

## ■ KEEPING SEAFOOD SAFE

*This article was written by Chris Leftwich, Chief Inspector at London's wholesale Billingsgate Market, and is reprinted with permission from Seafood Processor. This article is a continuation of the article published in Seafood Processor, April 2007.*

### Carbon monoxide

With the ever increasing trade in tuna and the desire for purchasers to receive it looking bright red, there was, for a period, a substantial growth in the misuse of carbon monoxide to maintain the original colour of the flesh. The gas is used to combine with the haemoglobin in the fish's blood to maintain the bright pinkish red colour of fresh tuna.

Carbon monoxide allows the colour to be retained even if the fish is exposed to the air, or when it is quite old. Normally, in both instances, the flesh would turn brown alerting potential users to possible problems.

The difficulties created by the use of carbon monoxide are that a product could have high levels of histamine or be way beyond its shelf life and there would be no indication that either problem exists.

Carbon monoxide does not extend the shelf life of the product. Carbon monoxide is a non-permitted additive in the EU, and in many other parts of the world, and is therefore banned from use.

However, there is a development in the US known as Clearsmoke in which carbon monoxide can be present. This process, which uses filtered wood smoke, was approved by the USFDA in 1998.

Allegedly, use of Clearsmoke extends the shelf life of the product without masking the decomposition factors. However, as far as the EU is concerned this is not a permitted process and products treat-

ed in this way are banned from importation into the EU.

The European Food Safety Authority is reviewing the process but to date has still not made a decision to allow its use.

### Fish poisoning

Although not strictly contaminants, there are two categories of fish which cause fish poisoning that are also banned from importation into Europe. The first is fish from ciguatera endemic areas.

#### Ciguatera fish poisoning

Incidences of ciguatera are well documented around the world. Toxic algae that live in certain reef areas are the causative agent of ciguatera. Fish that inhabit the reef consume the algae and these are eaten, in turn, by larger predatory fish. The toxin accumulates in the flesh of the fish and anyone unfortunate to eat it ends up with ciguatera fish poisoning.

The symptoms onset quite quickly from a few minutes up to about six hours and can last anything from a few days to several months. Symptoms may include parathesia, blurred vision, pain in the extremities, temperature reversals and respiratory paralysis. Rarely will someone die from the effects, but they can be debilitated for several months.

There has only been one reported case of ciguatera in the UK and this occurred several years ago and was well documented in Lancet as the unfortunate recipients were a doctor and his family.

The types of fish that are implicated are parrotfish, barracudas,

moray eels, snappers and groupers. All of these fish, with the exception of moray eels which are completely banned, are regularly imported into Europe, but all from ciguatera free areas. It is illegal to import fish into Europe from ciguatera positive areas.

#### Puffer fish poisoning

The second group of fish causing fish poisoning are puffer fish. These are the infamous Japanese fugu fish that are considered to be such a delicacy in Japan, where chefs are trained for up to seven years to be able to prepare the fish without causing their clients to be poisoned.

Puffer fish are able to produce their own toxin, which is found in the liver, gonads, blood and intestines. The chefs prepare the fish removing most of the toxin but leaving a small amount in the flesh to enhance the eating sensation.

However, despite the attention to detail, puffer fish have been implicated in several deaths in Japan, presumably due to inexperienced people preparing the fish. These fish are completely banned from importation into Europe, despite protestations from the growing number of Japanese chefs in Europe who would dearly love to import this delicacy.

#### Microbial contamination

Many microbial contaminants occur occasionally in seafood. However, the two that cause most problems are the salmonellas and vibrios, although of increasing concern is listeria.

### Salmonella

This group of bacteria is responsible for the majority of food poisoning cases in the UK, with poultry being the most common source. However, consignments of fishery products are often stopped at entry points into the EU and on analysis were discovered to be contaminated with salmonella.

More than 50% of these cases are attributable to shrimp and most of these would be from farmed shrimp. The reason for this can be attributed in part to the growing methods whereby the water in which they are farmed is contaminated with bacteria from animal sources, and in part to the fact that salmonella grows quite naturally in waters in many of the tropical climates. In addition, there are also problems that can occur by cross-contamination during processing and packing.

If discovered, the particular consignment will be refused entry and the next 10 consignments from that source will be checked. If further consignments are discovered to be similarly affected, the EU will take appropriate action to ensure that this does not continue.

