Biological Sampling Newsletter

for Observers and Port Samplers

SPC-OFP Ecosystem Monitoring and Analysis Section*

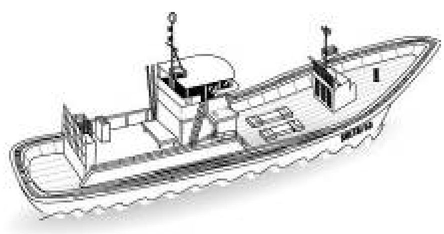
Issue #14 — 15 April 2010

Welcome

to the 14th issue of the *Biological Sampling Newsletter*, which provides news about the Ecosystem Monitoring and Analysis Section of the Secretariat of the Pacific Community's (SPC's) Oceanic Fisheries Programme (OFP).

In this issue we 1) provide an update on the albacore project for which tagging operations will soon begin again; 2) present a new project focusing on coral reef fish larvae and 3) look at a commonly found prey item in tuna stomachs and how to identify it; 4) provide a description of a new collaborative project that takes a closer look at tuna prey in their habitat; and 5) report on a training session for two port samplers who will be measuring the fat content of albacore tuna.

We hope you enjoy this new issue!



* SPC (Secretariat of the Pacific Community) OFP (Oceanic Fisheries Programme), EMA (Ecosystem Monitoring and Analysis) Section, BP D5, 98848 Noumea Cedex, New Caledonia. Tel: +687 262000, Fax: +687 263818.
Contacts: Valérie Allain (valeriea@spc.int) and Caroline Sanchez (carolines@spc.int).

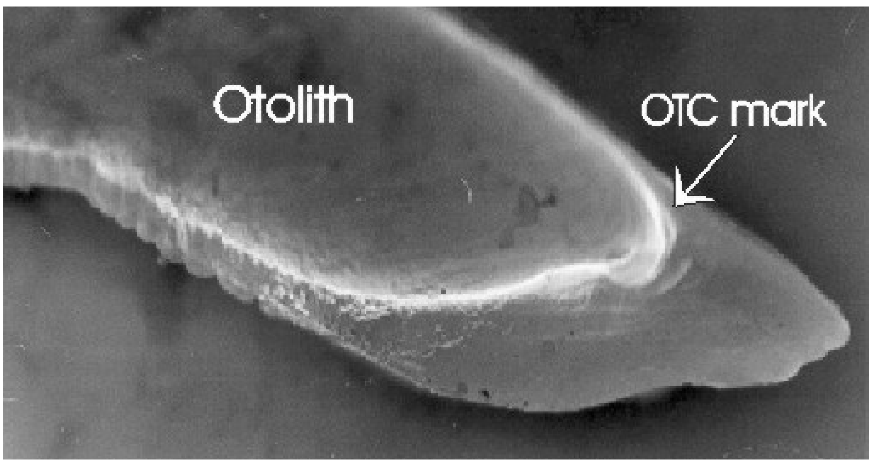
Albacore tagging

In 2009, scientists from SPC tagged over 2,700 albacore off the west coast of New Zealand. Details of the tagging cruise were described in issue #10 of this newsletter (April 2009). One year later, only one tagged albacore has been reported. This fish was recaptured about 200 km from where it was tagged and has grown about 7 cm (from 61 cm to 68 cm, fork length).

While the low number of recaptured albacore so far may be disappointing, analysing the otoliths (ear bones) from recaptured albacore will provide invaluable information. When this fish was tagged it also received an injection of oxytetracycline (OTC), an antibiotic that leaves a mark in the otoliths at the time of injection. The otoliths from this fish have already been removed and will soon be examined under a microscope with ultraviolet light that makes the OTC mark fluoresce. The amount of otolith growth since the fish was injected then allows scientists to determine how frequently (e.g daily, annually) the growth rings are deposited in the otoliths. This is essential for estimating the age of fish.

An albacore receiving an OTC injection before being tagged and released.

Albacore tagging will continue in 2010 with cruises planned for New Caledonia, New Zealand and Tonga beginning in April. During these cruises, longline fishing will be used to capture larger albacore (90-110cm) for tagging. These larger fish will be immediately available to the longline fleets and, as such, we expect a higher recapture rate than we have observed from juvenile albacore tagged in New Zealand last year. Please keep an eye out for any tagged fish and report details to SPC.

