Biological Sampling Newsletter

for Observers and Port Samplers

SPC-OFP Ecosystem Monitoring and Analysis Section*

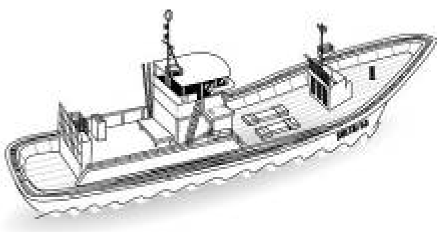
Issue #15 — 15 July 2010

Welcome

to the 15th 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) describe a shark sampling programme; 2) look at a commonly found prey item in tuna stomachs and how to identify it; 3) welcome new staff; 4) report on observer trainings and tag recoveries; 5) provide an update on the albacore project for which 2010 tagging cruises have started; 6) present results for the bigeye/yellowfin project; and 7) keep you informed on the stomach sampling project.

We hope you enjoy this issue!



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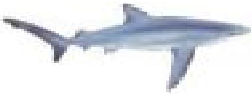
Contacts: Valérie Allain (valeriea@spc.int); Caroline Sanchez (carolines@spc.int) and Malo Hosken (maloh@spc.int)



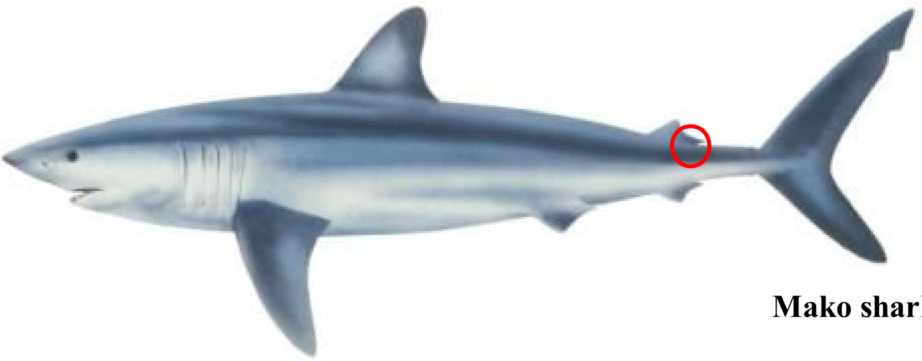
Blue and Mako Sharks: Genetic Sampling

Heather McMillan is working with the Aberdeen University Shark Genetics Group in Scotland. Her PhD project aims to develop a genetic marker that determines the health and status of shark stocks in a fisheries context. By using this marker, the overall genetic diversity of a population will help give an indication of the influences of fishing on shark stocks. The focal species are blue sharks and mako sharks — as these sharks constitute some of highest instances of bycatch — as well as target fisheries globally.

Charles Cuewapuru, a New Caledonian observer, will be sampling these sharks when he is onboard local fishing vessels where sometimes fishermen land sharks for their fins. The sampling protocol consists of taking a 'fin clip', a small (< 1.5 cm) piece of tissue from a shark's secondary dorsal fin (circled red in figures below). The sampled tissue is then placed in a tube containing a non-toxic tissue preservative called RNAlater®. This solution is designed to stabilise tissues for RNA and DNA extractions. However, if this solution is not available, 70% or 95% ethanol can also be used. If you would like to take part in this project, feel free to contact Heather who will gladly send you a detailed protocol and some sampling tubes containing the RNAlater® solution.

Heather's contact details are:
h.a.mcmillan@abdn.ac.uk

Blue shark (*Prionace glauca)*



Mako shark (*Isurus oxyrinchus)*

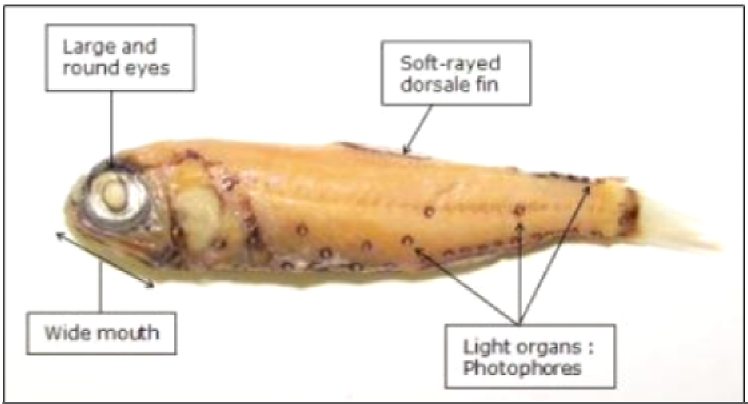
STOMACH ANALYSES: PREY COMMONLY FOUND

As in previous issues, we present some common prey species found in tuna stomachs and how our laboratory technicians identify them.

Myctophidae: A commonly known as lanternfish

Myctophids are among the most abundant group of mesopelagic fishes[1] in the world. They range from the Arctic to the Antarctic and can be found from surface waters down to depths exceeding 2,000 m. The majority of myctophids live in open oceanic waters but some species are found near continental slopes and islands where they form a component of coral reef communities. Most are meso- and bathypelagic[2] during the day, living in depths of 300–1,200 m, and migrating vertically to feed in the upper 100 m at night.

Myctophids are a major food source, and are preyed upon by many fishes such as tunas (particularly bigeye), marine mammals and even seabirds.

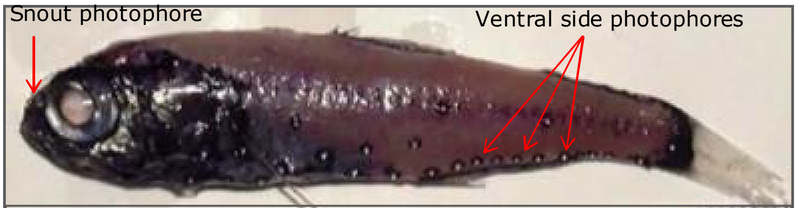


Well conserved specimen of *Benthosema* sp. (Myctophidae) found in a tuna stomach.

The Myctophidae family contains between 230 and 250 species. These fish are not large — the biggest species reaches 30 cm — with most growing to less than 12.5 cm. To identify them, the noteworthy characteristic is the presence of light organs, called photophores, which form the "lanterns" of these fishes. This bioluminescence along the body camouflages a fish from predators by breaking up its shape. Each species has a unique photophore pattern that is used for species identification.

Other useful characteristics are their large and round eyes, a wide mouth that gapes back beyond the eyes, one soft-rayed dorsal fin situated over or in front of the anal fin, and a deeply forked tail. The most similar families are Engraulidae (anchovies), some Sternoptychidae (Genus: *Maurolicus*) (pearlsides), Chiasmodontidae (swallowers) and Gonostomatidae (bristlemouths), but the above mentioned characteristics are enough to distinguish them.

These fishes have economic potential; in fact, the global myctophid biomass is estimated to be around 600 million tonnes. While few specimens are currently considered palatable, with the worldwide decline in traditional marine fisheries, this family is an obvious potential for increased exploitation as fishmeal and fish oil (used in aquaculture).



Top: A 6 cm long specimen of *Benthosema* sp. caught by a pelagic trawler in New Caledonia's EEZ.

These fishes play a pivotal role in oceanic energy dynamics, and overfishing of them could have dire consequences.

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[1] Mesopelagic fishes live in the mesopelagic zone of the open ocean in depths between 200 m and 1,000 m.
[2] Bathypelagic fish live in depths of between 1,000–4,000 m, but well off the sea bottom.

STAFF NEWS

In April, we had the pleasure of welcoming a new intern, Emilie Fernandez. Emilie is from France and is working with SPC's Ecosystem Monitoring and Analysis Section (under Valerie Allain) on a six-month (until October) student internship as part of her Master's degree. She is studying the importance of reef-based prey in the diet of the tuna. The first part of her study consists of identifying the stomach contents of samples that you have been sending us, before carrying out a spatial-temporal analysis of the data. The objective is to obtain ecosystem data on Pacific tuna, the primary marine resource of the island states. In Emilie's first year as a Master's student, she specialised in tropical fisheries and aquaculture in order to work in tropical areas when she graduates. She conducted her previous internship on the black lip pearl oyster *Pinctada margaritifera* at IFREMER[3] in Tahiti (French Polynesia). The aim of this programme was to acquire more genetic data on the pearl oyster in order to improve the quality of the pearl and improve French Polynesia's pearl oyster sector.

Malo Hosken has been working since June as a research assistant within the Ecosystem Monitoring and Analysis Section. His previous involvement in the Section was in the laboratory, analysing stomach contents. Malo coordinates the shipment of biological samples collected throughout the Pacific to SPC in Noumea. He also assists the fisheries technician and provides support to the scientists implementing the Albacore and Bigeye/Yellowfin projects. (Malo can be contacted about the collection of biological samples at: maloh@spc.int.) Malo is from New Caledonia where he has returned after an eight-year stay in Australia. He is passionate about the Pacific Ocean and its people, whoom he looks forward to getting to know better. Malo will participate in one of the tagging cruises in Tonga in July.

Caroline Sanchez moved from the position of Research Assistant to Fisheries Technician, and replaces Brian Kumasi. She continues to provide training in biological sampling to different observers during observer workshops, but is now more involved with the tagging programme. She coordinates tag recoveries with the different tag recovery officers as well as the tag seeding programme with observer coordinators.

