

**PACIFIC TUNA TAGGING PROJECT**  
**Phase 2 (Central Pacific)**  
**Cruise CP-5: 13 November – 07 December 2010**  
**SUMMARY REPORT**  
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**INTRODUCTION**

The Central Pacific (CP) tagging cruises are part of the Pacific Tuna Tagging Programme (PTTP) that started in August 2006 with the objective of tag and release of tropical tunas throughout the WCPO and concentrated in the latitudes where the tuna stocks are the most harvested, approximately between 10° N and 10° S. These CP cruises were designed to catch and tag tuna in areas where pole and line fishing gear is not efficient due to bait ground absence. Using specific trolling gears developed in Hawaii and targeting the NOAA TAO oceanographic buoys anchored east of the Date Line, the CP tagging cruises improved the overall spatial coverage of the PTTP tag releases and increased the number of tagged bigeye tuna that are rarely caught by pole and line gear in the western part of the WCPO.

Four CP cruises have already been achieved, using Hawaii based fishing vessels that tagged and released about 12,000 tuna, mostly bigeye (92%), on the TAO buoys anchored along the meridians 140°W, 155°W and 170°W and between 5°N and 5°S latitudes.

This report summarizes activities during a fifth CP cruise, named hereafter CP-5, during a 25 day cruise on the Tonga-based FV Pacific Sunrise. This longliner was chartered to extend tag release coverage westward from the preceding CP cruises, targeting the TAO buoys deployed along the 170° and 180° W meridians. The relative proximity of its base port Nuku'alofa to the intended fishing area (closer than Hawaii) and the ability of the experienced captain to adopt new fishing techniques motivated the choice of this tagging platform. The captain, having been involved in a previous regional tuna tagging programme (RTTP), was also well aware of all the tropical tuna tagging procedures.

Crew and scientific personnel onboard Pacific Sunrise during CP-5 are listed in Table 1 (see also Picture 8).

**Table 1: personnel onboard Pacific Sunrise during CP-5**

<b>Name (abbreviation)</b>	<b>Title/affiliation</b>	<b>Nationality</b>
Etimoni Palu (ETP)	Captain	Tonga
Bruno Leroy (BML)	Cruise Leader/SPC	France/EU
Malo Hosken (MJH)	Research assistant/ SPC	New Zealand
Hopoate Fakatoumafi (HVF)	Crew	Tonga
Uilisanasi Fania	Crew	Tonga
Lousinimani Potoi (LMP)	Crew	Tonga
Alani Latusele	Crew	Tonga

## **GENERAL DESCRIPTION OF VESSEL**

The F.V. Pacific Sunrise is a 22 metre fibreglass multi-purpose commercial fishing vessel built in 2003 by Westcoaster International, Australia (Picture 1, Appendix 4). Owned and skippered by Etimoni Palu, it is equipped with longline and deep dropline gear used for fishing pelagic fishes (mainly tuna, swordfish and deep sea bluenose and snapper) around the Tongan EEZ. The vessel is fitted with one 600hp main engine (Detroit), one 57 KVA generator, one water maker (116 l/h) and a hydraulic system which powers the longline winch, the dropline reels and the main davit. Electronic equipment includes VHF and HF radios, Furuno radar and sounder, autopilot, two Furuno GPS, a vessel monitoring system, a water temperature gauge, a longline master system, a Taiyo radio direction finder and two desktop computers for navigation and email communication (see complete specifications in Appendix 1).

The operational range of Pacific Sunrise is 2,500 nm with a 14 ton fuel tank capacity. This range was increased for the 3,600 nm CP-5 cruise by refueling tanks in Pago Pago after the first 500 NM and also by taking an additional 10 tons in fifty 200 litre drums which were stored in the vessel's fish holds.

## **FISHING GEAR**

For the purpose of this tagging cruise the vessel was fitted with four "danglers". This gear consists of galvanized steel davits which extend at right angles from the hull for 1.5 meters and deploy two short surface trolling lines (Picture 2 and 6). This type of gear has been successfully used during the four previous CP cruises as well as in Hawaii for other tagging programs and initially for commercial fishing of offshore tuna aggregations.

Three danglers were placed on the starboard side (two fore and one aft) and one on the aft port side. The troll lines hanging from the danglers consisted of a 2m length of 6mm rope spliced with loops at both ends to which a 80cm length of 2mm monofilament line was fitted with Moldcraft squid-like lure, one 45g lead weight and a 7.0 Mustad galvanized barbless hook.

Four conventional troll lines were also attached from the stern of the vessel. These consisted of a 12m by 6mm rope spliced with a loop at one end to which a 5m by 2mm monofilament line was attached and rigged with a tube squid bearing three 45g lead weights and a 7/0 Mustad galvanized barbless hook.

One hydraulic reel was rigged on the starboard stern corner with a trolling line equipped with a jet-head type lure.

A spray system was specifically rigged for this cruise. This consisted of a 25mm diameter PVC pipe attached on the outside of the hull at deck level and drilled with 1mm holes facing downwards directly beneath the danglers. Sea water was circulated through the pipe using three pumps (3KW each). This resulted in a spray reaching 1.5 m from the hull and might explain the unusual success of this cruise in catching larger fish using the danglers with the enhanced sprays. As these large fish were available during the day for archival tagging, the jigging gear (rods and reels, hand reels associated with metallic jigs) were seldom used during CP-5 (see Picture 3).

