you take it out of the tank. For fish, acceptable and humane methods include a blow to the head or spike to the brain.
- Whatever method is used, the killing process should not take more than 10 seconds.

Developed by:
Panaquatic Health Solutions Pty Ltd
www.panaquatic.com

This project is supported by funding from the Department of Agriculture as part of the Australian Animal Welfare Strategy.

Photos of coral trout, barramundi, painted crayfish, southern and western rock lobsters, prawns, and Tasmanian giant crab courtesy of FRDC/CSIRO

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Guidelines for restaurants and retailers keeping live fish and shellfish

Quality live seafood for quality restaurants

from a welfare perspective

PHS PANAQUATIC

AUSTRALIAN ANIMAL WELFARE STRATEGY










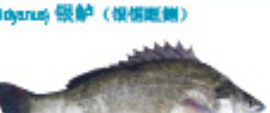





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Figure 1 - English version (page 1)

Report prepared by Panaquatic Health Solutions Pty Ltd and Department of Fisheries WA

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Figure 1 (cont.) - English version (page 2)

FISH REQUIREMENTS			Water Temperature Requirements	Salinity Requirements
<p>Coral trout (<i>Plectropomus</i> spp.) 红石斑 (花斑刺鲷)</p> <p>20° - 22.5°C</p> <p>Mainly Saltwater (20ppt salt)</p> 	<p>Morwong (<i>Chelodactylus spectabilis</i>) 唇指鲈 (礁唇指鲈)</p> <p>10° - 15°C</p> <p>Saltwater (30-35ppt salt)</p> 	<p>Tiger prawns – Sea water (<i>Penaeus monodon</i>) 明虾 – 海水 (对虾)</p> <p>18° - 22°C</p> <p>Saltwater (30-35ppt salt)</p> 		
<p>Barramundi (<i>Lates niloticus</i>) 澳洲鲈鱼 (尖吻鲈)</p> <p>20° - 22.5°C</p> <p>Mainly Freshwater (0ppt salt)</p> 	<p>Parrot fish (<i>Neolabrus tetricus</i>) 鹦嘴鱼 (西蓝背珊瑚头鱼)</p> <p>10° - 15°C</p> <p>Saltwater (30-35ppt salt)</p> 	<p>Western rock lobster (<i>Paralithodes cinctus</i>) 西岩龙虾 (天鹅龙虾)</p> <p>14° - 18°C</p> <p>Saltwater (30-35ppt salt)</p> 		
<p>Jade perch (<i>Scaenium tanzooi</i>) 宝石鲈 (澳洲宝石鲈)</p> <p>15° - 20°C</p> <p>Freshwater (0-3ppt salt)</p> 	<p>Eels (<i>Anguilla</i> species) 鳗鱼 (澳洲鳗鲡)</p> <p>12.5° - 17.5°C</p> <p>Mainly Freshwater (0ppt salt)</p> 	<p>Tasmanian giant crab (<i>Pseudosquilla gigantea</i>) 塔斯马尼亚巨蟹 (巨大拟滨蟹)</p> <p>10° - 15°C</p> <p>Saltwater (30-35ppt salt)</p> 		
<p>Silver perch (<i>Budytes budytes</i>) 银鲈 (银斑刺鲷)</p> <p>15° - 20°C</p> <p>Freshwater (0-3ppt salt)</p> 	<p>Mudcrab (<i>Scylla serrata</i>) 泥蟹 (拟球青蟹)</p> <p>20° - 25°C</p> <p>Saltwater (30-35ppt salt)</p> 	<p>Southern rock lobster (<i> Jasus edwardsii</i>) 南岩龙虾 (刺岩龙虾)</p> <p>10° - 15°C</p> <p>Saltwater (30-35ppt salt)</p> 		
<p>Murray cod (<i>Maccullochella peelii peeli</i>) 墨累鳕鱼 (鱼纹尖刺鲈)</p> <p>15° - 20°C</p> <p>Freshwater (0-3ppt salt)</p> 	<p>Painted crayfish (<i>Paralithodes ornatus</i>) 花龙虾 (锦绣龙虾)</p> <p>20° - 25°C</p> <p>Saltwater (30-35ppt salt)</p> 	<p>Abalone (<i>Haliotis</i> species) 鲍鱼 (鲍螺属)</p> <p>10° - 15°C</p> <p>Saltwater (30-35ppt salt)</p> 		