[3] Institut Français de Recherche et d'Exploitation de la Mer: French Institute on Research and Exploitation of the Sea

BIOLOGICAL SAMPLING TRAINING

Since January 2010, Caroline Sanchez has been providing observer training in the Solomon Islands, Cook Islands and Marshall Islands. Training consists of identifying and collecting biological samples from tunas.

In the Solomon Islands, general presentations were held at the National Archival Building and practical sessions at the new fisheries building in Honiara.

First row: Paul Anisi, Jimmy Belade, John Still Villi, Joe Maesimae, Frederic Austin. Second row: Caroline Sanchez, Derick Suimae, Walter Marau Mapolu, Jack Christopher, Frazer Riogano. Third row: Wilson Tommy Huka, Ivan Sesebo, Bernard Fiubala, Mark Seda, Nigel Mamutu, Back row; Patson OMI, Christine Rex Maebiru, Augustine K.Moama, Roy Murdoch.

In February and March, trainings were held at the Marshall Islands Marine Resources Authority in Majuro.

A special training in collecting albacore otoliths was provided to Cook Islands' fisheries staff in February.

Pamela Mauru finds her first otoliths.

Andrew and Jason master their skills.

TAGGING PROGRAMME: NEW TAG OFFICER / VISIT TO KIRITIMATI

Since the end of May, Tikarerei Mwea, officer in charge of the fisheries department, has been acting as a new Tag Recovery Officer in Kiritimati (Christmas Island, Kiribati). In response to the increased level of fishing and transshipment in this area, Caroline visited the fisheries department and implemented procedures for tag recoveries.

Tikarerei Mwea and Caroline Sanchez.

Caroline also took the opportunity to retrieve tags and increase awareness in tag recovery with local fishermen, and crew members of purse seiners and carriers.

The carrier *Salica Frigo*

The purse seiner *Albatun Tres*

ALBACORE RESEARCH UPDATE

The South Pacific Albacore Tagging Project began in 2009 with the overall objective of obtaining better estimates of exploitation rates, movement patterns, and growth rates, and to validate age estimates for South Pacific albacore.

Albacore tagging in 2010 is well underway with cruises already completed in New Caledonia and New Zealand. One of the objectives of these cruises is to deploy mini pop-up archival tags (miniPSATs), which are small enough to deploy on large albacore (~ 20 kg). During the tagging trip in New Zealand, 92 albacore were conventionally tagged (Fig. 1) and five were tagged with miniPATs (Fig. 2).

Unfortunately, no tags were deployed during the tagging trip in New Caledonia. Few fish were caught and those that were, were not in suitable condition to allow tagging. Another cruise in New Caledonia began in late June. We hope that winter conditions will allow for better catch rates from this cruise. Cruises in Tonga began in July and will be ongoing until September.

Since January 2009, 852 albacore tuna have been sampled, mainly for otoliths and gonads (Table 1). Other biological samples taken include stomach, muscle, liver, dorsal spine and blood. In total, 762 fish were caught using longline gear; other gear types include trolling (84), purse seine (3), and handline (1). The map on the following page (Fig. 3) shows the sampling area (rectangles 1–25) and where samples were collected from (red points).

We warmly thank all the observers for their continuous support in collecting biological samples, which allows us to better understand the ecology and biology of albacore tunas.

Figure 1: Albacore tuna tagged with a yellow conventional tag

Table 1: Number of otoliths and gonads sampled from each cell number in the grid below.

Cell	Number of otoliths	Number of gonads
2	3	1
7	159	155
8	58	39
9	60	60
11	29	30
12	254	254
14	116	114
17	53	54
22	82	83
Total	**814**	**790**

Figure 2: A miniPSAT fitted on an albacore tuna to test tag attachment. Two anchors hold the tag. Before placing it on the fish, it is programmed to self detach after a programmed time and/or depth. Data are transferred to satellite when the tag pops up.

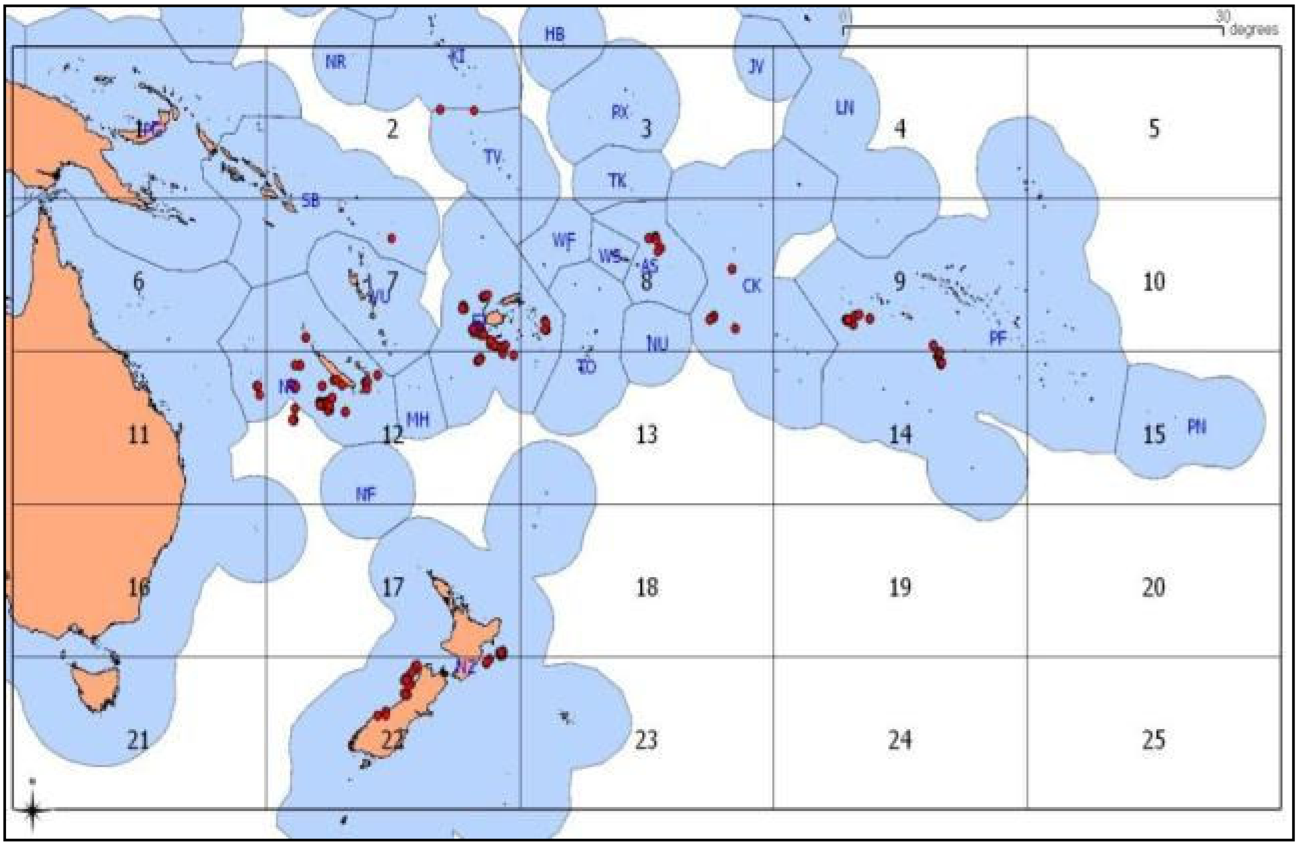


Figure 3: Spatial distribution of biological samples collected from albacore tunas.