## **TAGGING OPERATIONS**

Three tagging stations were set up on the deck of the vessel. The fish holds protrude from the floor and take a large part of the aft deck, restricting the choices for tagging cradle placement (see Picture 4). Two cradles were dedicated to conventional tagging and were of the same design as those previously used for pole and line tagging. One was placed at the stern (serviced by MJH) of the vessel (behind the fish holds) while the other one (serviced by the cruise leader (BML) or the captain (ETP)) was positioned in the centre of deck (between the fish holds and the cabin). The third cradle was set up specifically for archival tagging and supplied with a saltwater hose for irrigating the tuna during surgery. The archival cradle was placed directly in front on the fish holds. All cradles were marked with 1cm graduations from 30cm to 120cm.

Each crew member was assigned to a dangler station. Two crew men were hauling fish for the port and starboard stern dangler stations as well as taking care of two to four stern troll lines. Fish were handed to MJH manning the stern tagging cradle. Two other crews were hauling fish from the two for'ard starboard dangles to feed the other conventional tagging cradle manned by BML or ETP. The crewman at the first starboard dangler station was also in charge of the chumming. The captain was driving, often loading tags into blocs at the same time or, if CL was deploying archival tags, tagging from the center deck cradle. Suitable size fish for archival tagging were sourced from all four dangler stations.

### ***Conventional tagging***

Conventional tagging consisted of using the 13cm yellow dart tag manufactured by Hallprint Ltd. These were inserted between the pterygiophores of the second dorsal fin of fish using a sharp stainless steel applicator tube (Picture 5). Used applicators were collected by a crew member then immersed in a bucket containing fresh water and bleach, rinsed in fresh water and dried for re-use. Prior to each tagging operation, tags were placed inside the applicators and mounted in numbered tagging blocks each holding 100 loaded applicators. There were four 100 tag blocks and one 50 tag block in total. Too few blocks resulted in taking 15 to 30 minutes breaks needed to reload the applicators and blocks during tagging operations (Picture 7). Other times (when fish were not biting too frequently) the captain and a crew member were able to load applicators and blocks while tagging operations were underway. Conventional tagging was performed by Bruno (BML), Malo (MJH) and Eti (ETP). Having the captain able to tag with CTs was a big asset, allowing BML to deploy archival tags (ATs) during the fast biting schools without impacting the conventional tagging (see Table 2, which shows the number of tags released by tagger)).

A total of 6359 tropical tunas was tagged and released during the cruise, comprising 6091 bigeye (96%), 40 skipjack (1%) and 228 yellowfin tuna (4%). Spatial distribution of tag releases is shown in **Figure 1**.