It is perhaps unfortunate for developing countries that the EU takes such a hard line, particularly when domestic poultry is almost always affected. Yet no authority bans poultry from

being consumed. In the case of poultry the public are informed of the risks and urged to cook the product carefully thereby ensuring destruction of any bacteria.

Many developing countries have lobbied the EU to allow a more lenient approach to be adopted and suggested that a similar approach to that of domestic poultry be undertaken for imported shrimp. Unfortunately, the EU remains unmoved

### Vibrios

There are three major vibrios that are of concern, parahaemolyticus, vulnificus and cholera, and all three can be found in raw seafood in any sub-tropical country.

Parahaemolyticus causes nausea, vomiting and diarrhoea approximately 12–24 hours after consumption of raw and ready-to-eat seafood. Fortunately, the symptoms subside within 2–3 days and the patient should make a full recovery.

Vulnificus is much more problematic in that there are often no early warning signs. But the vibrio attacks the immune system and liver, sometimes with fatal consequences.

Cholera causes an acute intestinal disease and onsets within a few hours to five days causing the sufferer to dehydrate very rapidly. If sufferers remain

untreated there is a fatality rate of up to 50%.

This can be a problem in wild and farmed shrimp, and even freshwater fish have been known to be carriers.

### Listeria

There are many different strains of listeria, but the most dangerous is *Listeria monocytogenes*. However, discovery of any strain is indicative that *L. monocytogenes* could be present and the product would be rejected.

Listeria can be found in many seafood products as it is a salt tolerant bacterium, and is of particular concern in smoked fish where it can survive the cold smoking process. It has an incubation period of one to 90 days with an average of about 30.

In healthy adults, listeria can cause mild infections of the eyes and skin, and also gastro-enteritis, but in more severe cases it could lead to blood poisoning (septicaemia) or meningitis. But it is of most concern to pregnant women. In the expectant mother it can cause mild flu-like symptoms, but can have catastrophic consequences to the unborn infant where it can cause premature deliveries, still birth or severe illness.

Source: Seafood Processor, May 2007, pp 12–13.

(<http://www.seafoodprocessor.com/leighway/home.htm?site=sfp>)



## ■ POSTLARVAL FISH CAPTURE AND GROW-OUT MANUAL

by Cathy Hair\*

A new manual describing how to catch and rear postlarval fish and crustaceans for the marine aquarium trade has been published by the Australian Centre for International Agricultural Research (ACIAR). It is the culmination of a five-year study funded by ACIAR and conducted by the WorldFish Center in Solomon Islands on postlarval capture and culture (PCC). The initial four years of research (1999–2002) demonstrated the potential to use environmentally friendly methods to capture and culture a range of fish and crustaceans as they settled from the plankton. A final year (2003) allowed the project team to fine-tune the simple aquaculture techniques required to grow them out to market size.

Many coral reef species sought after in the aquarium trade were collected as postlarvae and reared for sale, with sufficient value to sustain a profitable fishery. Not all species on the aquarium fish list are currently included in the PCC fishery, however, as only the most valuable warrant the effort to catch, grow-out and sell. In particular, cleaner shrimp, lobster and a few high-end fish species, such



**Top: WorldFish Center PCC trainer, Regon Warren, demonstrating operation of the crest net and codend.**

**Middle: WorldFish Center PCC trainer, Ambo Tewaki, constructing a fish-holding cage with workshop participants.**

**Bottom: Workshop participants sorting the postlarval catch from a crest net deployed overnight on Nusa Nane reef near Gizo, Western Province, Solomon Islands.**

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as angelfish, received good farm-gate prices from the local exporter. We hope that the range and demand will expand as the environmental benefits associated with this fishery are recognised and rewarded, a goal that organisations such as the Marine Aquarium Council are working towards.

In 2004, soon after the conclusion of the research, the first batch of potential farmers was trained at an ACIAR-funded workshop in Gizo. A draft manual was used to assist in this process. Feedback on the usefulness of the manual was sought from workshop participants. Using this as the base, the next step was to decide on the content and format for a manual that would be appropriate for the target audience of PCC farmers. Following the release of the "Seaweed Farming in Kiribati" booklet, it was agreed that this cartoon style format was an ideal approach, being easy and fun to read, without any sacrifice of educational value.