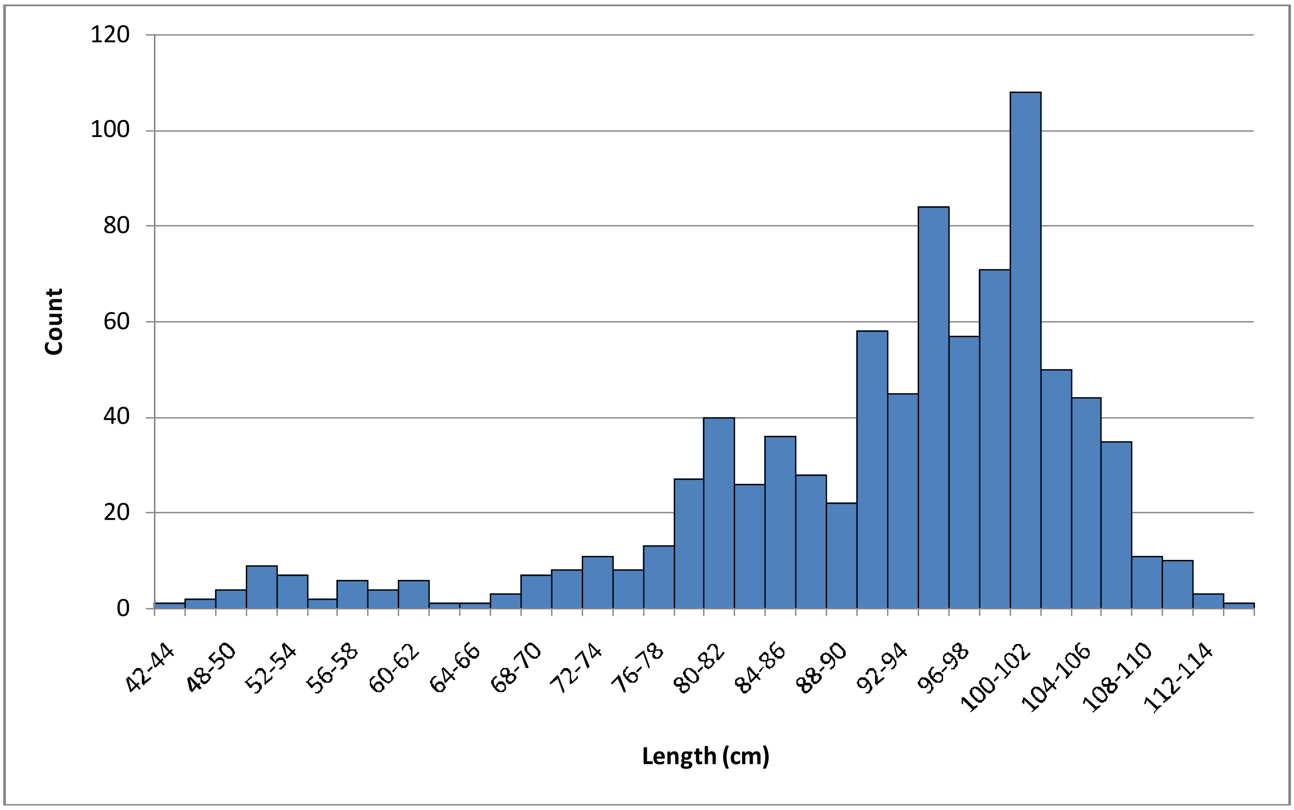


Figure 4: Length frequencies for albacore.

Albacore tunas caught during tagging trips in New Zealand ranged in length from 43–75 cm. Tunas sampled in American Samoa, Cook Islands, Fiji, French Polynesia, New Caledonia, New Zealand and Solomon Islands ranged in length from 76–90 cm. Fish caught in American Samoa, Cook Islands, Fiji, French Polynesia, Kiribati, New Zealand, New Caledonia and Tuvalu ranged in length from 91–114 cm (Fig. 4).

Bigeye and Yellowfin Research Update

The bigeye and yellowfin research project began in 2009. This is a Western and Central Pacific Fisheries Commission (WCPFC) project aimed at improving the precision of estimates of growth and maturity, which are used in stock assessment models for each species. So far, 283 bigeye and 331 yellowfin tunas have been sampled. Otoliths and gonads were the main biological samples collected although stomach, muscle and liver samples were also collected to assist with the stomach projects. Bigeye otoliths are currently being aged and preliminary results will be presented to the WCPFC's Scientific Committee in August 2010.

To date, 106 bigeye have been caught using purse seine gear, 80 with troll lines, 67 with longline, and 30 by unknown gear. For yellowfin, 211 fish were caught using purse seine, 103 using longline and 17 by unknown gear.

In July 2010, Caroline Sanchez will be in the Federated States of Micronesia (FSM) and Palau working with the fisheries company Luen Thai to set up sampling operations onboard vessels with crew members. An update will be provided in the next newsletter.

Thank you again for your collaboration and help to support this project.

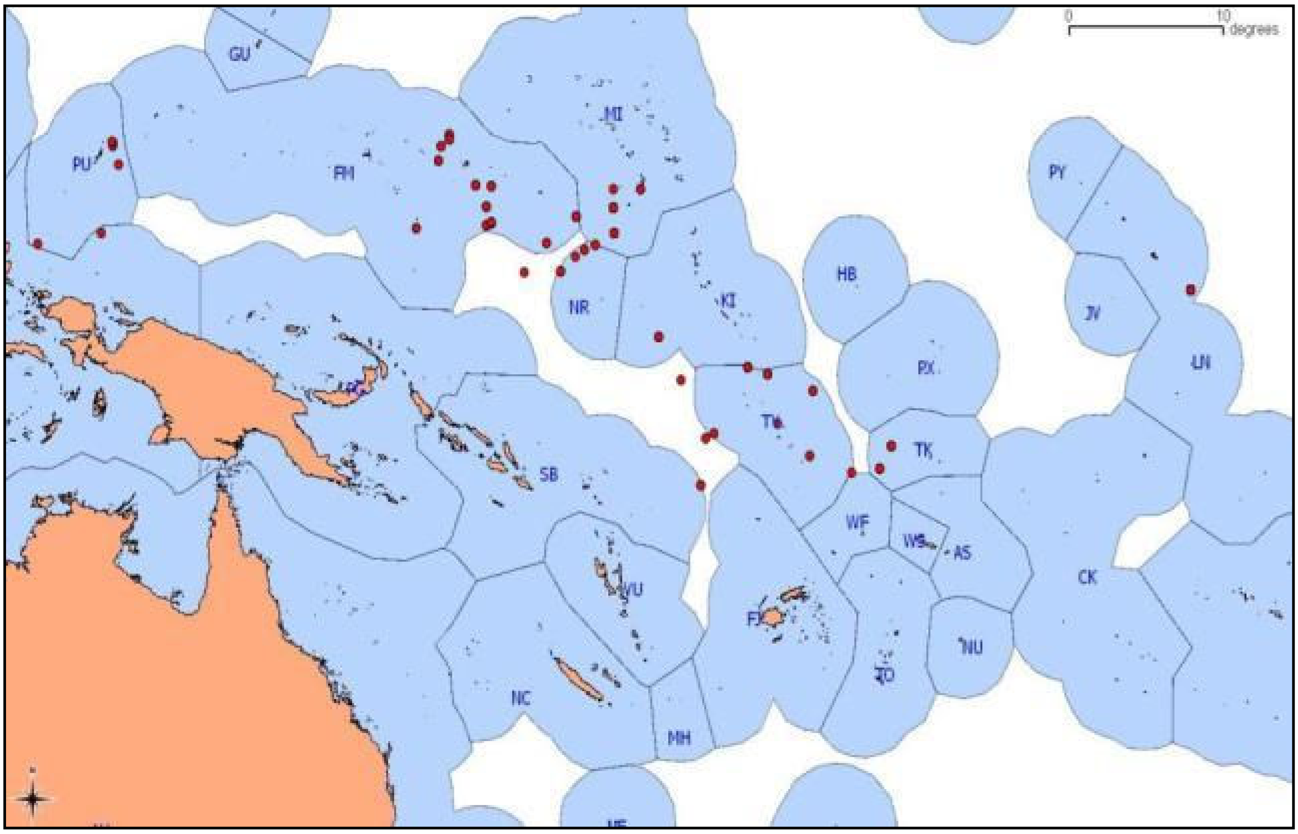
Bigeye: Otoliths and gonads collected

Country - EEZ	Number of otoliths	Number of gonads
FSM	58	20
International waters	15	4
Kiribati	21	5
Marshall Islands	47	17
Nauru	10	10
Palau	2	7
Solomon Islands	0	3
Tokelau	2	14
Tuvalu	0	24
Total	**155**	**104**

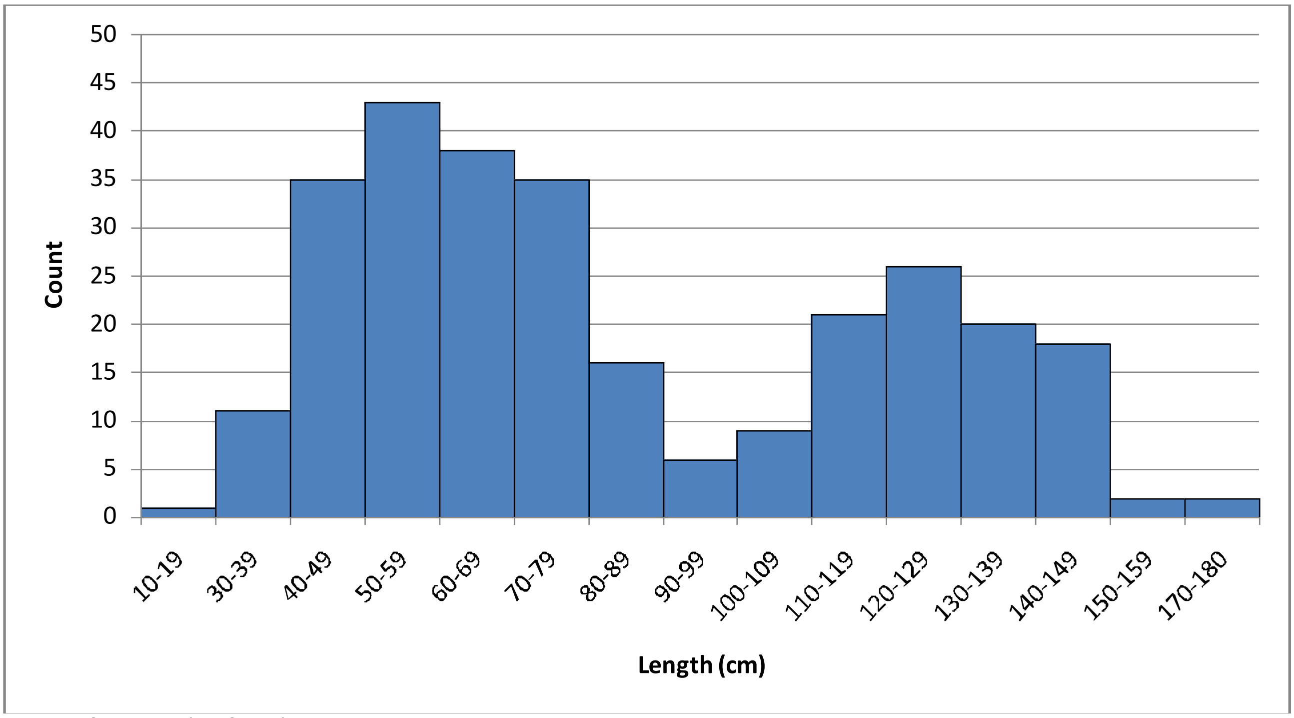
Yellowfin: Otoliths and gonads collected