活海鲜必须得到照顾，以保证良好的品质！

首先，确保您从供应商处购买的鱼类和贝类健康的，这样它们在水缸里会更容易保持健康。

别让鱼类和贝类在水缸里过度拥挤，水缸载畜量应该根据它们各自种类的需求，并根据您养鱼系统的容量！

良好的水质是健康鱼类和贝类必不可少的。这本小册子提供一些基本的福利信息，以更帮助您照顾鱼类和贝类。欲了解更多信息，请参阅各自的州政府网站。

- 确保您的水缸有充足的空气气泡。鱼类和贝类的数量越多，需要的空气也越多，请确保有需要的时候它们能够远离气泡。
- 放入空气不但确保缸水有足够的氧气，也有助除去鱼类和贝类释放的二氧化碳(CO2)。过多的二氧化碳会影响水质。
- 定期清理您的水缸和过滤器 - 缸水应该时时都清澈干净。
- 多数的鱼可以禁食一周，但有些贝类(例如虾)如果不喂就可能显示气盛的迹象。如果您需要喂鱼类和贝类，请确保废物不在缸内积聚导致鱼类和贝类患病。
- 缸水的酸度和碱度会改变。缸水的理想pH值(水酸性或碱性的度量)应该似于鱼类原来的水pH值。
- 淡水缸的水pH值不应低于6。
- 每天检查您的水缸，并立即清除任何患病、受伤或死亡的鱼类或贝类。

- 缸水、死鱼和死贝类的处置必须按照当地政府的规定。
- 决不可把任何化学品添加到有活鱼类或贝类的水缸。

不同种类的鱼类和贝类都需要不同的水属性，没有任和鱼类和贝类喜欢突然的变化！

- 不同种类的鱼类和贝类有不同的温度要求。有些喜欢温暖的水，有些喜欢偏凉的水 - 请参阅背页。
- 同样，某些鱼类和贝类喜欢淡水，有些喜欢咸水，有些喜欢在两者之间的盐度 - 请参阅背页。
- 没有鱼类或贝类喜欢缸水温度和盐度有突然变化。把活鱼类和贝类加入水缸之前，请确保水缸的温度和盐度是正确的。

人道屠杀鱼类和贝类！

- 活鱼类和贝类从水缸拿出就应该尽快屠杀。对鱼类合适的人道屠杀方法包括打击头部或扎透大脑。
- 无论使用何种方法，屠杀进程不应该超过10秒。

**餐厅和零售商
饲养鱼类和贝类的指南**

高档餐厅从福利的角度
提供优质的活海鲜



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网站 | website: www.panaquatic.com

该工程的资金支持来自农业部的澳大利亚动物福利战略(JAMES)：澳洲鲷鱼、尖吻鲈、小龙虾、澳洲岩龙虾、西岸岩龙虾、蚌、和嘴刺马那里巨墨鱼的照片来自FRDC/CSIRO

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Figure 2 - Chinese (mandarin) version page 1