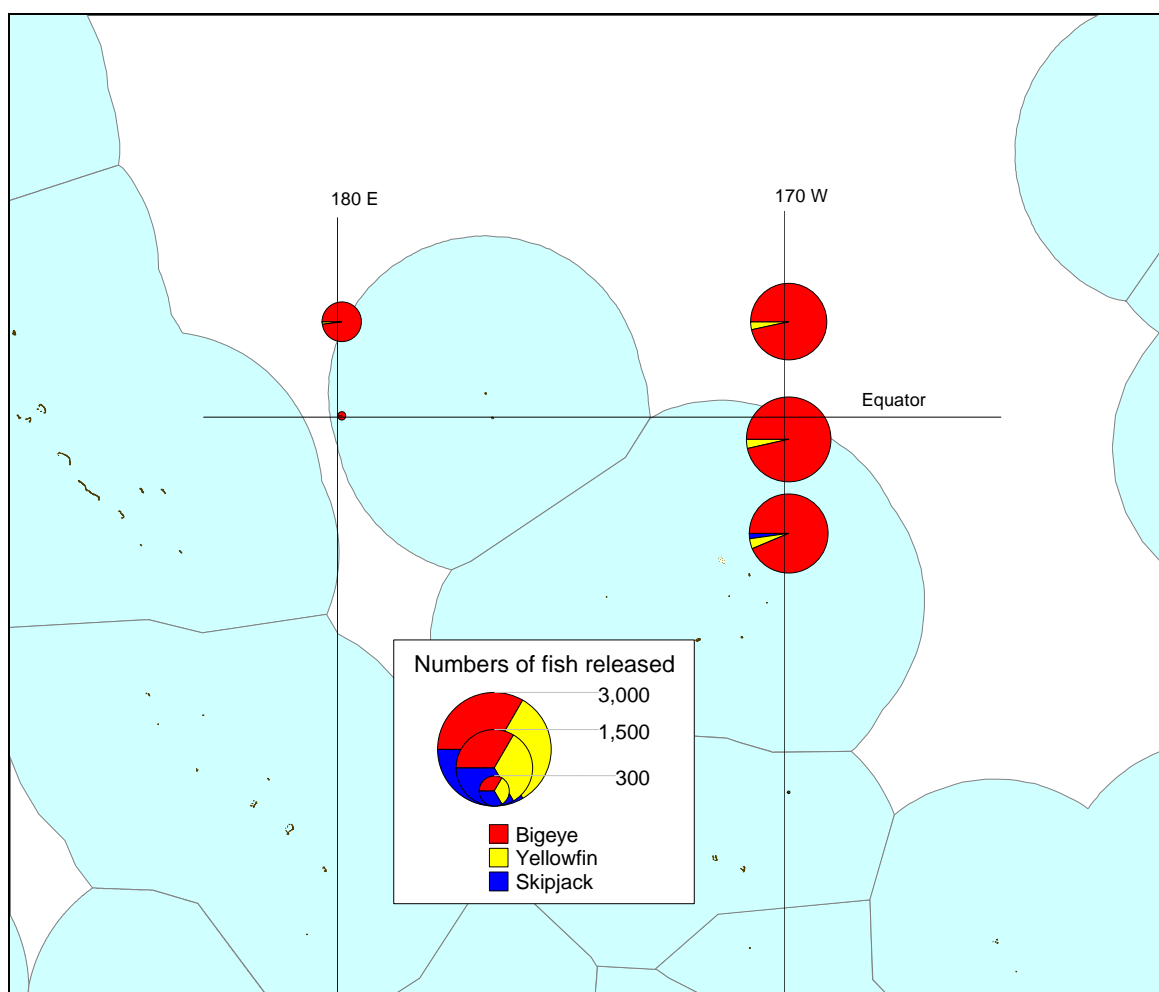


Figure 1: Distribution of tag releases during CP-5

**Table 2: Number of tags per tagger**

<b>Tagger</b>	<b>Archival</b>	<b>Conventional</b>	<b>Total</b>
BML	58	2521	2579
ETP		1166	1166
MJH		2614	2614
<b>Total</b>	<b>58</b>	<b>6301</b>	<b>6359</b>

### ***Archival tagging***

Fifty-eight Wildlife Computers MK9 archival tags were available during the cruise and all were deployed in bigeye tuna. Very few yellowfin of suitable size were caught during the cruise. These tags were configured to sample all likely depth, sea and fish temperature and light intensity every 30 seconds. Archival tagged tuna were externally marked with an orange 13 cm conventional tag. Suitable size tuna (generally > 60 cm) were placed belly up on the V-shaped central tagging cradle (see Picture 4), the eye covered with a synthetic chamois and irrigated via the mouth by a seawater hose. All archival tags were implanted into the peritoneal cavity and secured with two sutures. All archival tagging was conducted by the cruise leader (BML).

The large numbers of suitable size fish being caught on the dangles/troll lines and the captain being able to deploy conventional tags allowed for all archival tags to be deployed during the day and none during jigging fishing at night as it was necessarily the case during previous CP cruises.