Country - EEZ	Number of otoliths	Number of gonads
FSM	45	3
Indonesia	4	0
International waters	57	6
Kiribati	41	5
Marshall Islands	38	26
Nauru	58	27
New Caledonia	4	0
Palau	47	3
Solomon Islands	2	2
Tokelau	0	1
Tuvalu	22	24
Total	**318**	**97**

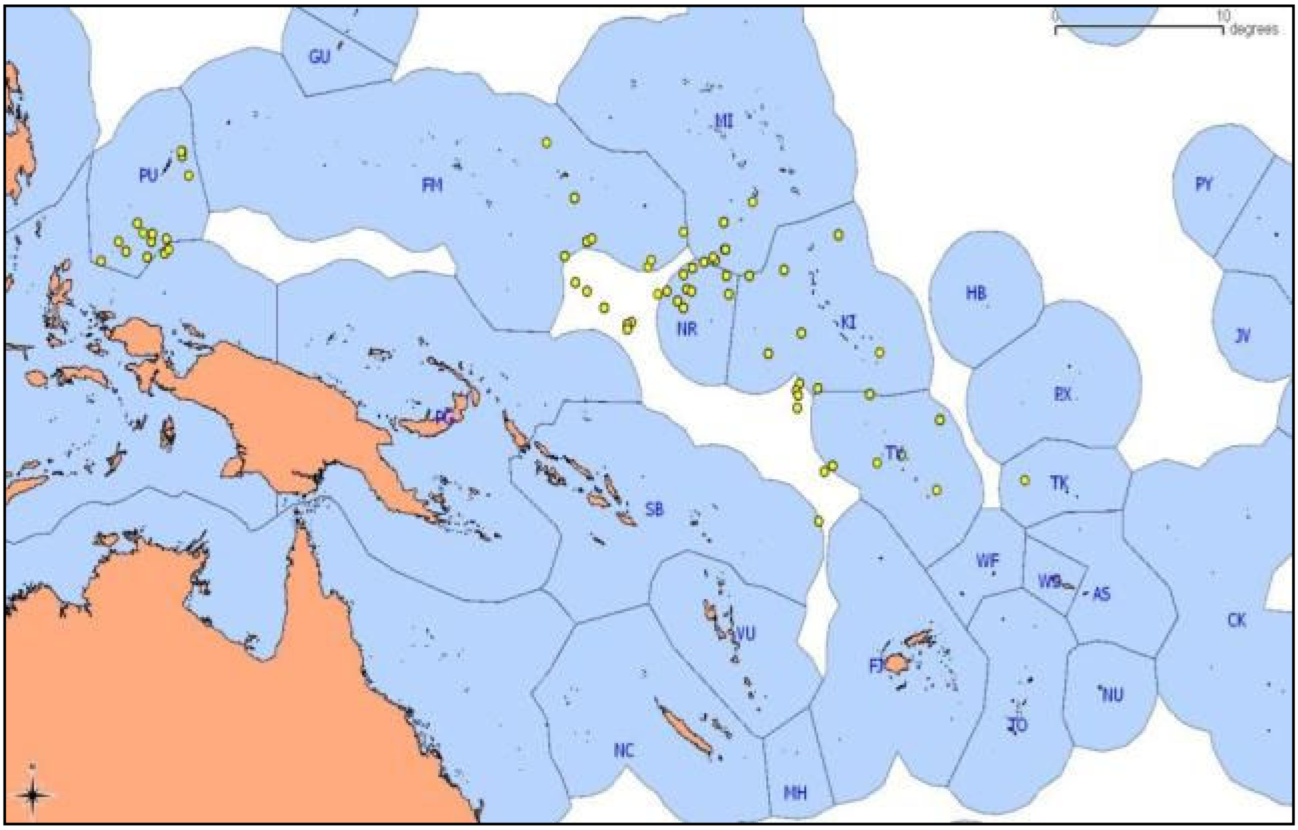
A yellowfin tuna on deck ready to be sampled.



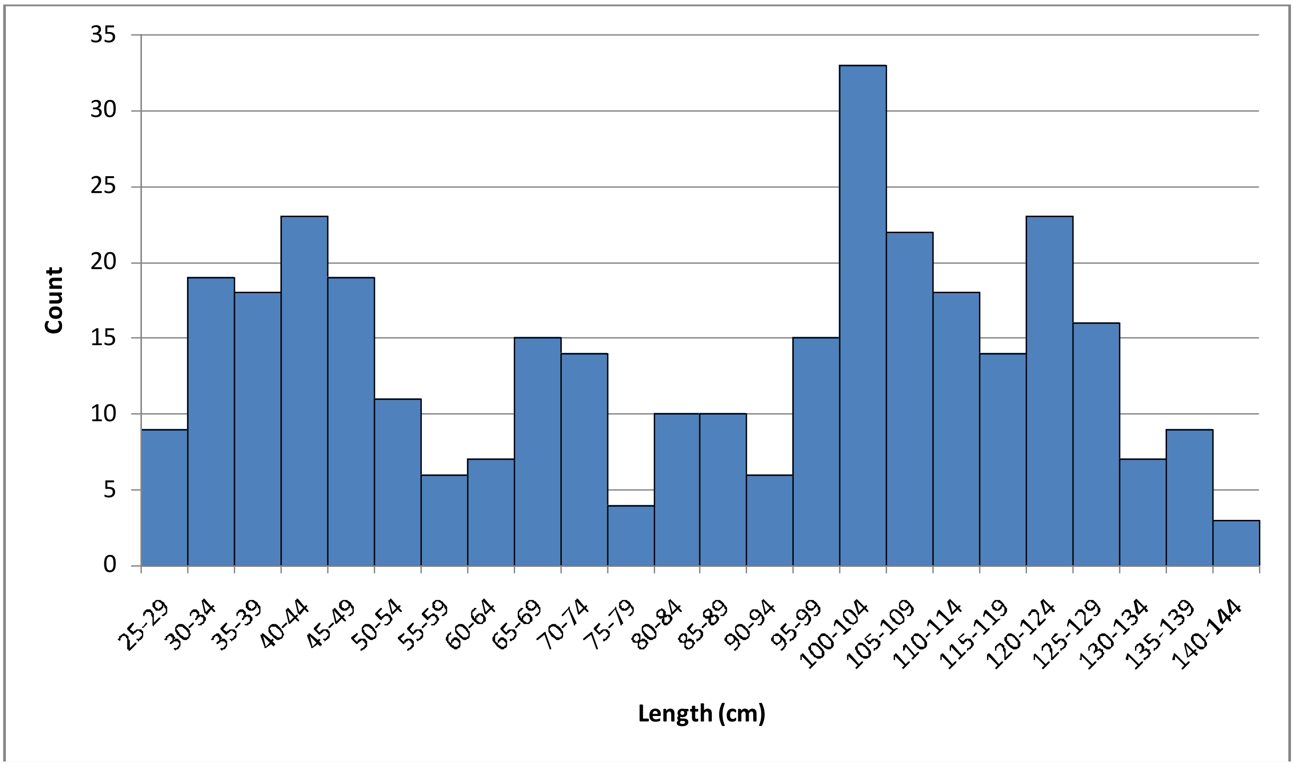
Spatial distribution of biological samples collected from bigeye tunas.



Length frequencies for bigeye tunas.