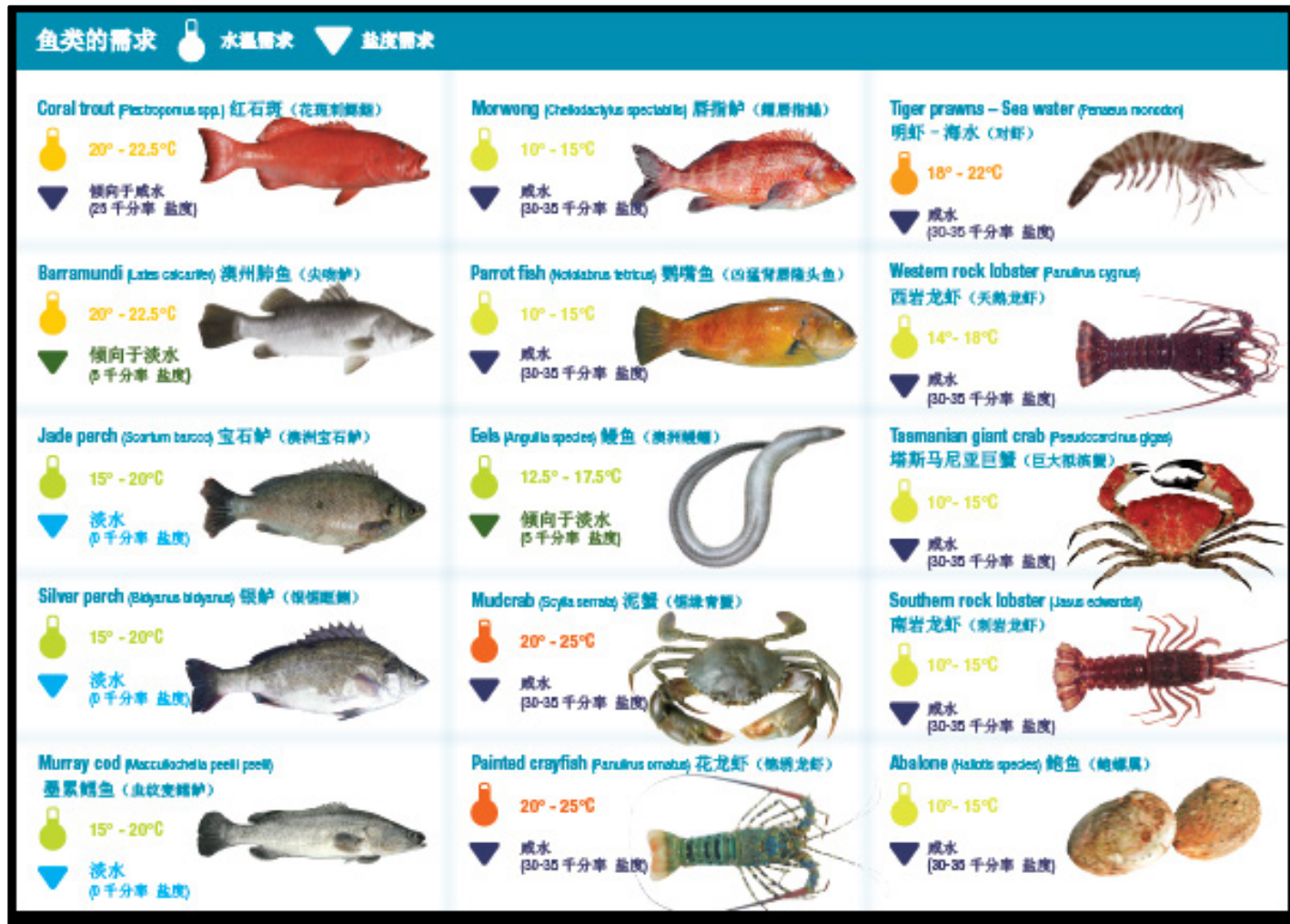


Figure 2 (cont.)- Chinese (mandarin) version page 2

Hải sản sống cần được trông coi để bảo đảm chất lượng tốt!

Trước tiên, bảo đảm cá và tôm cua sò ốc mua từ công ty cung cấp được khỏe mạnh do việc giữ chúng khỏe mạnh trong thùng chứa sẽ dễ hơn.

Đừng chứa quá tải thùng mà theo nhu cầu của các loại hải sản và dung tích kích cỡ của qui vị!

Chất lượng nước sạch sẽ là điều cần thiết cho cá và tôm cua sò ốc khỏe mạnh. Tệp chỉ dẫn này cung cấp một số thông tin lợi ích cần bản để giúp qui vị trông coi cá và tôm cua sò ốc được tốt hơn. Để có thêm thông tin, xin tham khảo trang mạng của chính phủ tiểu bang.

- Có nhiều bọt khí trong thùng chứa. Càng nhiều hải sản càng cần có nhiều không khí nhưng hãy bảo đảm là chúng có thể lợi trình các bọt nếu chúng muốn.
- Bọt khí sẽ bảo đảm có đủ đường khí oxy trong nước và cũng giúp loại bỏ thán khí Carbonic (CO2) do hải sản thải ra. Quá nhiều CO2 có thể ảnh hưởng tới chất lượng của nước.
- Hãy rửa sạch thùng chứa và dụng cụ lọc nước thường xuyên. Nước trong thùng cần luôn luôn được trong sạch.
- Hầu hết cá có thể sống được 1 tuần không cần thức ăn tuy nhiên có vài loại tôm cua sò ốc (chẳng hạn như tôm) có thể cho thấy những dấu hiệu hung hãn nếu không được nuôi ăn. Nếu cần cho cá và tôm cua sò ốc ăn, hãy bảo đảm là các thứ nức nển không tích tụ trong thùng có thể làm cho cá và tôm cua sò ốc bị bệnh.
- Điều lý tưởng là độ pH (số đo của Acid và Alkaline trong nước) trong thùng chứa cần tương đương với độ pH của nước nơi nguyên thủy của cá. Độ pH trong thùng chứa nước ngọt không nên ở dưới mức 6.
- Hãy kiểm tra thùng hàng ngày và loại ra ngay bất cứ cá hay tôm cua sò ốc nào bị bệnh, bị thương tích hay chết.

- Nước thùng chứa và cá hay tôm cua sò ốc chất cần phải được đổ bỏ theo đúng yêu cầu của chính quyền địa phương.
- ĐỪNG cho bất cứ hóa chất nào vào thùng khi có chứa cá hay tôm cua sò ốc trong đó.

Những loại cá hay tôm cua sò ốc khác nhau cần có nước khác nhau và không có sự thay đổi đột ngột!