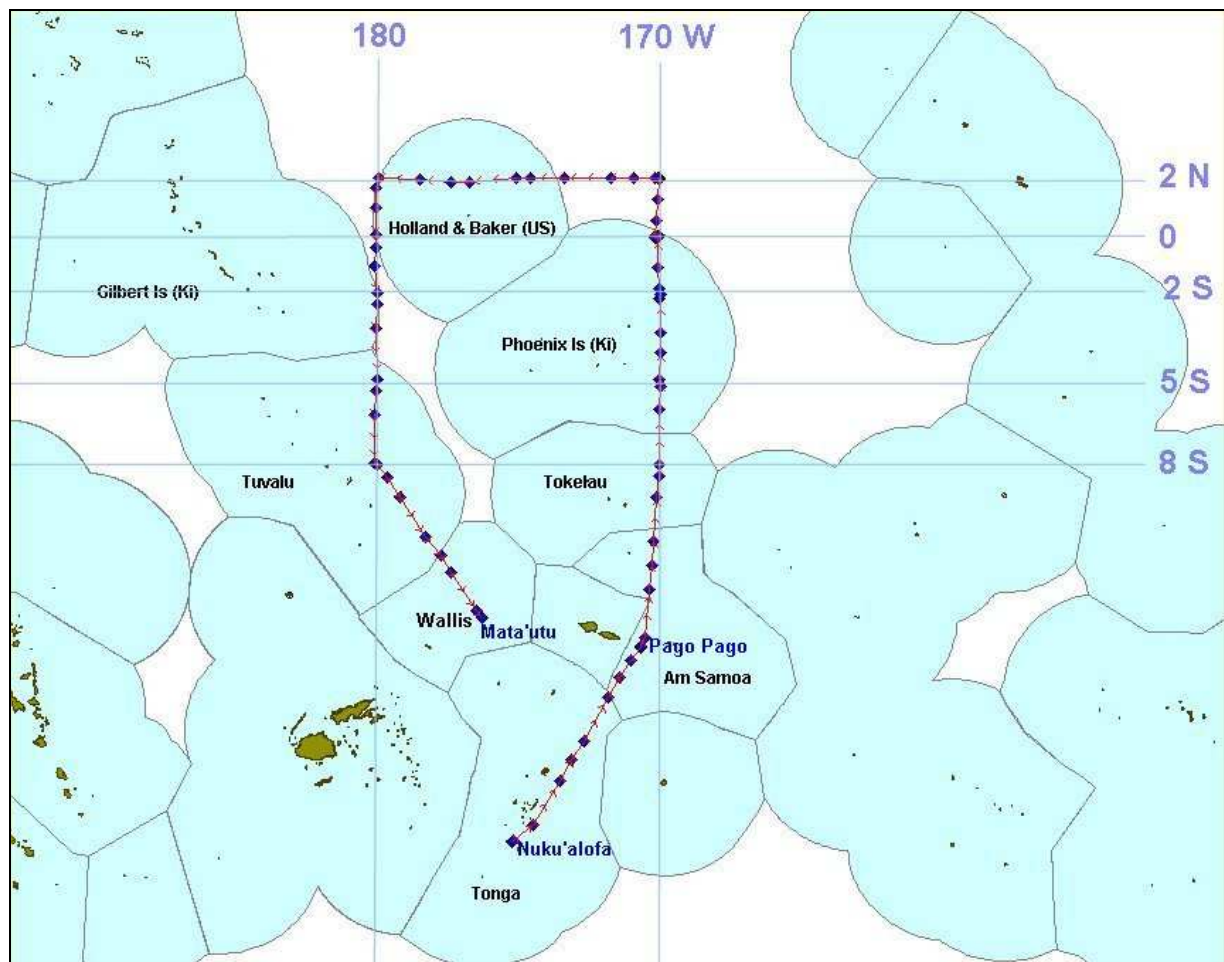
### ***Data recording***

Each tagger was equipped with a digital voice recorder enclosed in a waterproof sleeve. The first and last tag in each new block was read out before commencing tagging. After each fish was tagged, its length was recorded from the gradationss on the cradles and read out. Data were then transcribed onto hard copy release log sheets at the end of each tagging session. Data were subsequently entered into the Microsoft SQL Server data base 'TagDager'.

## GENERAL DESCRIPTION OF CRUISE TRACK AND FISHING ACTIVITY

The track of Cruise CP-5 is shown below in **Figure 2** and can be summarized by the following schematic:

**Nuku'alofa → Pago Pago → 170W TAO line (8S, 5S, 2S, 00, 2N) → 180W TAO line (2N, 00, 2S, 5S, 8S) → Mata'utu**



**Figure 2: Cruise track during CP-5**

A summary of general movements during the cruise and daily tag releases by area/buoy is given in Appendix II

Daily Log extracts that provide detailed written descriptions of daily activities are provided in Appendix III.

Of the 25 days of charter during CP-5, 9 days were spent steaming, one day was spent in Pago Pago to take fuel and provisions, and part or all of 15 days were spent fishing and tagging.

### SIZE DISTRIBUTION OF TAGGED FISH

The size distribution of skipjack, yellowfin and bigeye tuna conventionally tagged during the cruise is shown in **Figure 3** bellow.

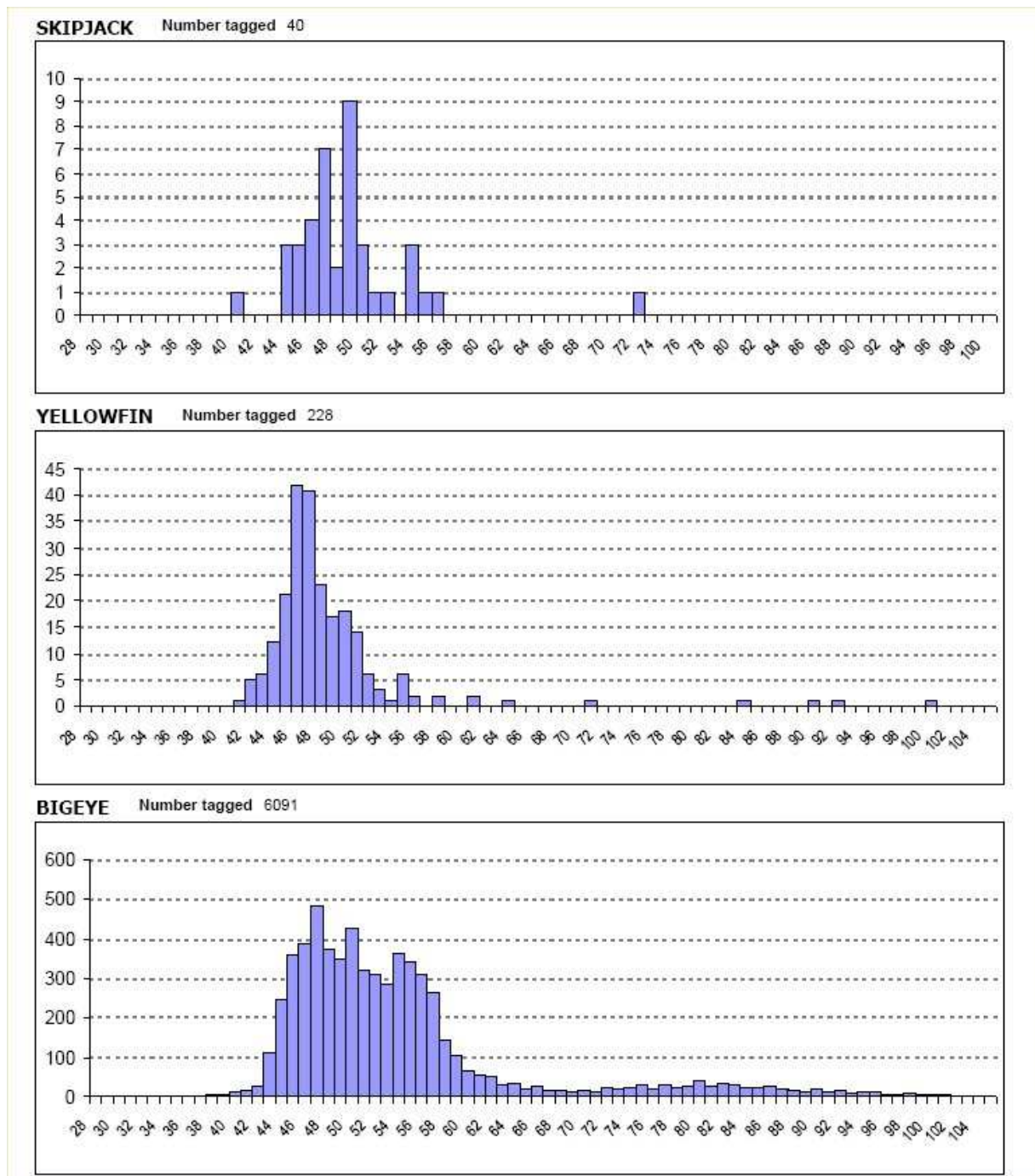
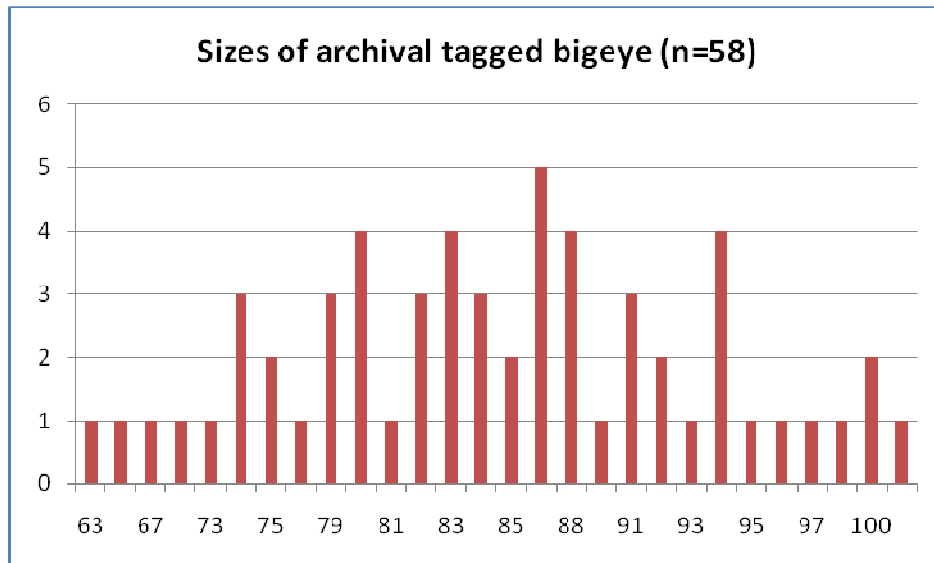