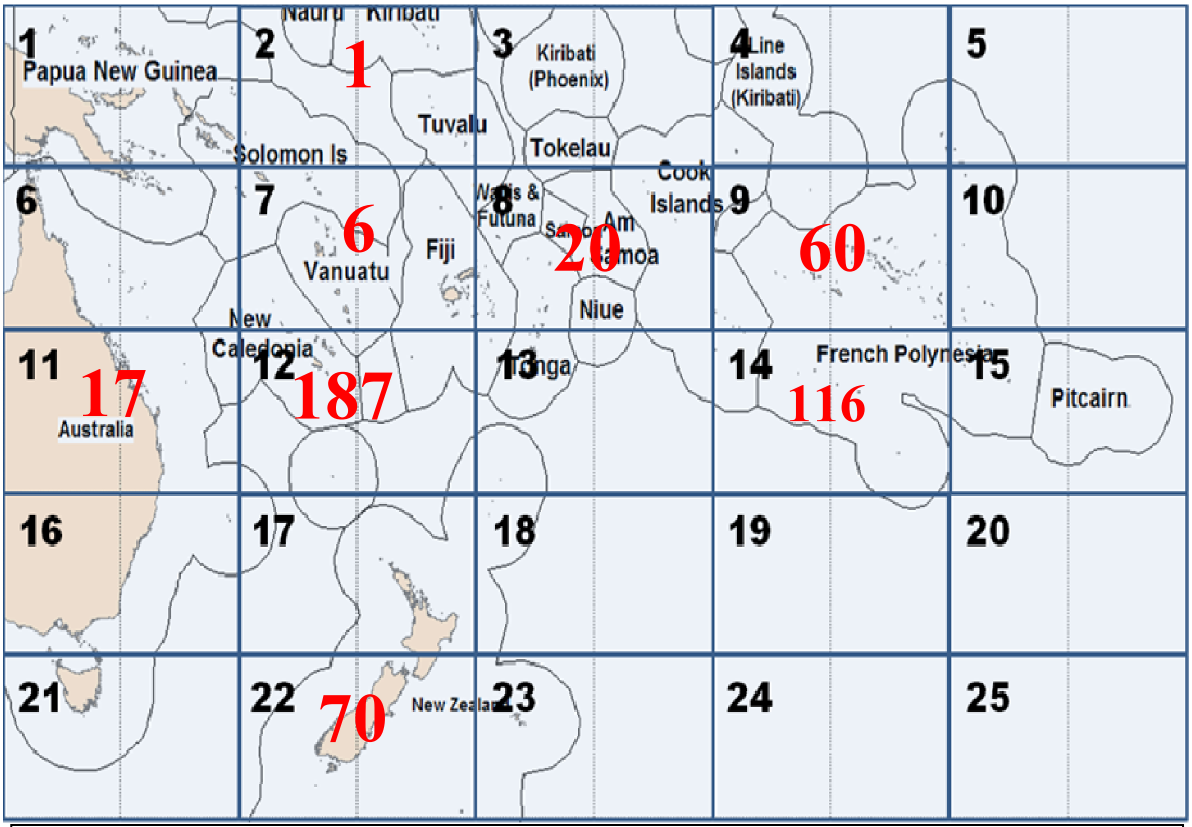


An otolith under a microscope showing the bright OTC marks.

Collecting biological samples from albacore in New Zealand

The albacore biology project is relatively new to SPC, beginning in late 2008. Since then, the region's observers and SPC tagging operations have collected otoliths and gonads from 477 albacore. Most of these were collected from the western Pacific, but recently, good numbers were collected from French Polynesia. The goal of the project is to collect samples from at least 100 albacore in each of the 25 cells of the grid shown in the figure bellow, providing samples from over 2,500 albacore.

We still have a long way to go to reach our target, so we encourage observers to continue collecting samples, particularly in areas where we have few samples to date. Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) is providing samples from Australia's east coast, but we urgently need samples from Vanuatu, Fiji, Samoa, Tonga and Cook Islands.



Black numbers indicate sample areas for the collection of albacore biological samples. Red numbers indicate the number of samples collected in each area so far.

