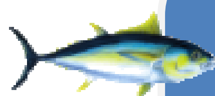
Biological Sampling Newsletter

for Observers and Port Samplers

SPC-OFP Ecosystem Monitoring and Analysis Section*

Issue #13 — 15 January 2010

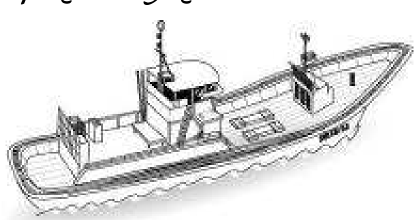


Welcome

to the thirteenth 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 present the new database BioDaSys, information about one prey commonly found in stomachs and how to identify it, as well as updates on trophic dynamic studies – with a workshop on comparison of top predator diets and measurement of fat percentages in fish muscle. You'll also find a profile of Fisheries Information and Technology Officer Sylvain Caillot, who recently joined our growing team. You will also learn about biological sampling training that has been done in Fiji Islands, Federated States of Micronesia (FSM) and Palau.

We hope you enjoy this new issue!



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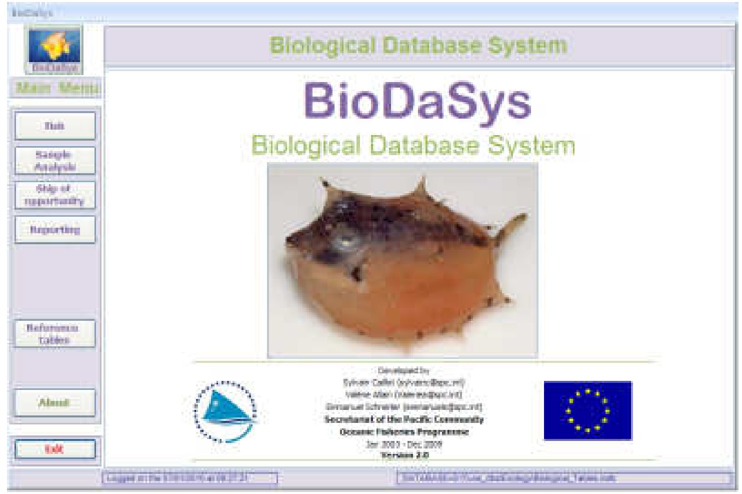
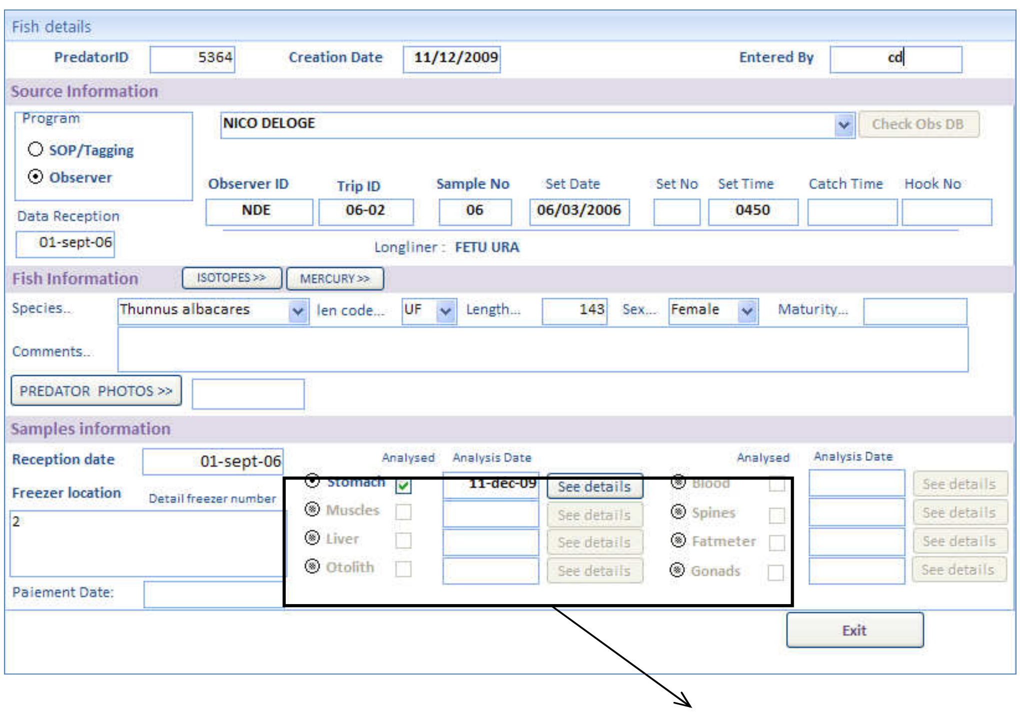
BIODASYS: A NEW DATABASE