Figure 3: Length frequency of skipjack, yellowfin and bigeye tuna conventionally tagged during CP-5

The size distribution of bigeye tuna tagged with archival tags is shown in **Figure 4**.



**Figure 4: Length frequency of bigeye tuna tagged with archival tags**

## BIOLOGICAL SAMPLING

Eighty-seven fish across seven species were sampled during this cruise (Table 3), including 66 bigeye, two yellowfin and two skipjack tunas, as well as 11 mahi-mahi, three wahoo, two rainbow runner and one amberjack. Overall, sizes of fish ranged from 35 cm to 126 cm. For bigeye tuna, sizes ranged from 47 cm to 105 cm. Sampling was conducted after tagging operations in the morning. Fish that were unsuitable for tagging were put aside in the shade on the port side of the aft deck. On only one occasion when tagging action was not so rapid, fish were placed in a freezer and later retrieved for processing. Sampling was coordinated by MJH with the assistance of two crew members and the cruise leader. The two crew members were briefed on sampling procedures and its purpose. One was tasked to sample stomach, muscle, liver and gonads while the other one sampled the dorsal spine and otoliths. Measurement, data recording and labeling was done by MJH and the cruise leader. The majority of fish were sampled for all biological samples. Once sampling operations were over, the samples were placed in the freezer located in the galley as this was more efficient at freezing the samples than the freezers on the aft deck. Samples from each school were placed in labelled bags and a sample of the bait used was also included. The “fatmeter” instrument (measuring lipid content in fish) was used during the first day of sampling, but abnormally high measures were noticed as well as a puncture in the instrument’s reading cell and thus it was not used during later sampling. For taxonomic purposes, one flying fish which landed on the deck of the boat at night was also collected (not counted in samples summary) as tuna and mahi-mahi seemed to be feeding on these fish.



**Table 3: Summary of biological samples collected during CP-5 (S: stomach; M: muscle; L: liver; G: gonads; O: otoliths and DS: dorsal spine).**

Species	Number	S	M	L	G	O	DS
BET	66	66	66	66	62	57	53
DOL	11	11	10	11			
WAH	3	3	3	3			
YFT	2	2	2	2	1		1
SKJ	2	2	2	2			
RRU	2	2	2	2			
Amberjack	1	1	1	1			
<b>TOTALS</b>	<b>87</b>	<b>87</b>	<b>86</b>	<b>87</b>	<b>63</b>	<b>57</b>	<b>54</b>

Two crew members assisted in the collection of biological samples. One was collecting stomach, muscle, liver and gonad samples (Hopote Viliami Fakatoumafi – HVF) while the second one was collecting dorsal spines and otoliths (Lousinimani Potoi \_ LMP). Their efforts were of a high standard and thus in agreement with the vessel's captain and Simon Nicol, we decided that they would be given the opportunity to carry out biological sampling during longline fishing trips in the Tongan EEZ. The two crew members were trained in the sampling techniques (including 'cutters' and 'saw' for otoliths), given presentations about the purposes and the specifics of biological sampling and were instructed how to record data correctly. An esky and sampling equipment was left onboard the vessel. Follow up of this work will be made through liaising with the captain.