Tuna Help to Understand the Biology of Coral Reef Fish Larvae

The larvae of many coral reef fish are preyed upon by tunas. In a collaborative effort with Dr. Dominique Ponton from IRD[1] (Institut de Recherche pour le Développement) in Noumea, a project was set up to examine the size at age of these larvae by analysing their otoliths.

Top: Butterflyfish (family Chaetodontidae) found in a yellowfin tuna stomach.
Bottom: Boxfish, *Lactoria fornasinii*, found in a longsnout lancetfish stomach.

Because it is often time consuming and challenging to capture larval fish using conventional techniques (such as light traps and reef-crest nets), stomach contents of pelagic predators such as tunas appeared to be a good procurement source.

When coral reef fish larvae are found in a tuna's stomach, and the head of the reef fish (i.e. where the otoliths are located) is in relatively good condition, the specimen is measured, weighed, labelled, bagged and stored in a freezer.

The most common coral reef fish larvae observed are triggerfish (Balistidae), surgeonfish (Acanthuridae), and butterflyfish (Chaetodontidae).

Specimens are then handed over to Dr. Ponton. A high definition picture (see above) of each larva is taken before it is dissected and the otoliths removed. The otoliths are prepared (embedded, cut and polished) in order to count the number of microstructures, with each microstructure corresponding to one day.

This collaboration is mutually beneficial because we provide Dr. Ponton interesting specimens that would otherwise be difficult to obtain, and in return, we receive high-quality photographs of prey species that substantiate our identification keys.

When completed, this collaborative project will also provide valuable data on size at age for different species of larval coral reef fish eaten by tunas at different distances from islands where their settlement habitats are. These data will increase our knowledge about a crucial phase of the life cycle of different coral reef species.

Left: A sagittal otolith extracted from a triggerfish. **Right**: The otolith prepared for analysis: black arrows show the microstructures and the white arrow shows the otolith's core. From a rapid count, the fish was found to be approximately 30 to 40 days old.

For further information, feel free to contact Dr. Ponton: Dominique.Ponton@ird.fr

The red area on this unicornfish, *Naso unicornis*, highlights the two blades at the base of the tail.

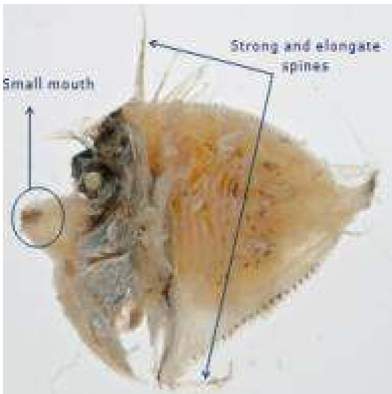
As in the previous issue, we introduce you to some common prey species found in tuna stomachs and how our laboratory technicians identify them.

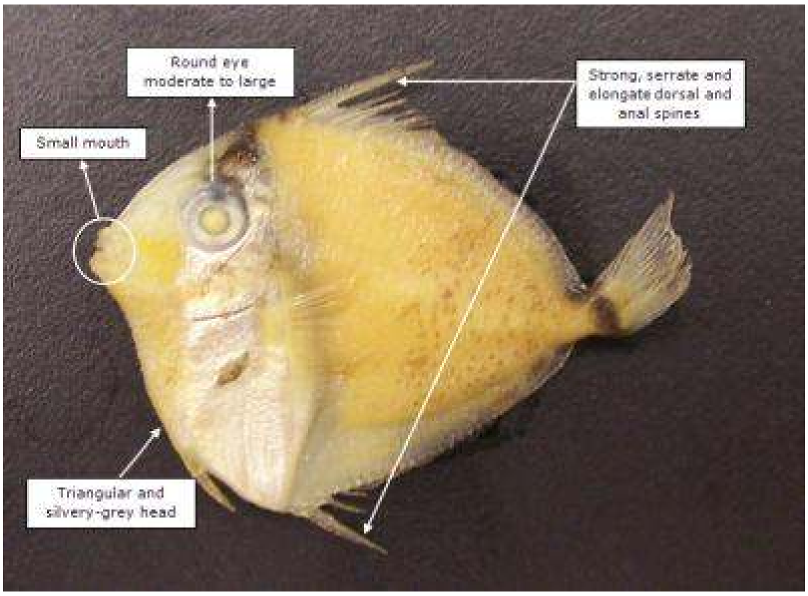
Acanthuridae, commonly named surgeonfish

The family name Acanthuridae is derived from the Greek words *akantha* and *aura*, which loosely translate to 'thorn' and 'tail', respectively. Indeed, the distinctive characteristic of this family is one or more blades on either side of the base of the tail, which are dangerously sharp (figure on the left). These fish can use these scalpel-like blades to slash other fish by a rapid side sweep of the tail, hence their common name surgeonfish, tangs or doctorfish. Studies on unicornfish have found that the blades and/or the surrounding tissues are poisonous.