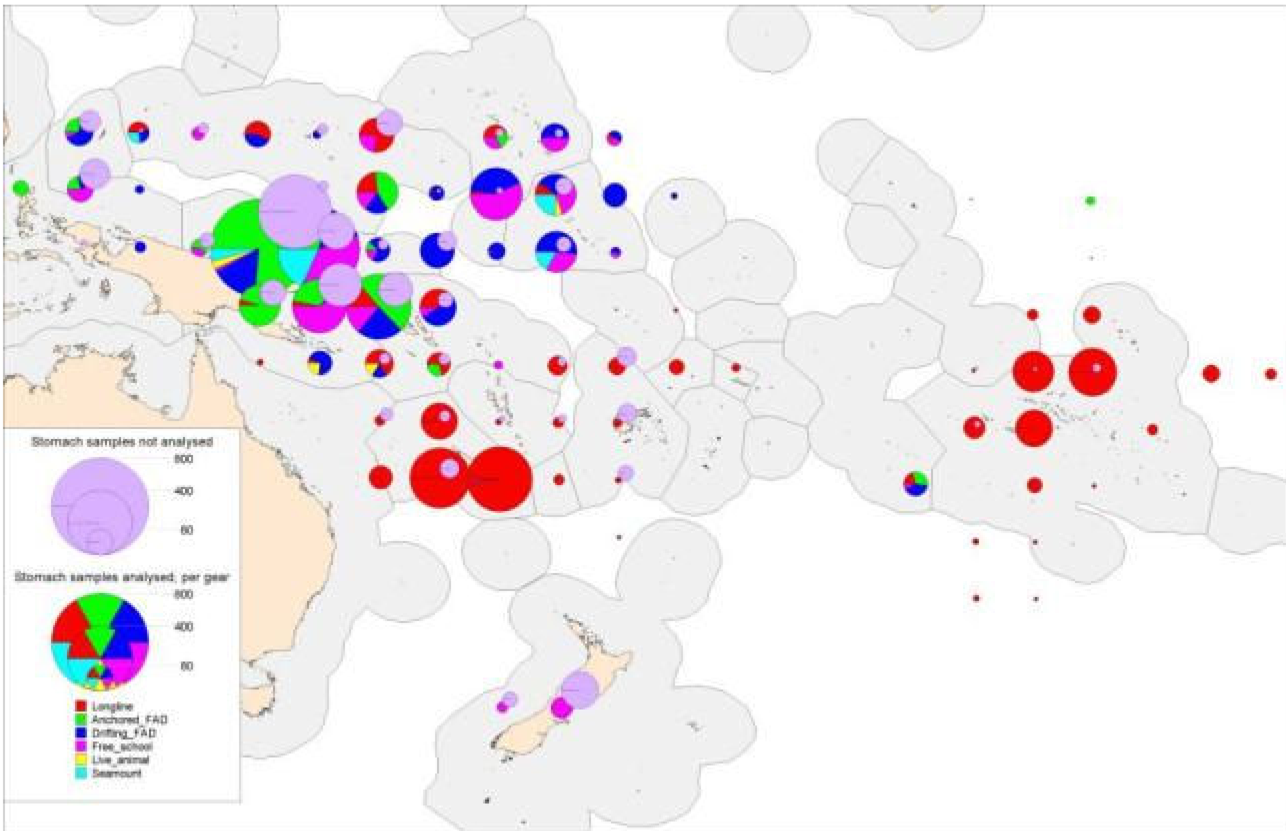
Spatial distribution of biological samples collected from yellowfin tunas.



Length frequencies for yellowfin tunas.

STOMACH SAMPLING UPDATE

Stomach sampling has been conducted with great success by the region's observers since the project's beginning in 2001. Since 2006, tagging operations led by SPC in collaboration with regional observer programmes have allowed us to increase the number of samples obtained and to expand geographic coverage using a pole-and-line vessel. As of June 2010, 3,808 samples have been collected by observers, of which 3,372 have been analysed; 4,332 stomachs were collected onboard the tagging vessel, of which 2,742 have been analysed.

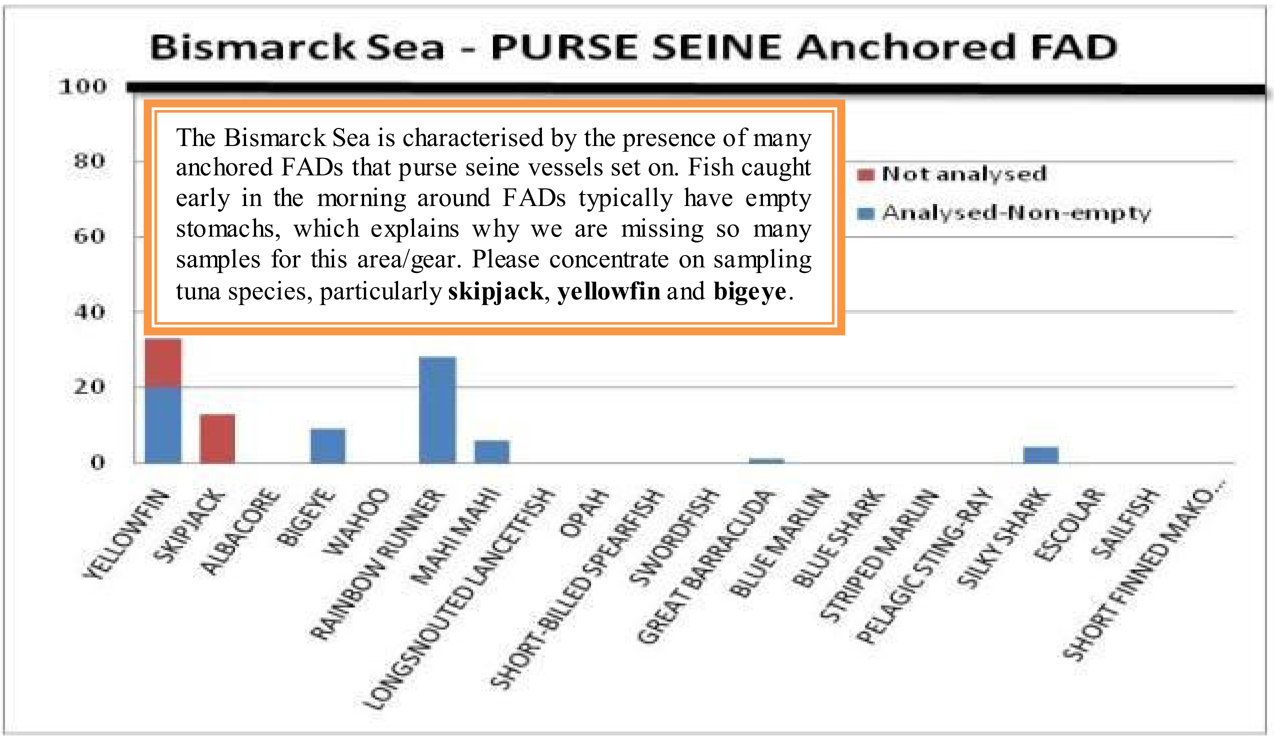


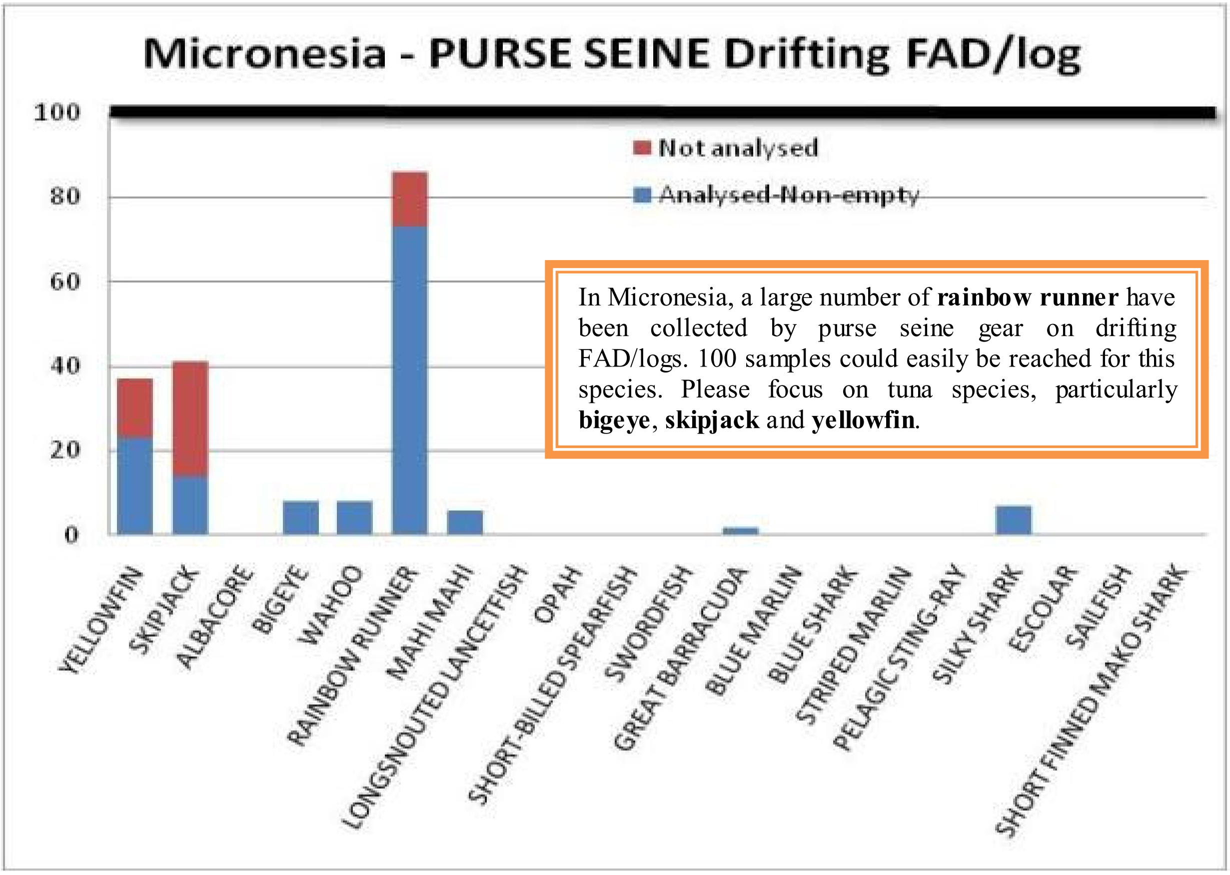
Spatial distribution — by 5-degree squares — of stomach samples collected by observers and during tagging cruises since 1 June 2010. The number of stomach samples examined in the lab is colour-coded according to the sampling gear used; stomachs not yet analysed are indicated in purple.