Sylvain Caillot, our Fisheries Information and Technology Officer, has been busy improving on the old Stomach Data Manager (S'DANGER) database. The result is the new Biological Database System (BioDaSys). Biological data can be entered into this system more rapidly and they are now automatically validated, resulting in even higher quality control of data-entry!



BioDaSys is linked to multiple distant databases. It ensures consistency between other OFP databases such as TagDager and Observer. Therefore, data from all OFP Section projects (Stomach Analysis Project, Albacore Tuna Project, Yellowfin and Bigeye Tuna Project) are linked together in a single database.



Now for each predator we can visualise all the samples collected and analysed (stomach, muscles, liver, otoliths, blood, spines, fatmeter or gonads).

Stomach analyses: Preys commonly found

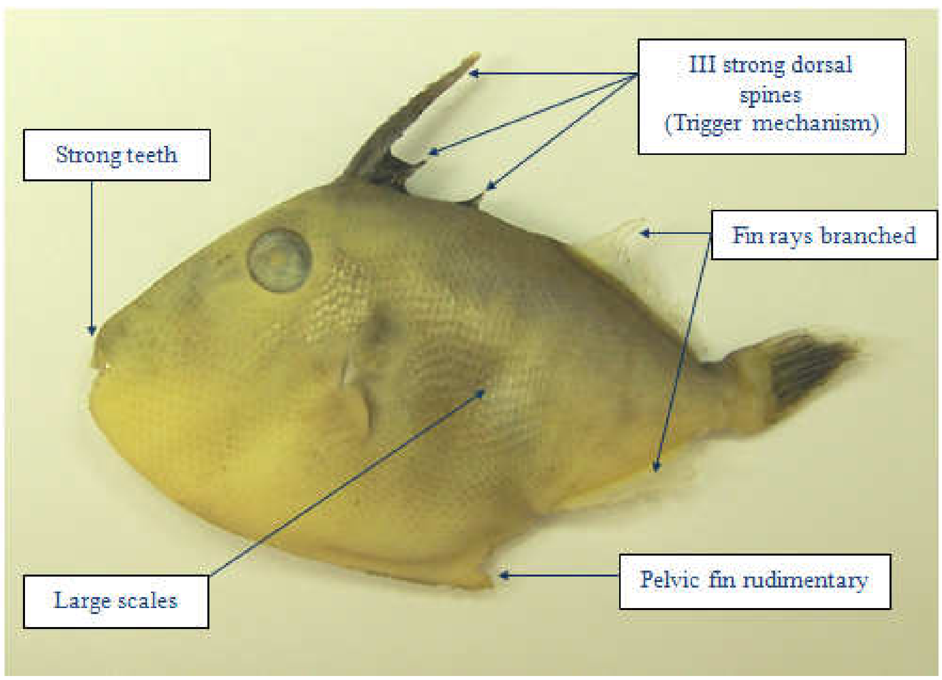
We are going to introduce you in this and coming newsletters to some of the most common species found in tuna stomachs and how our lab technicians identify them.

Balistidae, commonly named triggerfish

The name of the family Balistidae is derived from the Latin *ballista*, which means catapult. Indeed, these fish have a locking mechanism similar to a catapult that consists of the strong first dorsal-fin spine and the slender second spine being raised into an upright position. This mechanism is used to deter predators and may present injury risk during handling. It can be unlocked by applying pressure on the third spine; this is the origin of the common name triggerfish.

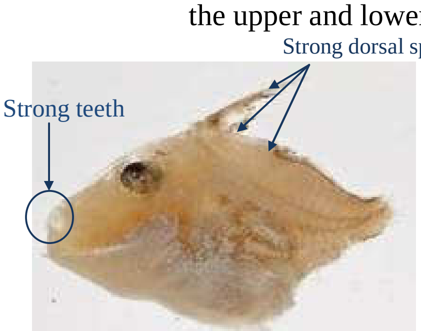
Most triggerfish are good to eat, although large specimens of some species like orange-lined triggerfish, clown triggerfish and titan triggerfish are toxic, and eating them may result in ciguatera poisoning.