## **DIGITAL MEDIA DOCUMENTATION**

### ***Still pictures***

A Canon 450D SLR digital camera equipped with 18-55mm and 15mm lenses was used during the cruise. Captured files are in JPEG and RAW formats.

### ***High definition videos***

A Sanyo Xacti HD waterproof (3m) video camera was used to shoot fishing and tagging operations. A small 'grip' tripod and stretchy chord allowed setting the video camera onto railings and poles to record operations without a camera man. On one occasion, the video camera was mounted onto a 2.5m pole to film underwater scenes. Recorded files are in MP4 format and can easily be edited to produce a short movie clip about this cruise or for web posting.

## **CONCLUSIONS / RECOMMENDATIONS**

The use of a powerful spray system during CP-5 has probably increased the efficiency of dangler fishing in a significant way. Compared to previous CP cruises, fish were biting for longer periods of time and more fish over 70 cm FL were caught during day fishing sessions. It is recommended rigging such a spray system for future CP cruises.

Pacific Sunrise proved to be a very efficient tagging platform and the captain and crew performed very well in all aspects of the cruise. Having a captain well aware of the fish tagging procedures and able to man a tagging station was of course a big advantage. Proximity of the vessel port base to the fishing grounds compared to Hawaii allowed this cruise to be successfully completed in only 25 days. It is strongly recommended that this vessel be considered for future tagging cruises in this region of the central Pacific.

#### **APPENDIX I: PACIFIC SUNRISE specifications**

Built:	2003
Designer:	Westcoaster (Australia)
Length:	22 m (72 feet)
Beam:	6.2 m
Draft:	2.3 m
Gross tonnage:	80 tons
Hull:	Fibreglass
Main Engine:	Detroit MTU 600 hp
Cruising:	10 knots
Auxiliary:	Cummins 57.5 KVA
Steering Stations:	3
Fuel Capacity:	14,000 litres (2500 nm range)
Radios:	ICOM IC-M45 VHF 57 channels ICOM IC-M710 HF 160 channels
Satellite communications:	Iridium linked to a computer
Chart plotter:	Max Sea
Water:	9,000 liters capacity
Desalinator:	116 liters per hour
Electronics:	Radar, sounder, computer, radio direction Finder, Inmarsat, stereo, plotter, GPS, Auto pilot
Survey:	USL Class 3B

**APPENDIX II: Summary of cruise activities, with number of fish released per day. EEZ abbreviations: TK (Tokelau), PX (Phoenix Islands – Kiribati), IW (International Waters), HB (Howland and Baker – US) and TV (Tuvalu).**

Date	General area	Principal activity	Conventional tags			Archival tags		Total tagged
			BET	SKJ	YFT	BET	YFT	
<b>2010</b>								
13-Nov	Leave Nuku'alofa	Steaming from midday						
14-Nov	W Tonga EEZ	Steaming, spray system set						
15-Nov	W Tonga EEZ	Steaming						
16-Nov	Stop in Pago	Fuelling, provisioning						
17-Nov	Am Samoa EEZ	Steaming, fish gear rigging						
18-Nov	TAO 8S/170W-TK	Checking -fishing buoy			2			<b>2</b>
19-Nov	TAO 5S/170W-PX	Checking -fishing buoy						
20-Nov	TAO 5S/170W-PX	Fish morning then steam						
21-Nov	TAO2S/170W-PX	Fishing	1200	13	32	2		<b>1247</b>
22-Nov	TAO2S/170W-PX	Fishing	579	24	49	3		<b>655</b>
23-Nov	TAO2S/170W-PX	Fishing & steaming	12	3	1			<b>16</b>
24-Nov	TAO 0/170W-PX	Fishing	1218		34	28		<b>1280</b>
25-Nov	TAO 0/170W-PX	Fishing	751		31	4		<b>786</b>
26-Nov	TAO 0/170W-PX	Fishing & steaming	8		7			<b>15</b>
27-Nov	TAO2N/170W-IW	Fishing	1679		60	21		<b>1760</b>
28-Nov	International W	Steaming						
29-Nov	IW and US EEZ	Steaming						
30-Nov	US EEZ	Steaming						
1-Dec	TAO 2N/180-IW	Fishing & steaming	556		12			<b>568</b>
2-Dec	TAO equ/180-HB	Fishing & steaming	29					<b>29</b>
3-Dec	TAO 2S/180-KI	Fishing & steaming						
4-Dec	TAO 5S/180-TV	Fishing & steaming	1					<b>1</b>
5-Dec	TAO 8S/180-TV	Fishing & steaming						
6-Dec	TV & Wallis EEZ	Steaming to Wallis						
7-Dec	Wallis	Arrival in Wallis						
<b>Total</b>			<b>6033</b>	<b>40</b>	<b>228</b>	<b>58</b>		<b>6359</b>

### **APPENDIX III: Daily activities summary from Daily Log entries**

#### **13/11/2010 - Leaving Nuku'alofa and steaming towards Pago Pago**

*Left the wharf at 11h35 after immigration clearance and last shopping for veggies and crops. Seven people onboard after the engineer finally got his passport yesterday afternoon. Weather forecast not really good with rain and 15-20 knots ENE and depression center moving possibly towards us (moving NE from 30S/185W). Wind drop a bit and completely changed direction in the afternoon. Crossed sea and swell, not very comfortable.*

