

# ...Continuation of the Sampling Procedure

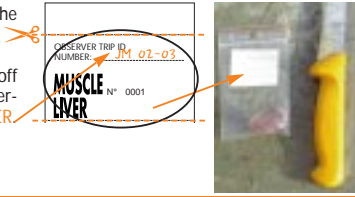
## 5. SAMPLE A PIECE OF MUSCLE AND LIVER

Sample a piece of muscle and a piece of liver for every stomach examined.

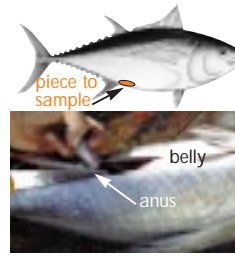
### MUSCLE

**RETAINED FISH:** sample near the anus (A), enlarge the hole made by fishermen gutting the fish.  
**DISCARDED FISH:** sample from the back of the fish near the first dorsal fin (B), and from the wings for rays (W).

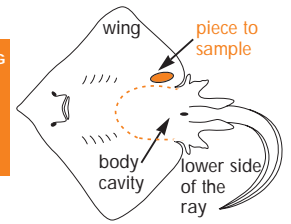
- Cut a sample of muscle, around 4–5 cm<sup>3</sup>, about the size of a finger.
- Remove the skin from the muscle sample.
- Put the muscle sample in a small plastic bag. Tear off the remaining MUSCLE/LIVER part of the waterproof label. Fill in your **OBSERVER TRIP ID NUMBER**. Put the label in the bag with the muscle.



### SAMPLING NEAR THE ANUS (A)



### SAMPLING FROM WINGS OF THE RAYS (W)



### LIVER

- Cut a sample of liver, around 4–5 cm<sup>3</sup>, about the size of a finger.
- Put the liver sample in a tiny plastic bag, close it tightly, place it inside the bag containing the muscle sample and the label, and close that bag tightly.



### SAMPLING FROM THE BACK NEAR THE FIRST DORSAL FIN (B)



- **Don't put the small plastic bag containing the muscle and liver samples into the plastic bag containing the stomach.** This will contaminate the sample. Instead, gather all the small plastic bags containing muscle/liver samples in one clean big plastic bag, which will be kept in the freezer (see section 7).

## 6. COMPLETE THE FORMS

- On the LL-4 form, subtitle the **COMMENTS** column 'muscle/liver'.
- **Record the number of the muscle/liver sample here.** The number must be followed by the letter **B (back)**, **W (wing)** or **A (anus)**, to indicate the part of the fish where the muscle was sampled.

CATCH DETAILS												
SAFETY TIME	HOOK No	SPECIES CODE	CONDITION CODE	WEIGHT	LENGTH	WEIGHT	SEX	AGE	STOMACH	MUSCLE/LIVER	REMARKS	
17:05	1	B5H	A1	D	210	UF			DFR	F	9	9 B
17:23	15	BET	D		112	UF			RGG	M	10	10 A

**REMEMBER:** The stomach and muscle/liver samples will have the same number.

## 7. STORAGE AND PACKING OF SAMPLES

Once you have sampled all your fish from the set, put the samples (stomachs, muscles and livers) in the freezer either

- in the cooler (esky), and follow the procedure as outlined below, or
- in the strong plastic bag if the freezer is very small, and pack the samples in the cooler (esky) just before disembarking as outlined below.

- Put the first 50 samples (or 1/2 of your samples) above the layer of frozen hydrated gelpacks ENVIROFREEZE™ you put in the bottom of the cooler (esky).
- After 50 samples (or 1/2 of your samples) put another layer of frozen hydrated gelpacks ENVIROFREEZE™, then add the rest of the samples.
- Stop sampling when the cooler (esky) is full or when you don't have any more labels.
- When you are finished sampling put another layer of frozen hydrated gelpacks ENVIROFREEZE™ on top of the last samples.
- Close the cooler (esky) just before disembarking.

## 8. COPY THE FORMS

When you arrive at the harbour, make a copy of forms LL-2, LL-3 and LL-4 for each set where stomach/muscle/liver sampling was done.

See page 1 for information on how to send the samples and the forms.