The Triggerfish family includes 44 different species, with about 31 species occurring in the Pacific area. The identification characteristics are presented in the following figure.



Juvenile triggerfish found in yellowfin tuna stomach

Besides a particularly recognisable morphology, their body is covered with strong, plate-like scales that provide further protection and a rough texture. Although they have a small mouth, the upper and lower jaws of triggerfish each have eight strong and sharp teeth.



Digested Triggerfish

Stomach analyses reveal that that these fishes are commonly found in yellowfin and skipjack tuna, mahi-mahi and wahoo stomachs.

To identify triggerfish, the most useful characteristics are the three dorsal spines and the eight strong teeth. These characteristics are also used to differentiate triggerfish from other similar looking fish such as filefishes (family Monacanthidae). Even if the digestive process is advanced, these structures still remain.

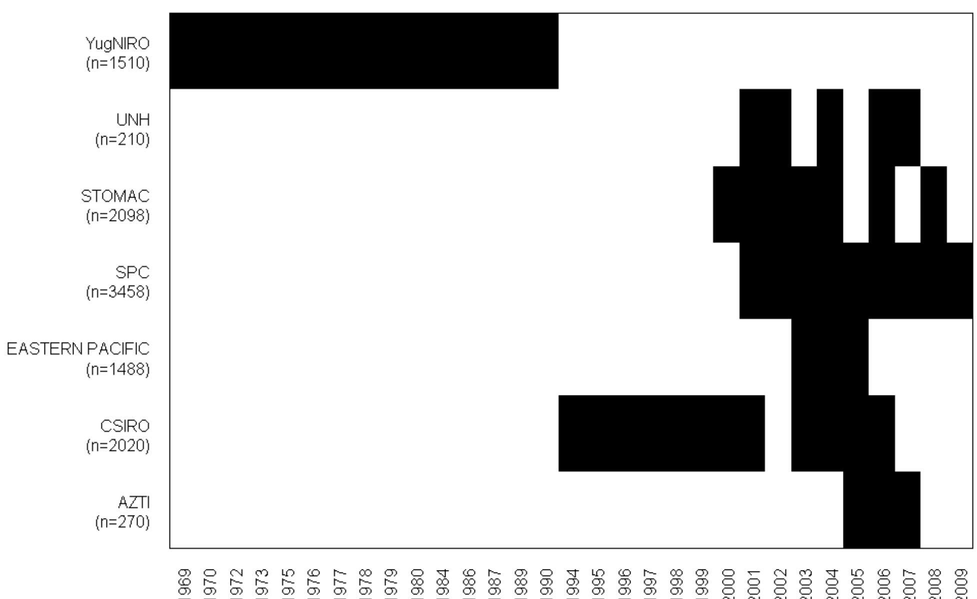
WORLDWIDE TUNA DIET STUDIES: SPC IS A MAJOR PARTNER

In October 2009 Valerie Allain from SPC-OFP-EMA attended an important workshop on tuna diet in Sète, France. This meeting brought together 14 scientists from research institutes in France, Australia, USA, and Spain, and from 2 Pacific regional organisations: SPC and the Inter-American Tropical Tuna Commission (IATTC).

The group of international tuna diet experts meeting in France in October 2009.

The workshop was entitled 'Feeding in tunas – a global comparison', and the aim of the meeting was to answer this question: **Can a comparison of top predator diets within and between the Pacific, Indian and Atlantic Oceans lead to an understanding of the effects of ocean warming in these predator communities?**

This workshop was a first in that it gathered seven datasets of diet studies on tuna and other pelagic top predators covering the three oceans to prepare a large-scale analysis for identifying differences between oceans and regions. Data came from two studies in the Indian Ocean (one of which also covered the Atlantic Ocean), one from the eastern Pacific Ocean (IATTC), two from the western Pacific Ocean (including SPC), and two from the Atlantic Ocean. These data were collected between 1969 and 2009. SPC's dataset was the largest in terms of number of samples collected and analysed, with nearly 3500 fish analysed after being collected by observer programmes and tagging operations. It also covers a very large spatial area and has been operating continuously since 2001.



Total number of stomachs collected by project and years of collection.