- Những loại cá và tôm cua sò ốc khác nhau có những yêu cầu nhiệt độ khác nhau. Một số thích nước ấm, một số thích nước lạnh - xin xem trang sau.
- Tương tự, có một số loại cá và tôm cua sò ốc thích nước ngọt và một số thích nước mặn. Một số thì thích nước lợ - xin xem trang sau.
- Không loại cá hoặc tôm cua sò ốc nào thích hợp với sự thay đổi nhiệt độ và độ mặn đột ngột. Hãy bảo đảm nhiệt độ và độ mặn trong thùng đúng mức TRƯỚC KHI cho cá và tôm cua sò ốc vào.


Hãy làm thịt cá và tôm cua sò ốc một cách nhân đạo!

- Hãy làm thịt cá và tôm cua sò ốc ngay khi lấy ra khỏi thùng. Đối với cá, những cách thức nhân đạo gồm đập một cái vào đầu hay đánh một cái vào nĩa.
- Bất cứ hình thức nào được sử dụng, cách sát hại không nên lâu hơn 10 giây.

Bản Hướng Dẫn Các nhà hàng và Tiệm Bán Lẻ Bảo quản Cá và Tôm Cua Sò Ốc Sống

Hải sản tươi chất lượng cho căn cứ nước khác nhau và không có sự thay đổi đột ngột!

Hải sản tươi chất lượng cho nhà hàng chất lượng



Từ góc nhìn sức khỏe



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Dự án này được hỗ trợ bởi quỹ tài trợ từ Bộ Nông Nghiệp như là một phần của Australia Animal Welfare Strategy.

Những hình ảnh cung cấp của FRDC/CSRO cá Hồi Sen Hồ (Coast Trout), Cá Chình (Barramundi), Tôm công xanh (Painted crayfish), tôm công Southern và Western Rock (Southern and Western rock lobster), tôm (prawn) và cua khổng lồ Tasmania (Tasmanian giant crab)

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Figure 3 - Vietnamese version page 1
















NHỮNG ĐIỀU KIỆN CỦA CÁ			Điều Kiện Nhiệt Độ Của Nước	Điều Kiện Độ Mặn
<p>Cá Hồi san hô - Coral trout (<i>Plectropomus</i> spp.)</p> <p>20° - 22.5°C</p> <p>Nước Mặn Chính Yếu (muối 25/1000)</p> 	<p>Cá Kẽm - Morwong (<i>Chelodactylus spectabilis</i>)</p> <p>10° - 15°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 	<p>Tôm sú - Tiger prawns – Sea water (<i>Penaeus monodon</i>)</p> <p>18° - 22°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 		
<p>Cá Chêm - Barramundi (<i>Lates niloticus</i>)</p> <p>20° - 22.5°C</p> <p>Nước Ngọt Chính Yếu (muối 5/1000)</p> 	<p>Cá Vẹt - Parrot fish (<i>Notolebrus tetraicus</i>)</p> <p>10° - 15°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 	<p>Tôm hùm đỏ - Western rock lobster (<i>Panulirus cygnus</i>)</p> <p>14° - 18°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 		
<p>Cá Rồng - Jade perch (<i>Scortum barcoo</i>)</p> <p>15° - 20°C</p> <p>Nước Ngọt (muối 0-5/1000)</p> 	<p>Lươn - Eels (<i>Anguilla</i> spp.)</p> <p>12.5° - 17.5°C</p> <p>Chủ yếu - nước mặn (muối 5/1000)</p> 	<p>Cua khổng lồ Tasmania (<i>Pseudosquilla Gigas</i>)</p> <p>10° - 15°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 		
<p>Cá Rồng Bạc - Silver perch (<i>Budytes budytes</i>)</p> <p>15° - 20°C</p> <p>Nước Ngọt (muối 0-5/1000)</p> 	<p>Cua bùm - Mudcrab (<i>Scylla serrata</i>)</p> <p>20° - 25°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 	<p>Tôm hùm đỏ - Southern rock lobster (<i>Jaanus edwardsii</i>)</p> <p>10° - 15°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 		
<p>Cá Thu - Murray cod (<i>Maccullochella peelii peelii</i>)</p> <p>15° - 20°C</p> <p>Nước Ngọt (muối 0-5/1000)</p> 	<p>Tôm hùm xanh - Painted crayfish (<i>Panulirus ornatus</i>)</p> <p>20° - 25°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 	<p>Bào Ngư - Abalone (<i>Haliotis</i> species)</p> <p>10° - 15°C</p> <p>Nước Mặn (muối 30-35/1000)</p> 		

Figure 3 (cont.)- Vietnamese version page 2