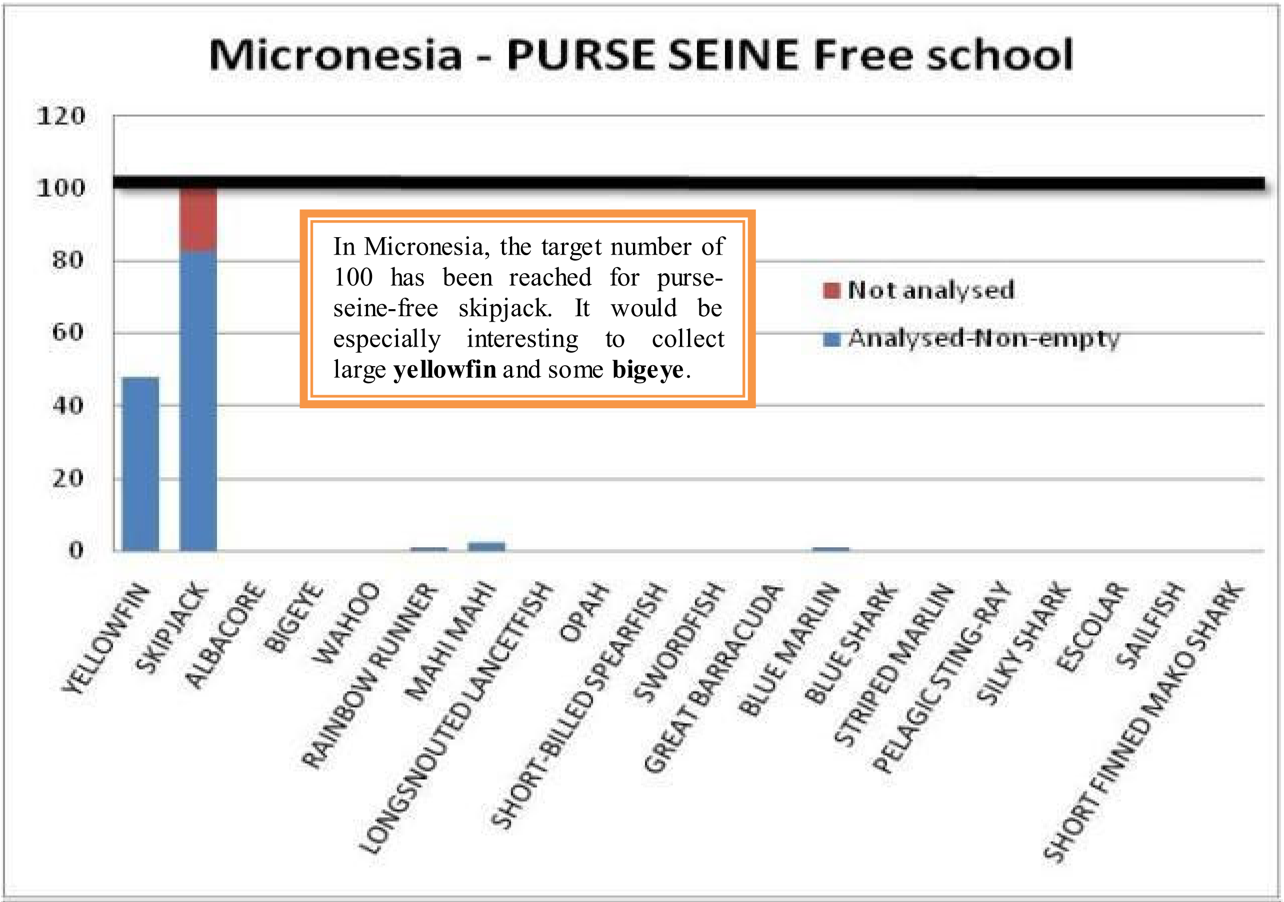
The following graphs present an update of the number of stomach samples collected by observers only; samples from tagging cruises are not considered here. The data presented relate to the number of stomachs examined by our team in the lab, and only include non-empty stomachs that actually provide information on predators' diets. Where applicable, we have added the number of stomachs you have collected but yet still need to be examined in the lab (this number may include empty stomachs).

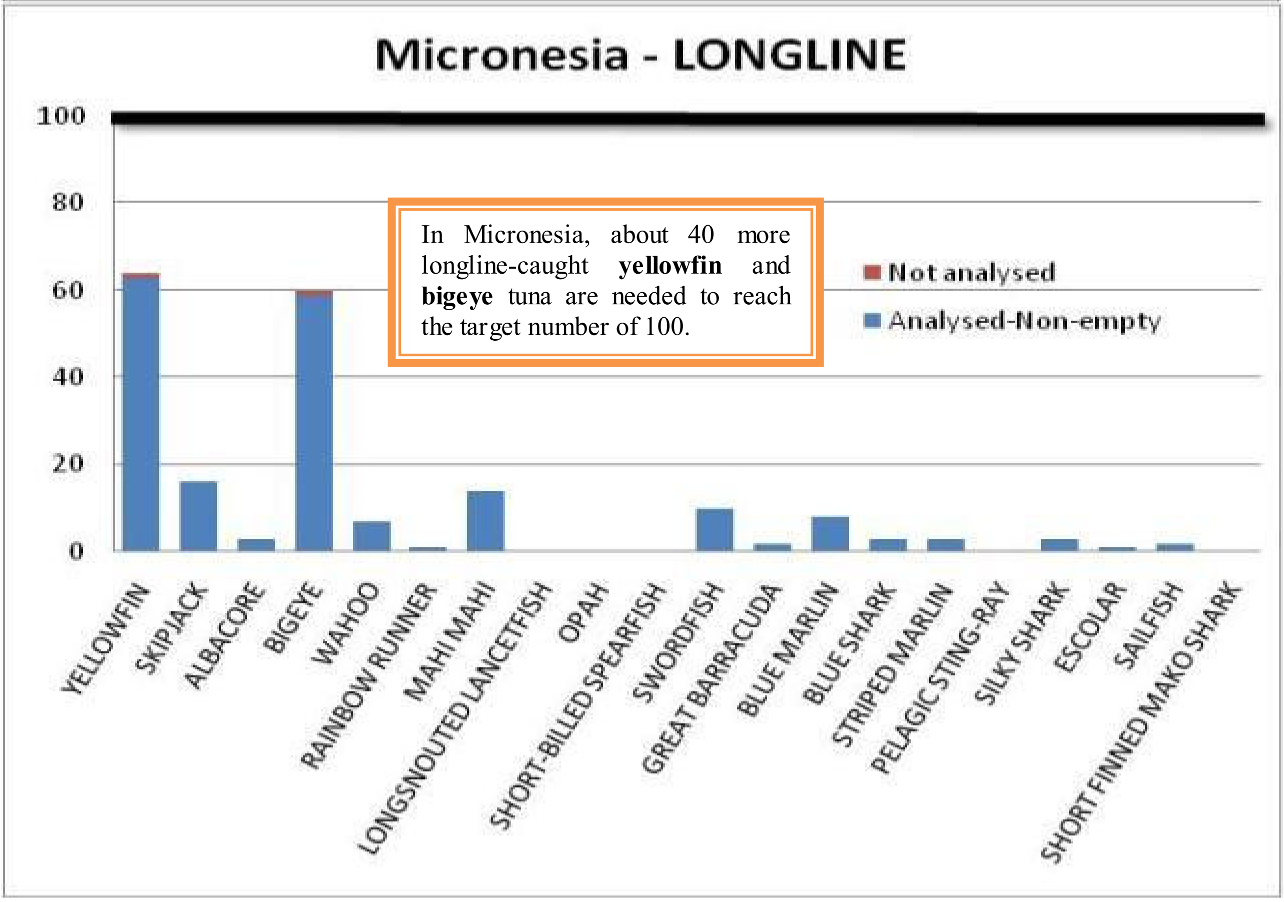
The goal is to examine 100 non-empty stomachs per species, area and gear. Although this target has been reached for a number of species in some areas, more sampling is required as outlined in the figures below.