YugNIRO = historical Russian dataset (Indian)
UNH = University of New Hampshire (Atlantic)
STOMAC = France (Indian and Atlantic)
SPC = SPC (Pacific)
Eastern Pacific = IATTC (Pacific)
CSIRO = Australia (Pacific)
AZTI = Spain (Atlantic)

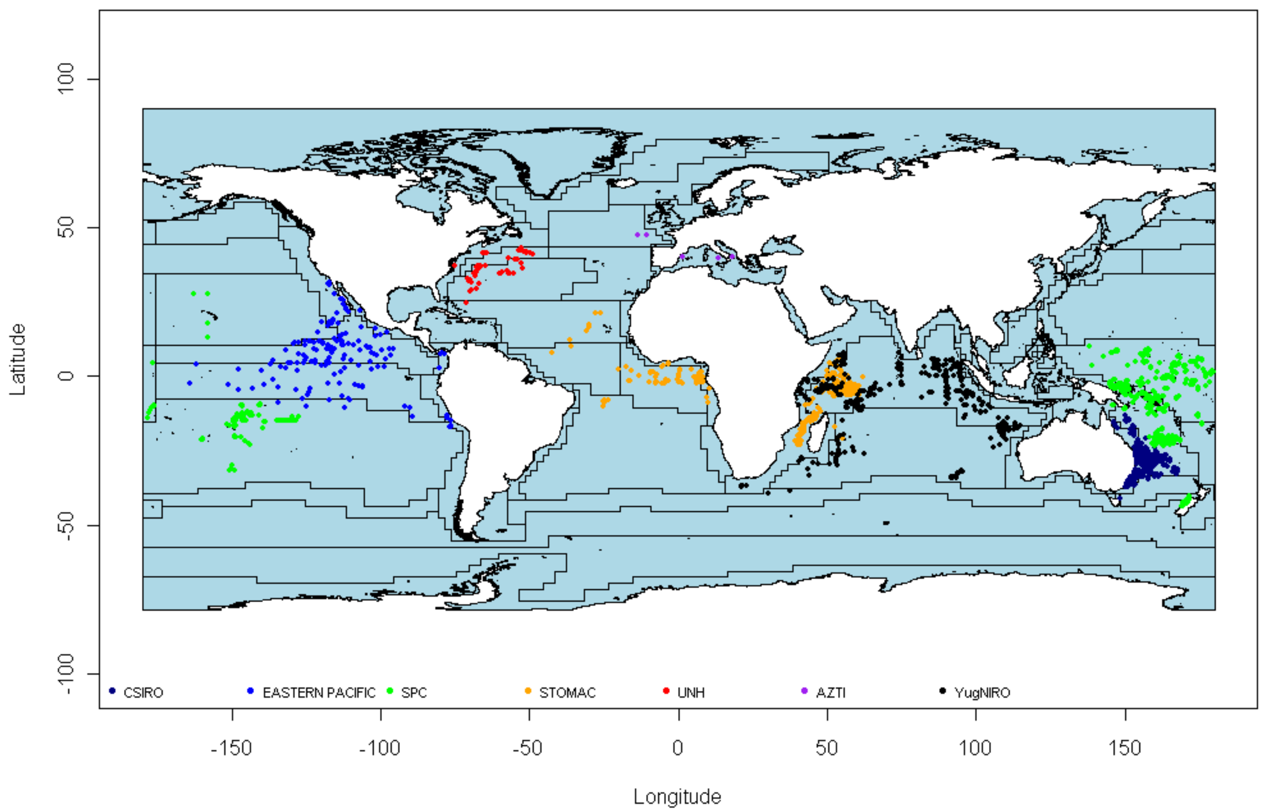
The study focused on eight species: yellowfin, bigeye, skipjack and albacore tunas; swordfish; lancetfish and mahi-mahi, and gathered a total of approximately 20,000 fish. The first objective of the workshop was to complete the assimilation and checking of data from the stomach contents data sets begun prior to the start of the workshop. This objective continued as a major focus of the workshop and a lot of issues on data standardisation were discussed and solved.

Initial examination of the database revealed a prey species list of approximately 600 taxa from approximately 300 families. Using these data, our major objective was to examine the relationship between latitude and prey composition. However, other environmental, physical and sampling variables were included in our analysis, such as Longhurst province, year of collection, sea surface temperature, predator species, predator length and fishing gear.

The results from the overall comparison identified Longhurst zone (that is the fishing area) followed by predator species and fishing gear (linked to fishing depth) as the major factors explaining differences in the diet composition of the top predators.