#### **14/11/2010 - Steaming to Pago Pago**

*First night a bit sloppy, the usual. Wind changed from NW to NE. Crew cleaning the deck. Malo cooked nice food, as usual. Caught one barracuda and one wahoo on troll line in the afternoon; the later provided a nice diner after being sampled. Wind dropped and sea eased just bothered by a few showers.*

#### **15/11/2010 - Steaming to Pago Pago**

*Still steaming towards Pago Pago at 8knts. Crew installing second new pump for spray system. Too many corners, so will need to devise a new system when in Pago Pago. Three troll lines out, no fish. Salad for lunch. Wahoo curry for dinner.*

#### **16/11/2010 - Stop in Pago Pago to get fuel and food**

*Today is Monday by Pago Pago Time but Tuesday by Tongan time. All crew up by first light, waiting to enter port, preparing boat for customs and quarantine arrival. Docked alongside fuel wharf by 07h30. Tony Grey, the agent arrived a bit later and custom clearance was done by 08h30. Gordon Yamazaki was also there to give us all the fishing gears sent by David Itano (5 boxes + rod+ scoop net). The car booked from Noumea also arrived in time and cruise leader and Malo went to do the shopping. Managed to get all we needed in 3 hours. Fuel delivery done by 13h00. Left the dock at 14h30. Started making dangler leaders and storing all gears in handy places. Eti started rigging up the new spray system. Steak and mushroom sauce for dinner. Showed the crew the Tagging and dangling fishing movies. Cruising steadily at 256deg at 8.5knts.*

#### **17/11/2010 - Steaming to TAO 8S/170W**

*Up at 07h00. Continued gearing up the lines and mounting the rods. Easterly wind picking up to 12-15knts, cruising at 8.8knts course 356 deg. Rigging the fixed four troll lines, the rod and reel and also some lures for long trolling with the big reels. Eti finished setting the spray system with success. 18h00:*

*All dangles mounted with two lines each. Crew started transferring drum fuel into the boat's tank. Carbonara pasta for dinner.*

**18/11/2010** - Steaming to TAO 8S-170W - finished rigging the boat

*Wind increased during the night and turn a bit more toward NNE, making the ride a bit bumpy in 1 meter waves. After transferring the fuel from the 4 drum that were still on the deck, we installed the tagging cradles at the supposed good place. Then we filled the tag blocs...ready for action! ETA for the first buoy around 15h00. Reached first buoy at 14h56, started trolling with 2 lines then with 3 lines. Tagged 2 yft (46 and 51cm), 2 hook offs. After a while there was no more biting and nothing was showing up on the sounder so we decided to make way towards next buoy.*

**19/11/2010** - Steaming towards TAO 5S/170W and fishing around the buoy

*Up at 06h00. Swell and wind picked up during night, very sloppy (front wind), steaming at 8 knts towards next buoy. Rigged up 8 jigging lures. Arrived at the TAO at 13h45. Some fish detection between 100-150 m. Decided to drift til 15:30. After looking/trolling around the buoy for 20 min for no sign of life, we decided to stay around the area of the buoy to do a bit of jigging during the night and see if anything would bite in the morning. Unsuccessful jigging session between 17h00 and 19h00; same result from 02h00 to 03h00 and again at 04h00.*

**20/11/2010** - Steaming toward TAO 2S/170W

*Left the area of the TAO 5S at 05h20, then fished with all dangles and troll lines til 05h50; only one wahoo caught and sampled, no sign of tuna. Started steaming at 06h00. Sea increased in the afternoon, becoming quite uncomfortable.*

**21/11/2010** - Fishing TAO 2S 170W

*Up at 04h30, slowed down to 5knts in search of TAO buoy 2S 170W. Grey light at 05h15, still searching. Crew on fly bridge spotting for buoy. Sunrise at 06h00. Lost 2 hours looking for the buoy before thinking to look at CP4 positions: the buoy was 10 miles south from the position. Started fishing at 08h05 and fish answered quickly to chumming; spray water system worked very well to keep fish at the boat till 10h55 for 1014 CT and 2 AT releases. Started again at 15h15 but fish only biting for about 30 min before becoming a bit shy and staying deeper. Stop at 16h45 after 211 releases. We then checked the second TAO which is about 1 mile east of the first one; some fish were also there but in much less quantity; only 11 releases. We came back to the first buoy and stayed around the area. A short jigging session was carried out at 22h15 when cruise leader was asleep; 7 fish were released and CT tagged. Total for the day : 1243 + 2 AT.*

**22/11/2010** - Fishing TAO2S-170W

*Small jigging session at 02h00 for one hour before current started to be too strong. Only three fish caught and CT tagged (too tired for AT); started trolling at 05h30 and tagged about 200 fish in 1 h but then fish stopped biting; gave them a rest for 45 min and started again but fish remained shy; went to the second buoy and tagged a few including one AT; back again at the first buoy at 08h45 and stayed fishing around till 11h20 when we stopped to have a rest and because bites were becoming scarce. Started again fishing at 15h15 til 17h30. Lots of SKJ, eating the baits, prevented us to catch the bigeye at the end. Started jigging at 18h30 and also used the hydraulic reels with baits. Caught some small fish we*

tagged with CT. Tagged one fish rod caught with AT but didn't look good at release; two other fish caught on the hydraulic reel but were too damaged to be tagged. One 40 kg 126cm YFT gave a good exercise on the rod to the cruise leader, samples taken and fish kept in freezer.