# Tuna Ecosystem Study

## STOMACH, MUSCLE AND LIVER SAMPLING PROCEDURE

## LONGLINE

### BACKGROUND

Tuna are the main oceanic resource of the Pacific Ocean. In 2000, the tuna catches of the western and central Pacific Ocean represented around 48% of the world's tuna catch. The Secretariat of the Pacific Community's Oceanic Fisheries Programme (OFP) provides information, analysis and advice to Pacific Island member countries to allow them to make informed decisions when managing the tuna fishery.

Until now, traditional management models were based on single species stock assessments. That view is now broadening to include the complex ecosystem of which tunas are a part. Many fish are inter-related: big fish (tuna) eat small fish and squid, while smaller fish eat tiny fish, who in turn feed on zooplankton (mainly small shrimps) and phytoplankton (microscopic algae). Scientists now realise that while it is important to keep an eye on the total tuna catches, it is also necessary to consider the food that tuna eat, because without this food there would be no tuna.

In this study, two methods are used to look at the tuna ecosystem. By examining stomach contents we will have a better understanding of predator-prey relationships (for tuna, bycatch and discard species). Observers are also asked to take muscle and liver samples from every fish. The muscle and liver samples will undergo chemical analysis, which will establish if the species is a top predator (sharks, tunas), a predator, or an herbivore that feeds on phytoplankton.

The results of the study, along with the catch and bycatch information that observers collect, should allow us to draw an elaborate food web, like the 'trophic model' shown to the right, and to understand which species are critical to the tuna fishery. We can then predict the response of the different ecosystem elements to our fishing management policy.

This work is funded by the United Nations Development Programme under its Global Environment Facility project: the Strategic Action Programme for the International Waters of the Pacific Small Island Developing States.

Dr Valerie ALLAIN  
Fisheries Research Scientist



### SEND THE SAMPLES AND THE FORMS

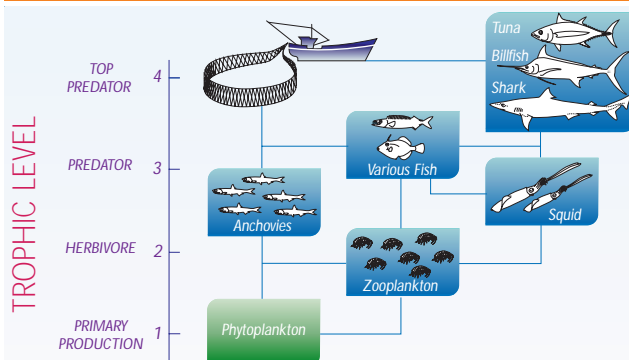
When you arrive at the harbour, contact your supervisor (see list of contacts to the right).

Remove the samples from the cooler (esky) and store them in a freezer until they are sent to SPC by freight.

Send copies of forms LL-2, LL-3 and LL-4 for each set where stomach/muscle/liver samples were taken, to Valerie ALLAIN at SPC (see address to the right).

### CHECKLIST

- 1 cooler (esky) + 1 strong plastic bag
- waterproof labels + pencils
- plastic bags of different sizes
- 1 knife
- dehydrated gelpacks ENVIROFREEZE™ with hydration procedure
- forms LL-2, LL-3, LL-4
- checklist for stomach/muscle/liver sampling



Trophic model of a pelagic ecosystem. Modified from Christensen and Pauly, 1997. Placing fisheries resources in their ecosystem context. EC Fisheries Cooperation Bulletin 10(2):9-14.

### CONTACTS

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**NUMBER OF SAMPLES TO COLLECT**  
Stop sampling when the cooler (esky) is full or when you don't have any more labels.

# Sampling Procedure

2  
SPC 2002

## LONGLINE

### 1. BEFORE YOU START SAMPLING

- Hydrate gelpacks ENVIROFREEZE™ with **FRESH WATER** as outlined on the 'Hydration of gelpacks ENVIROFREEZE™ (ice replacement)' leaflet. Put them in the freezer at least 24 hours before you start sampling.
- Place the cooler (esky) in the freezer, leave it open. Put a layer of hydrated frozen gelpacks ENVIROFREEZE™ in the bottom of the cooler (esky). You will store your samples here.
- If the freezer is very small, keep your samples in the strong plastic bag in the freezer. Pack the samples in the cooler (esky) just before disembarking (see section 7 of this protocol).
- YOU ARE NOW READY FOR SAMPLING.**



### 2. SELECT YOUR FISH

- Select 2 specimens of each tuna species from each set. That is 2 YFT, 2 ALB, 2 BET and 2 SKJ when possible.
- Select, when possible, 2 specimens of each bycatch species from each set, including species usually discarded or struck off before landing.
- Use the checklist for stomach/muscle/liver sampling to remind yourself how many specimens of each species you have already sampled during the set.