This work is still in progress and more analysis will be conducted during 2010 to try to improve our understanding of trophic relationships in the pelagic ecosystems.

Longhurst provinces: Based on values and variability of parameters such as temperature, water masses, circulation, wind, nutrients, primary production, and ecosystem functioning, Longhurst divided the oceans into biogeographic provinces characterised by specific ecosystems (see Figure).



Stomach sample positions in relation to ocean and to Longhurst biogeographic zones (see box). See previous figure for the definition of the dataset names.

FAT FISH, HEALTHY FISH?

In 2007 SPC acquired a fish fatmeter. This is an electronic device that allows determination of fat percentages in fish muscle simply by placing the device in contact with the fish's skin and pressing a button. If the device has been calibrated for the species being tested, the fat content is then instantly displayed on the instrument's digital readout and saved in its memory, which can be downloaded to a computer.

Based on the hypothesis that fat content is a good gauge of the heath of fish (fat fish being healthier than skinny fish), we took the opportunity provided by the tagging cruises to test fish in different areas of the Pacific. The goal is to establish if some areas are favourable for fish because they provide a greater food supply, leading to fatter tuna. It is also an opportunity to test if high densities of fish aggregating devices (FADs) could have a negative impact on the health of tuna. It has been hypothesised that tuna could stay around FADs even if the feeding conditions are not favourable; in this case the tuna would be skinnier and in worse condition, and this could be detected using the fatmeter.

Thomas Usu from NFA, Papua New Guinea measuring the fat content of yellofin tuna onboard the tagging vessel in western Pacific

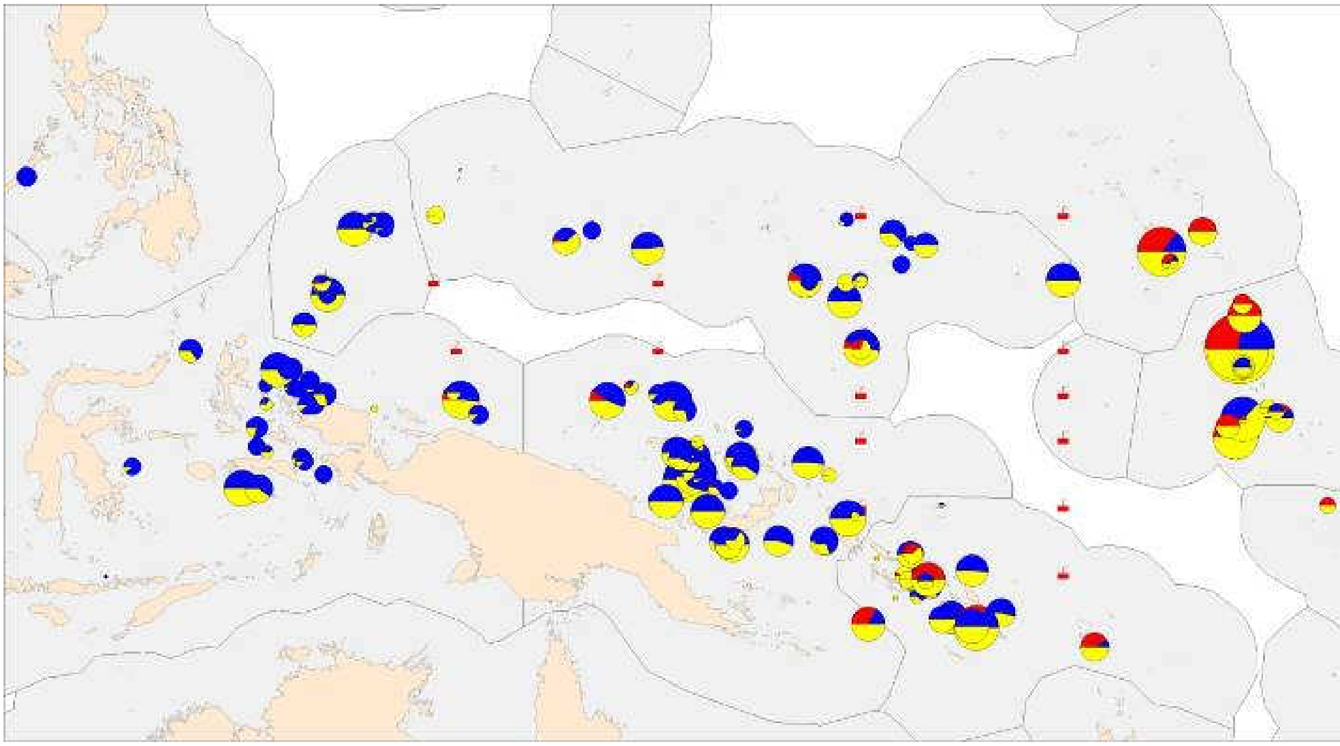
Species	Number of fatmeter measurements
Frigate tuna	1
Bigeye	86
Skipjack	1503
Yellowfin	1062
Albacore	147
Grand Total	2799