The Kiribati Seaweed booklet was the model but the PCC manual has a definite Solomon

flavour. The booklet was designed at the WorldFish aquaculture station at Nusa Tupe by Cathy Hair, Regon Warren, Ambo Tewaki and Ronnie Posala. A local artist, Kisi Mae, provided the wonderful illustrations. The format differs also from the other in that it has more text, necessary because of the more complex nature of the PCC techniques. Decisions on the manual's content arose out of consultations with the WorldFish staff responsible for PCC research and extension activities, with valuable input from a successful PCC farmer. The ACIAR publications team also contributed to the final product.

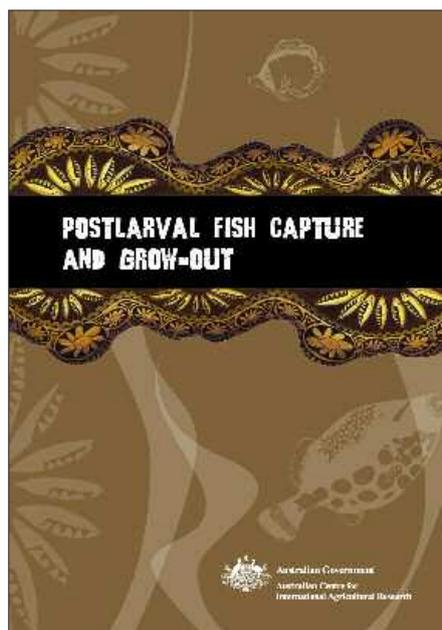
The manual is divided into four sections. The Introduction explains what this new fishery is all about and who it is suitable for; the Capture section explains how to make, set and catch fish with the collection gear; the Grow-out section deals with fish retrieval, handling and husbandry aspects of the fishery; and the Export section shows how to tell when the fish and crustaceans are ready for export and how to get them to

market in good condition with the lowest possible mortality. The manual focuses on a sustainable and responsible approach to harvesting the postlarval resource. We emphasise looking after the catch all the way from the sea to the exporter because this makes sense for the environment and the farmer's pocket.

The manual is available to anyone who is interested in learning about this new fishery, although some kind of hands-on training is recommended before developing a PCC fishery. For a copy of the manual and more information, contact:

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## ■ FISH – A CORNERSTONE OF FUTURE FOOD SECURITY FOR THE PACIFIC

by Johann Bell\*

Maslow has helped us understand that development rarely takes place until people's basic needs — food, shelter and security — have been met\*\*. This lesson must be taken to heart in the Pacific — plans to improve health and education, provide jobs and manage natural resources have to be underpinned by access to nutritious food for all.

This is no easy task. Pacific Island populations are growing rapidly and careful planning is needed to identify how best to provide the food required.

Four programmes at the Secretariat of the Pacific Community (SPC) have joined forces to help Pacific Island countries and territories (PICTs) meet this challenge — Public Health, Statistics and Demography, Coastal Fisheries and Oceanic Fisheries ([www.spc.int](http://www.spc.int)). The conclusion is that much of the answer lies with fish.

The SPC team identified how much fish should be eaten for a healthy diet, how much fish is being eaten in the region now, and how much fish will be needed for food security in the region in 2030.

The results confirm that the Pacific is still extraordinarily dependent on fish. In many PICTs, fish makes up 70–90% of total animal protein intake. Other important findings were that most of the fish used for food comes from subsistence fishing, and that fish consumption in most PICTs well exceeds the level required for good nutrition (i.e. an average of 35 kg per person per year). The

large inland populations of Papua New Guinea are a notable exception — their consumption of fish is meagre due to limited access.

The good news is that Pacific islanders are eating plenty of fish. The reality is that they have few alternative sources of animal protein. The challenge for national planners, therefore, is to ensure that growing populations continue to have physical, social and economic access to the fish they need. In rural areas, fish needs to be made available in ways that enable households to catch or produce it for themselves. In urban centres, it needs to be supplied at affordable prices.

The amount of fish needed by the region in 2030 will be much greater than most people realise (see figure). Another sobering realisation is that even well-managed coastal fisheries cannot produce the fish required. Preliminary analysis shows a huge shortfall between the needs for fish in 2030 and estimated sustainable production from coastal fisheries for 13 of the 22 PICTs. Solomon Islands is a case in point. Sustainable production from the nation's coastal fisheries is not known accurately, but is likely to be in the range of 5000–10,000 tonnes per year. This falls far below the 30,000 tonnes of fish the country will need for food security in 2030.