**STOP SAMPLING**  
when the cooler (esky) is full,  
or when you don't have  
any more labels.

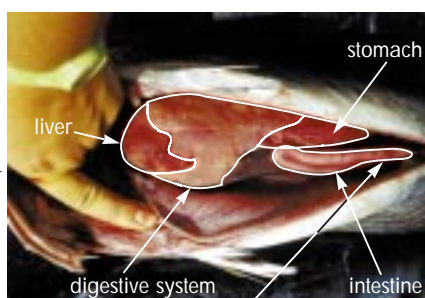
**Don't select**  
the fish if the  
stomach is turned  
inside out.

### 3. SAMPLE THE STOMACH



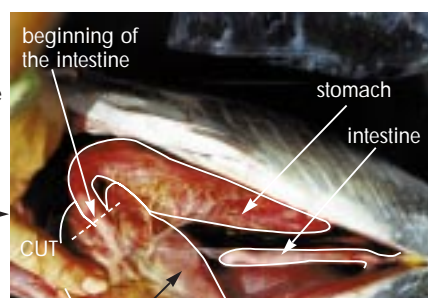
Identify the different organs.

Determine the sex, if possible.



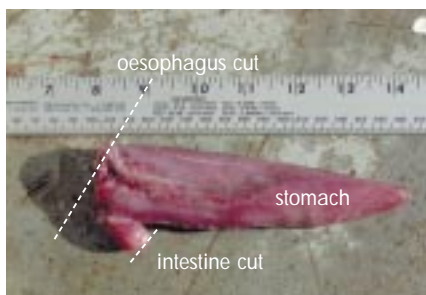
Gonads (testes or ovaries) are located under the intestine, near the anus.

Remove the digestive system to see the stomach.



digestive system on its side

Open the fish's body carefully with the tip of the knife to avoid cutting internal organs.



Remove the stomach.



Cut the oesophagus as near as possible to the gills.



Cut the intestine away from the digestive system.



OBSERVER TRIP ID NUMBER: \_\_\_\_\_

**MUSCLE LIVER** N° 0001

OBSERVER TRIP ID NUMBER: JM 02-03

**STOMACH** N° 0001

- Carefully put the stomach in a plastic bag.
- Tear off the STOMACH part of the label and keep the MUSCLE/LIVER part of the label for muscle/liver sampling (section 5 on the following page).
- Record your **OBSERVER TRIP ID NUMBER** on the STOMACH part of the label (ex: third trip of John Masa in 2002: JM 02-03), put the label in the bag with the stomach, and close the bag tightly.
- Complete the forms (see section 4 below).
- Sample a piece of muscle and liver (see section 5 on the following page).

### 4. COMPLETE THE FORMS

Complete the form LL-4 CATCH MONITORING:

- Use the same LL-4 form you have filled in for this set.
- Mark the blank column 'STOMACH' (the 'COMMENTS' column will be used for the muscle/liver sample - see section 5 on the following page).
- Record the standard information (i.e. ship's time, hook No., species code, condition code, length, weight, fate code and sex).
- Under your new 'STOMACH' column, record the number of the stomach sample, which is on the waterproof label you put in the plastic bag with the stomach.

CATCH DETAILS										
SHIP'S TIME	HOOK No.	SPECIES CODE	CONDITION CODE	CAUGHT LET NO.	LENGTH (cm)	WEIGHT (kg)	FATE CODE	SEX	STOMACH	COMMENTS
17:05	1	B5H	A1	D	210	UF	DFR	F	9	
17:23	15	BET	D		112	UF	RGG	M	10	

**THE SAMPLING PROCEDURE IS CONTINUED ON THE FOLLOWING PAGE. SAMPLE A PIECE OF MUSCLE AND A PIECE OF LIVER FOR EACH FISH EXAMINED (SEE SECTION 5 ON THE FOLLOWING PAGE)...**