Acanthurids comprise about 72 species grouped in 6 genera. They are found in every tropical sea in the world. Most surgeonfish are good to eat and are also popular aquarium fish as they often have vibrant colours.

In tuna stomachs, we mainly come across larvae or juveniles that range in size from 0.9 mm to 82.5 mm (standard length). The figures bellow show the morphologic characteristics that we look for to identify surgeonfish.





Right: A well preserved juvenile surgeonfish presenting all key features. **Above:** A partly digested surgeonfish larva that still presents key identification features.

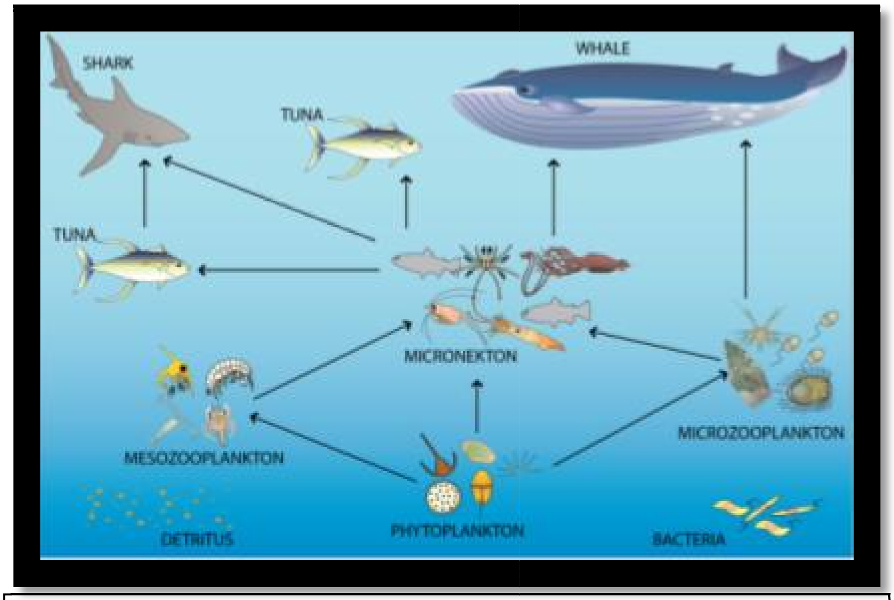
These fish have a strongly compressed body with a small mouth adapted for their diet. Most surgeonfish are herbivorous while some species, such as unicornfish feed on zooplankton in midwater.

To identify larval surgeonfish, the most useful characteristics are i) body nearly as deep as long, ii) a triangular silvery-grey head, and iii) strong and elongate second dorsal fin and first anal fin spines. Even if the digestive process is advanced, these structures still remain. The caudal blades (scalpels) are not developed at this stage.

Stomach analyses reveal that these fish are common prey for yellowfin, skipjack and albacore tunas, and sometimes for mahi mahi, wahoo and bigeye tuna.

PROJECT NECTALIS: A CLOSER LOOK AT THE TUNA FORAGE IN ITS HABITAT TO ENHANCE TUNA STOCK MODELS

Thanks to the great collaboration between the region's observer programmes, we have been able to gather extensive information on the diet of tunas and other large pelagic predators. Those data are included into ecosystem models whose goal it is to better understand the variation in tuna stocks and tuna movements.



Micronekton, or forage, occupy a central position in the pelagic ecosystem. Located at an intermediate level in the ocean, they consume plankton and are eaten by all top-level predators.

However, it is a difficult task and our virtual models do not perfectly mimic what we observe in the real world. We are constantly trying to improve the model in order to predict tuna stock variations according to fisheries management measures, or according to environmental changes such as global climate change.