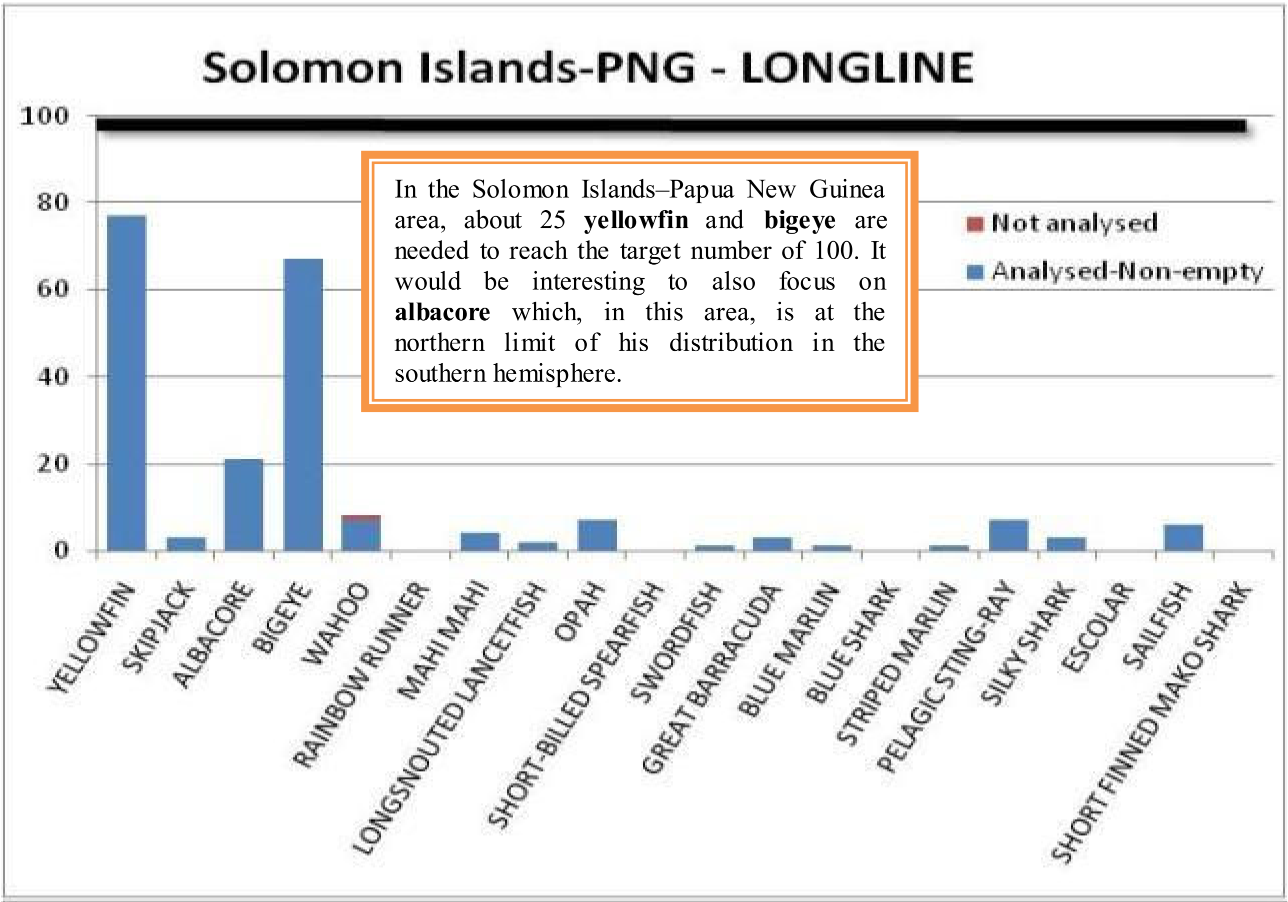
Thank you for your support in collecting samples. This helps us fill in the gaps in our research.

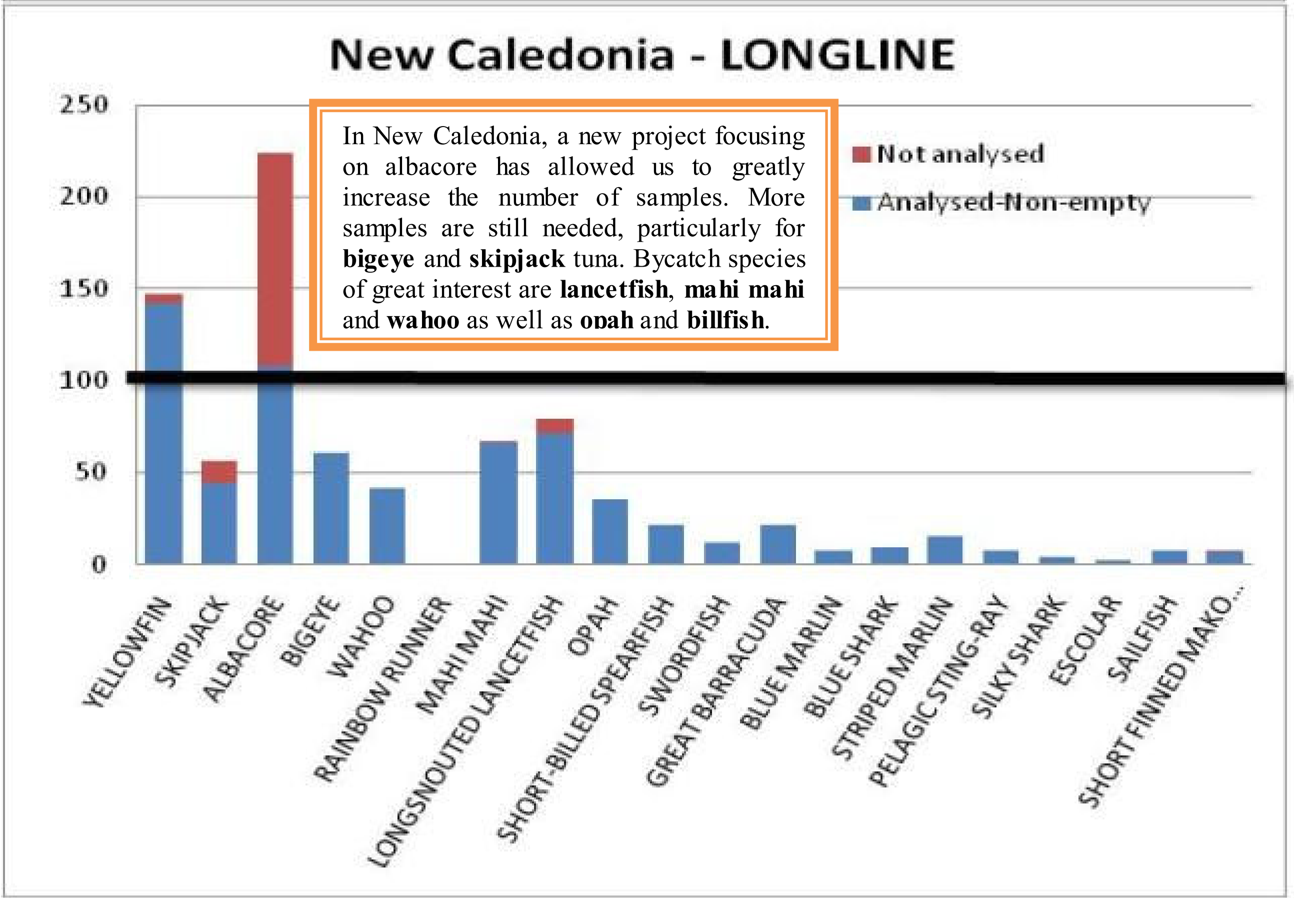

Bismarck Sea - PURSE SEINE Anchored FAD
The Bismarck Sea is characterised by the presence of many anchored FADs that purse seine vessels set on. Fish caught early in the morning around FADs typically have empty stomachs, which explains why we are missing so many samples for this area/gear. Please concentrate on sampling tuna species, particularly **skipjack**, **yellowfin** and **bigeye**.
Not analysed
Analysed-Non-empty
100
80
60
40
20
0
YELLOWFIN
SKIPJACK
ALBACORE
BIGEYE
WAHOO
RAINBOW RUNNER
MAHI MAHI
LONGSNOUTED LANCETFISH
OPAH
SHORT-BILLED SPEARFISH
SWORDFISH
GREAT BARRACUDA
BLUE MARLIN
BLUE SHARK
STRIPED MARLIN
PELAGIC STING-RAY
SILKY SHARK
ESCOLAR
SAILFISH
SHORT FINNED MAKO...


Micronesia - PURSE SEINE Drifting FAD/log
Not analysed
Analysed-Non-empty
In Micronesia, a large number of **rainbow runner** have been collected by purse seine gear on drifting FAD/logs. 100 samples could easily be reached for this species. Please focus on tuna species, particularly **bigeye**, **skipjack** and **yellowfin**.
100
80
60
40
20
0
YELLOWFIN
SKIPJACK
ALBACORE
BIGEYE
WAHOO
RAINBOW RUNNER
MAHI MAHI
LONGSNOUTED LANCETFISH
OPAH
SHORT-BILLED SPEARFISH
SWORDFISH
GREAT BARRACUDA
BLUE MARLIN
BLUE SHARK
STRIPED MARLIN
PELAGIC STING-RAY
SILKY SHARK
ESCOLAR
SAILFISH
SHORT FINNED MAKO SHARK


Micronesia - PURSE SEINE Free school
120
100
80
60
40
20
0
In Micronesia, the target number of 100 has been reached for purse-seine-free skipjack. It would be especially interesting to collect large **yellowfin** and some **bigeye**.
Not analysed
Analysed-Non-empty
YELLOWFIN
SKIPJACK
ALBACORE
BIGEYE
WAHOO
RAINBOW RUNNER
MAHI MAHI
LONGSNOUTED LANCETFISH
OPAH
SHORT-BILLED SPEARFISH
SWORDFISH
GREAT BARRACUDA
BLUE MARLIN
BLUE SHARK
STRIPED MARLIN
PELAGIC STING-RAY
SILKY SHARK
ESCOLAR
SAILFISH
SHORT FINNED MAKO SHARK


Micronesia - LONGLINE
100
80
60
40
20
0
In Micronesia, about 40 more longline-caught **yellowfin** and **bigeye** tuna are needed to reach the target number of 100.
Not analysed
Analysed-Non-empty
YELLOWFIN
SKIPJACK
ALBACORE
BIGEYE
WAHOO
RAINBOW RUNNER
MAHI MAHI
LONGSNOUTED LANCETFISH
OPAH
SHORT-BILLED SPEARFISH
SWORDFISH
GREAT BARRACUDA
BLUE MARLIN
BLUE SHARK
STRIPED MARLIN
PELAGIC STING-RAY
SILKY SHARK
ESCOLAR
SAILFISH
SHORT FINNED MAKO SHARK