There is consensus that no further increases in coastal fisheries production are possible for many PICTs, so where will the additional fish come from? Improved access to tuna by rural communities is part of the solution, as is

small pond aquaculture. There is more than enough tuna to feed the people of the Pacific for decades to come and, with careful planning and management, the large surplus can continue to be used to contribute to national economies through export-orientated domestic industries and sale of access rights to distant water fishing nations. Distributing the proportion of tuna required for food security to rural communities is the challenge.

A joint project between SPC and NZAID has provided a way forward. The project team modified the design of the moored fish aggregating devices (FADs), commonly used in the region since the early 1980s, to reduce their cost and extend their lifespan. These low-cost moored FADs, designed for inshore waters, are suitable for use by coastal fishing communities. They can be placed close enough to shore so that villagers can paddle to them in canoes, or further offshore where communities can afford to operate skiffs. The FADs aggregate tuna and other large pelagic fish and promise to greatly increase production from subsistence fisheries. Their potential has been confirmed through trials in Niue and Cook Islands, where the gross value of fish harvested exceeded the cost of the FADs by three- to seven-fold.

Nauru is also benefiting from new designs for inshore FADs. The Nearshore Fisheries Development and Training Section at SPC recently helped the Nauru Fisheries and Marine Resources Authority (NFMRA) to deploy seven simple inshore FADs with-

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\*\* See Maslow's Hierarchy of Needs at [http://en.wikipedia.org/wiki/Maslow's\\_hierarchy\\_of\\_needs](http://en.wikipedia.org/wiki/Maslow's_hierarchy_of_needs)

in 500 m of the coast. These FADs, funded by Taiwan/ROC, have innovative mooring systems, using grapnels instead of concrete blocks, and can be deployed from small vessels. SPC also trained local fishermen in mid-water fishing methods and arranged for an Australian boat builder based in Kiribati to teach local fishermen to construct canoes using modern materials and tools. These canoes are suitable for fishing around FADs in reasonable weather.

Charleston Debye, CEO of NFMRA, reports that all FADs

are yielding fish and three have large mixed schools of rainbow runner, skipjack, frigate mackerel, yellowfin tuna and wahoo. 'Our fishermen all know the importance of FADs and are very attentive to keeping them in place and making suggestions about improvements,' he said.

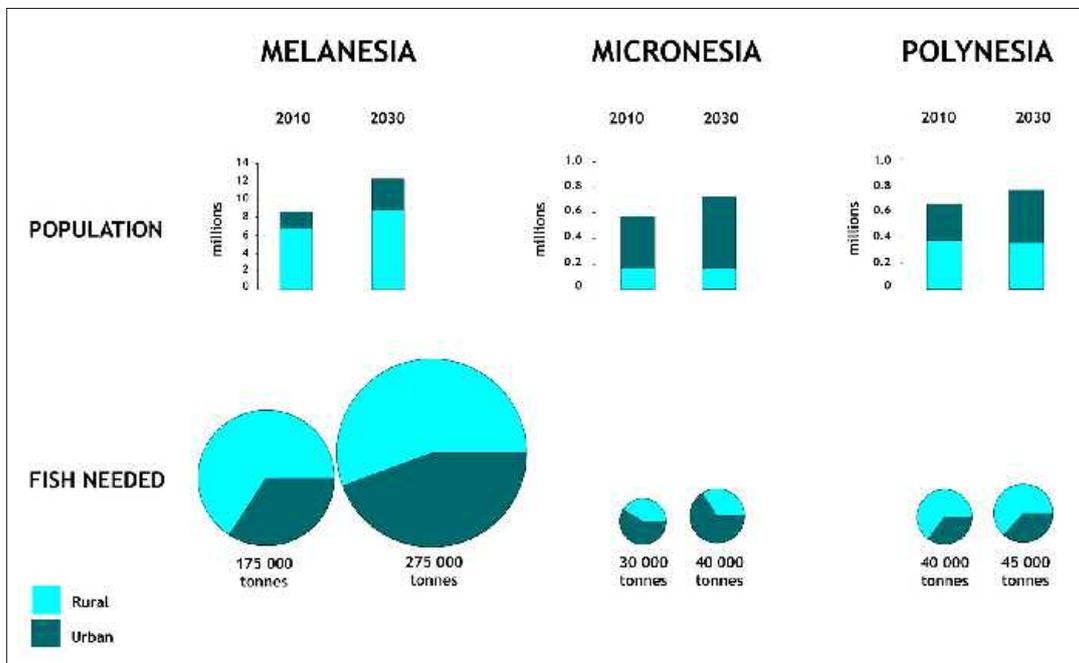
Mr Debye will join staff from SPC and the Forum Fisheries Agency at this year's Conference of the Pacific Community in Apia to make presentations during the special theme on "The future of Pacific fisheries — planning and managing for

food security, sustainable livelihoods and economic growth"