There are still many unknowns. Small fish, squids and shrimps (called forage or micronekton) — which constitute prey for tunas — are, in particular, poorly understood. They are a center masterpiece in the ecosystem architecture but their quantity, variation, or movements are not well known.

Because of this, we have developed a new project called Nectalis to increase our knowledge on this part of the ecosystem, which will improve the quality and accuracy of our tuna models. Our goal is to obtain new information on the quantities of micronekton available to tuna for foraging, their species composition, their spatial distribution, their vertical migration behaviour, and their connections with environmental factors such as temperature, currents, phytoplankton and zooplankton. We will synthesise all of the information gathered, and relate it to albacore tuna behaviour.

Scientists from different disciplines within SPC and IRD[1] are working together on New Caledonia's pelagic ecosystem. Because the work must be done within an easily workable spatial area, this work will later apply to the rest of the Pacific, particularly to southern countries where albacore tunas are abundant.

SPC Secretariat of the Pacific Community

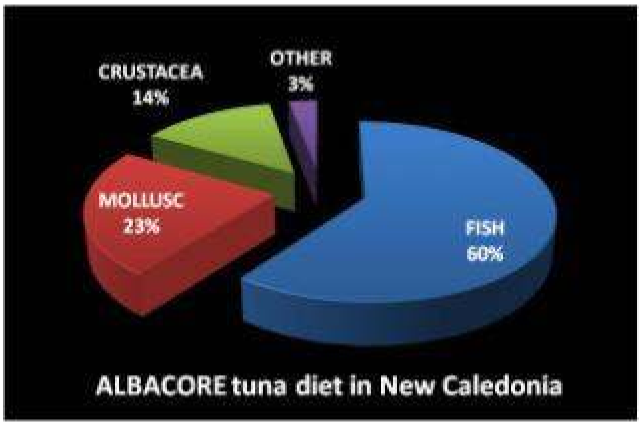
IRD Institut de recherche pour le développement

In the coming three years we will develop several activities:

- Albacore tuna tagging: To gain additional information on albacore tuna behaviour, about 30 pop-up satellite tags will be attached to adult albacore. This activity will provide important information on tuna movements, particularly their vertical behaviour (e.g. when and to what

[1] IRD: Institut de Recherche pour le Developpement is the French Institute of Research for Development. One of its offices is located in Noumea, New Caledonia, next door to SPC headquarters.

depth are dive). We will then be able to relate this information to our new knowledge on forage distribution, and determine when and where tuna are feeding.



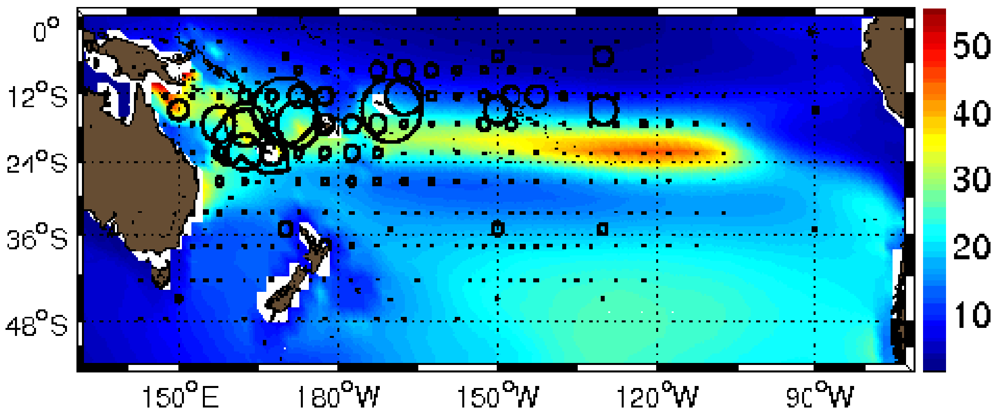
Preliminary results on the composition of the diet of Albacore tuna caught on longline in New Caledonia EEZ.

- Albacore tuna diet: Our collaboration with the New Caledonia observer programme will allow us to collect more tuna stomachs in order to increase the information we have been gathering in recent years. At the end of the project we will be able to fully describe the diet of this species, and identify its preferred prey.