Solomon Islands-PNG - LONGLINE
100
80
60
40
20
0
In the Solomon Islands–Papua New Guinea area, about 25 **yellowfin** and **bigeye** are needed to reach the target number of 100. It would be interesting to also focus on **albacore** which, in this area, is at the northern limit of his distribution in the southern hemisphere.
Not analysed
Analysed-Non-empty
YELLOWFIN
SKIPJACK
ALBACORE
BIGEYE
WAHOO
RAINBOW RUNNER
MAHI MAHI
LONGSNOUTED LANCETFISH
OPAH
SHORT-BILLED SPEARFISH
SWORDFISH
GREAT BARRACUDA
BLUE MARLIN
BLUE SHARK
STRIPED MARLIN
PELAGIC STING-RAY
SILKY SHARK
ESCOLAR
SAILFISH
SHORT FINNED MAKO SHARK


New Caledonia - LONGLINE
250
200
150
100
50
0
In New Caledonia, a new project focusing on albacore has allowed us to greatly increase the number of samples. More samples are still needed, particularly for **bigeye** and **skipjack** tuna. Bycatch species of great interest are **lancetfish**, **mahi mahi** and **wahoo** as well as **opah** and **billfish**.
Not analysed
Analysed-Non-empty
YELLOWFIN
SKIPJACK
ALBACORE
BIGEYE
WAHOO
RAINBOW RUNNER
MAHI MAHI
LONGSNOUTED LANCETFISH
OPAH
SHORT-BILLED SPEARFISH
SWORDFISH
GREAT BARRACUDA
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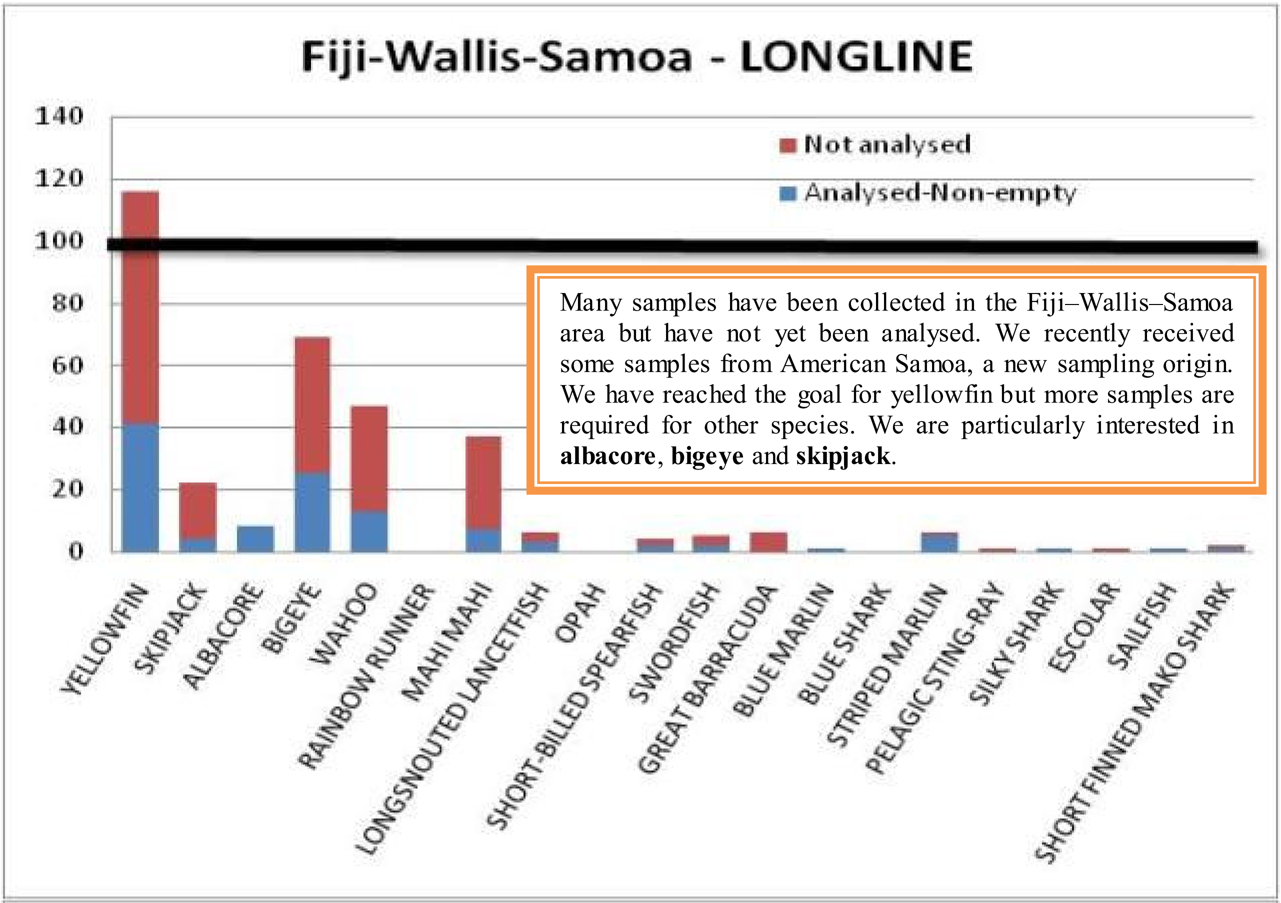

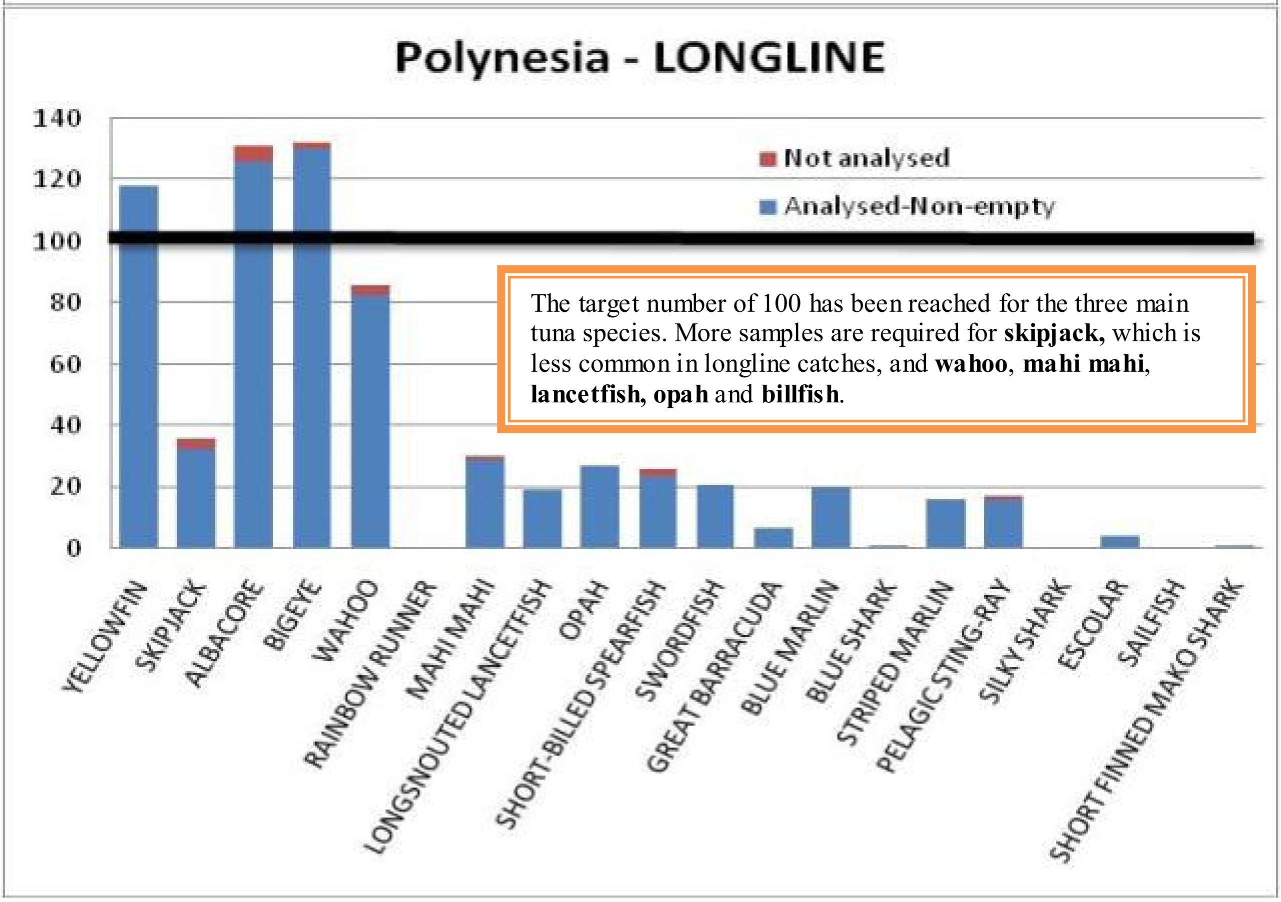

Next newsletter in October 2010

Your comments on the content of this newsletter are welcomed and can be sent to Valérie Allain (valeriea@spc.int), Caroline Sanchez (carolines@spc.int) or Malo Hosken (maloh@spc.int).