Since the acquisition of the fatmeter we have measured the fat content of a total of 2799 fish. Most of them were skipjack and yellowfin tuna.

The device has not yet been calibrated for skipjack. We are in the process of conducting the skipjack calibration with a colleague from Australia and with the financial support of an Environmental Small Grant from the US Embassy in Fiji (US Department of State). The project started in Ocober 2009 and SPC lab technicians prepared fish samples that were sent to Australia for lab lipid analysis.

In the lab the flesh of the fish will be processed using chemical procedures to determine the total lipid content. Between 50 and 100 samples will be analysed in early 2010 to allow the calibration of the fatmeter for skipjack. Then it will be possible to proceed with the data analysis on the information already gathered.

Preparation of skipjack fillet for lab chemical lipid analysis



Distribution of fatmeter measurements in the western Pacific (red = bigeye, yellow = yellowfin, blue = skipjack; red flags = Tropical Atmosphere Ocean [TAO] meteorological buoys). Albacore tuna were measured in New Zealand waters (not shown).

THE NEW FISHERIES INFORMATION AND TECHNOLOGY OFFICER: SYLVAIN CAILLOT

Sylvain is from France and has a master's degree in geophysics and a master's degree in computerisation applied to earth sciences. After starting his career as a geographic information system (GIS) analyst and a geologist in France and Belgium, he worked for two years in Cape Town (South Africa) for the national Marine and Coastal Management agency with France's IRD (Institut de recherche pour le développement) as a GIS and database engineer. He then worked for three and a half years for FAO (UN Food and Agriculture Organisation) in Rome as an information officer in charge of IT projects in geomatics, Web publication and data collection.

Sylvain has been working for one year at SPC as a Fisheries Information and Technology Officer. He is in charge of the different IT development projects for the section (GIS, Web dissemination, database) and works more specifically on the tagging database. His most recent work concerning biological sampling has been to migrate the S'Danger stomach database to a more comprehensive database (BioDaSys) in order to include other biological samples and to make it more ergonomic and more reliable in terms of data quality.

BIOLOGICAL SAMPLING TRAINING: FIJI, FSM, PALAU

Training in identifying and collecting biological samples has been undertaken during the observer workshop in Fiji in November 2009. The observers gained a better understanding of scientific use of biological samples and the purpose of the different projects.

Thirteen observers had the chance to practice otolith extraction and collection of stomach, muscles and liver. They showed great skills and all of them passed the final test! When they master their observer's skills they will be ready to start sampling.

Training in biological sampling on a skipjack

Stomach/muscle/liver samples

Fiji Observers proud to extract their first otoliths!

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Otoliths extraction with cutters

For the Albacore Project, a graduated in Marine Science from the University of South Pacific, Ravikash Lal, is now collaborating with us; he has already collected 90 otoliths and gonads with the cooperation of the fishing company Solander.

Training has also been undertaken in Pohnpei (FSM) and Koror (Palau). Caroline Sanchez organised a special biological sampling training session for the pilot study on the biology of bigeye and yellowfin tunas. She trained observers as well as observer coordinators, port samplers and private individuals. She is coordinating sampling with Steve Retalmai from FSM and Kathy Sisior and Ian Trevet from Palau.

Training in Pohnpei, FSM

Training in Koror, Palau

For this project a total of 300 biological samples will been needed. On board longliners, the fish are tagged around the tail with a special label, the stomach, muscle, liver and gonad samples are collected, and when the fish get to the processing plant the otoliths are extracted.

Observer sampling at the processing plant

This operation requires good logistic coordination between observers and the observer coordinator. The observers are asked to show great skills in sampling but also in communication with their coordinator.

Label placed around the tail of fish

Next newsletter in April 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), or Cyndie Dupoux (cyndied@spc.int).