- Micronekton and zooplankton acoustic observations: We will analyse existing acoustic data that were collected by the scientific boat over many years in New Caledonia. Originally, those acoustic data were used to study ocean currents; however, we will develop a new data analysis method to deduce from this acoustic signal information, the spatial distribution and quantity of zooplankton and micronekton.

- Scientific cruise: We are planning two scientific cruises to collect new information on water characteristics (i.e. temperature, currents, oxygen, chemicals, phytoplankton), and on zooplankton and micronekton, which will be sampled with nets, and which acoustic signals will be recorded.

- Modelling: Existing and new information will be used for analyses and improvement of models that describe phytoplankton development, zooplankton, micronekton and tuna behaviour.



Ecosystem modelling results showing the average predicted quantity of albacore tuna (kg/km^2). Black circles represent observed catches by the region's fisheries. Model OPA-OMS/PISCES/SEAPODYM developed by SPC and IRD.

It is a very ambitious programme that has already acquired the support of several donor agencies, particularly ZONECO, which is the sustainable management of marine resources within New Caledonia's EEZ. The tagging of albacore, and studies on their diet, have started in March 2010. Acoustic analyses will begin shortly afterward, while the cruises, if approved, will be organised in 2011. Synthesising the information and modelling work will be the final step of this project.

ZoNéCo
PROGRAMME D'ÉVALUATION DES RESSOURCES MARINES DE LA ZONE ÉCONOMIQUE DE NOUVELLE-CALÉDONIE

TRAINING PORT SAMPLERS TO USE THE FATMETER ON ALBACORE TUNA

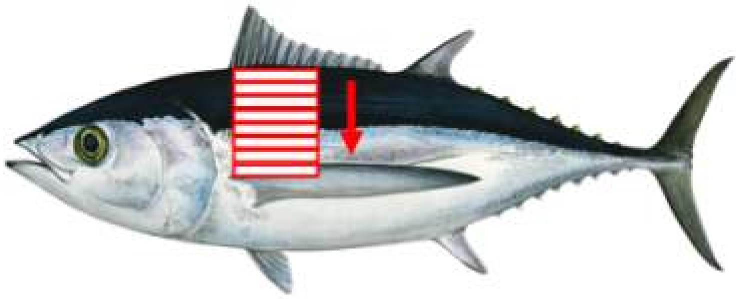

The fatmeter being calibrated

In collaboration with AFFMAR[2]. a new project has been launched to record the fat content of albacore tunas (*Thunnus alalunga*) as they are landed in the commercial fishing port in Noumea, New Caledonia. This study is being undertaken by two port samplers: Marthe Tokyo and Rose Waia, who use an electronic device called a fatmeter (see previous issue #13).

Since 2007, this method has been used on almost 3,000 fish during tagging activities, and has proven successful in determining the fat content of fish. In order for Marthe and Rose to become familiar with using the fatmeter, a training session was held in SPC's laboratory under the supervision of Dr. Valerie Allain and New Caledonian observer and port sampler coordinator Hugues Gossuin.

Training consisted of learning how to calibrate the fatmeter and how to use it on fish. It is very important to follow standard procedures to ensure reliability of data. Marthe and Rose work in a team to ensure the exercise is accurately carried out. Below is a brief description of the protocol.

1. The species of interest is selected, in this case albacore.
2. The instrument is calibrated using a checking pad (see picture above).
3. The head of the fatmeter is placed firmly against the flank of the fish and eight measurements are taken (see figure at right) from underneath the dorsal fin towards the pectoral fin.
4. Finally, the fatmeter provides an average of these measurements, which is noted by one of the observers and is stored within the device.



Above: Areas where successive measurements are taken.

Left: The fatmeter team, left to right, Rose, Hugues, Marthe, Valerie and a guinea-pig albacore tuna.

Marthe and Rose will use the fatmeter in Noumea's port beginning in April 2010 to try and obtain monthly data to monitor the albacore fat content throughout the year.

[2] AFFMAR: Affaires Maritimes. Maritime Affairs Department of New Caledonia

Next newsletter in July 2010

We welcome your comments on the content of this newsletter — please send them to Valérie Allain (valeriea@spc.int), Caroline Sanchez (carolines@spc.int), Cyndie Dupoux (cyndied@spc.int), or Malo Hosken (maloh@spc.int).