[http://www.spc.int/AC/conf\\_V\\_theme.htm](http://www.spc.int/AC/conf_V_theme.htm)

The theme will not only help PICTs find ways to maximise the contribution of tuna to economic growth, it will also focus on planning the use of fish for food security.

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**Forecasts of population growth, and the fish needed for food security, for rural and urban areas in the Pacific. (Estimates of fish needed by Melanesia are based on an average annual consumption of 35 kg per person per year, except for inland Papua New Guinea. Estimates for Micronesia and Polynesia are based on current rates of per capita fish consumption.)**

## ■ THE COLLECTED WORKS OF R.E. JOHANNES AVAILABLE

Robert Johannes' publications on marine traditional knowledge and management (2007) are available for immediate purchase in downloadable, CD and hardcopy versions from the International Resources Management Institute's website.

Robert Johannes was a tropical marine ecologist who, beginning in the mid-1970s, pioneered the idea of integrating the specialised ecological knowledge and traditional marine resource management systems of Pacific Island communities with Western concepts of scientific manage-

ment for the purposes of resource conservation. In so doing, he highlighted the importance of indigenous knowledge and community-based systems as key factors in marine conservation.

Aware that the rapid disappearance of traditional knowledge

and the lack of interest of younger people in acquiring this knowledge was a serious constraint to implementing his approach, Johannes sought to create a widespread awareness of this often encyclopedic knowledge base. He advocated a reawakening of traditional environmental ethics among youth and hereditary chiefs related to their exclusive reef

and lagoon tenure, an ancient form of marine protection which, he contended, provides a practical and time-tested model of "limited entry" that Western fisheries biologists and economists were only then hitting on as an innovative way to manage their own fisheries.

The International Resources Management Institute has reprinted,

in chronological order, 24 of Robert Johannes' contributions about marine traditional knowledge and management that extend the ideas he expressed in his renowned book, *Words of the Lagoon*. To purchase the collected works, visit:

<http://www.intresmanins.com/publications.html>



## ■ ORGANIZATION SEEKS MANUSCRIPTS DEALING WITH FISHERIES AND COASTAL MARINE ISSUES

The International Resources Management Institute (IRMI) is a Hong Kong-based research and consulting organization that is soliciting manuscripts pertaining to fisheries and coastal marine issues.

IRMI focuses on the Asia-Pacific region and on fisheries and development problems in coastal marine communities and environments. Manuscripts focusing on other regions and topics will also be considered for publication. IRMI has established a website to make publications available electronically and at low cost.

IRMI is especially interested in handling items that more conventional publishers would likely reject as being of very limited appeal, and so either not economically viable, or viable only if sold only at astronomical prices. Such writings would include highly specialised monographs (particularly from tropical coun-

tries), collected works, conference proceedings, festschriften, and items with a large number of colored photographs. In particular, IRMI encourages inquiries from younger authors at institutions in countries where there are few publications outlets and opportunities.

So far, publications have been kept inexpensive, and sold just to recover expenses. In keeping with that objective, IRMI prefers to produce downloadable versions. However, CD and printed versions are also produced, especially for institutional libraries. Printed versions are made on demand, and distributed unbound. Besides allowing libraries or individuals to bind them to suit their own needs, this greatly reduces total costs, because binding and storage costs are eliminated. This contributes to keeping the price of publications reasonable.

IRMI's main objective has been to provide publications within the reach of relatively low income individuals and institutions. For that reason a modest publications subsidy is requested from authors who are in a position to provide one. Subsidies are used solely to defray unavoidable expenses, and so to keep sales prices as low as possible.

For that reason, too, IRMI encourages communication by email. If you wish to learn more, please go to:

<http://www.intresmanins.com/>

You can use the "Feedback Form" for any inquiries or comments. When doing so, make sure to write "Publication Inquiry" in the subject line. Like all of us, IRMI suffers from spam abuse.