**23/11/2010** - Fishing the TAO 2S-170W

Started fishing at 05h30 but fish not interested anymore in the chumming; stopped at 06h20 to check the second buoy but only a few fish there, no school so came back to first one at 07h10. But school seems to have gone. Stayed drifting in 20 knts wind for one hour and started fishing again but no sign of fish on the sounder. Pulled the plug at 09h20. Wind seems to increase. Decided to hit the road toward TAO at the equator.

**24/11/2010** - Fishing at TAO 00 170W

Arrived at the equator TAO position at 03h00 but couldn't spot the buoy with the radar in rough weather. Crew up at 04h15 and searching using spotlight on fly bridge. Found buoy at 05h15; big school detection on the sounder and started fishing at 05h30. Fish started to bite at 05h45 ; much bigger sizes than the previous buoy, up to 100cm+. Fished until 07h05 for a 1 hour break to load tags and repair lures; same stop at 09h20; resumed at 09h45 then stopped at 10h45 for the mid-day break. Drifted with part of the aggregation til 15h30 for 6 miles. Started fishing going back to the TAO at 3 knts, then fished til around 17h30. Total for the day :1045 CT and 28 AT.

**25/11/2010** - Drift and fishing the fish aggregation then back to TAO and fish

Stopped steaming around the TAO at 00h15 and deployed the sea anchor; retrieved parachute at 05h30 and started fishing about 6 miles from TAO but fish seemed not interested, only biting the troll lines and playing with small *Coryphaena* and flying fish around. Stopped fishing at 06h40 and drifted for a while, hoping to re-assemble the fish to the boat and steam back slowly to TAO. Started fishing again at 07h30. Same result, fish not coming to the dangles. Tried to jig with boat drifting to see if big fish present but no taker. Steamed back to TAO and fished from 09h50 til noon. Drifted for two and half hours and fished on the way back to the buoy and at the buoy; stopped at 17h00 and stayed steaming around the buoy.

**26/11/2010** - Drift the tuna school away from TAO, start steaming to TAO 2N

Stopped steaming around the TAO at 00h15; could see tuna chasing small flying fish alongside. Started fishing at 05h30; only a few fish came to the chum and they made pass the 4000 tags for the cruise. Started steaming north at 3 knots with school under the boat. Increased boat speed to 8knts at 09h20, about 16 miles NW from the TAO. SKJ following us all day.

**27/11/2010** - Fishing TAO 2N/170W

Arrived at the buoy position at 00h00, then drifted til 05h15, started steaming back towards buoy. Checked the first buoy at 01'59N but nothing under. Went to the second TAO, about 2.2 miles to the NE; started chumming at 06h25 and fish started biting immediately. A big school of nice fish up to 100 cm provided an amazing 1751 releases in 5 hours, + 21 archrivals; stopped at 11h25 and drifted with sea anchor till 17h00; we didn't fish in the afternoon to keep the remaining 1000 CT for the 180 W line. Came back to the buoy at 18h to steam and stay with school with the intention of drifting away the school at 02h00; Fries, steak, tuna and ice cream for dinner. Started entering data but current had the boat rolling so planned to continue next day with following seas.

**28/11/2010** - Move tuna school away from TAO and steam towards 180W line.

*Stopped steaming around the TAO at 02h00; current and wind together made the boat drifting at 1,7 kn; seems tuna are following, all around the boat, chasing baitfish attracted by the lights; at 06h00 we were almost 8 miles from the TAO and we started steaming west at 5 knts with the school all around the boat following. Started increasing speed at 08h30 to 8,5 knots (21 nm from TAO) and lost most of the school one hour later. Steamed all day with only skipjack remaining on sides.*

**29/11/2010** - Still steaming towards 2N / 180E

Up at 06h30. It appears the schools of tunas have left us. Started writing report and editing daily logs. Steaming all day with following seas.

**30/11/2010** - Steaming toward TAO 2N/180W

Steaming all day, weather a bit better.

**1/12/2010** - Fishing the TAO 2N-180W then steaming toward TAO equator

*Arrived at the buoy at 04h00, drifted until 05h30; started fishing at 06h05 (Tongan time, as we are now GMT+12); nice school of almost pure BET; a small break at 06h55 for 15 min to load tags. Stopped at 07h45 after 568 tagged to keep some for the next one. Looking at the VMS data with no PS around (closest is near Tarawa) and only a few in the surrounding EEZ, decided to hit the road at 08h45 to be at the next buoy early next morning.*

**2/12/2010** - Fish Tao 00-180, then steam toward the 2S

*Arrived at the buoy position at 02h00; drifted and came back to it twice; strong current associated with 15-20 knt wind put the drift speed at about 2 knt. Started fishing at 06h30 but no real school present, just a few fish very close to the buoy; the weather and current conditions making also the chumming less efficient; pulled the plug at 08h00 after just 29 fish tagged and a few juvenile dolphin fish caught, also took 5 samples.*

**3/12/2010** - Fishing TAO 2S-180 and steam toward 5S

*Steamed at 4.5 knt to arrive at 04h00 at the buoy. Started fishing at 06h15 but no tuna present; caught 3 mahi; looked around for a possible second 2S buoy before getting confirmation that it was gone earlier this year. Started heading to the 5S at 10h. ETA, 07h00.*

**4/12/2010** - Fishing TAO 5N-180 and steam toward the 8S

*Arrived at the buoy at 06h00, started fishing at 06h15; few spots on the sounder, caught 2 BET. Tried hard for 1.5 hours, found what looked like a nice school about 1 mile downwind from buoy, but it stayed at 150 meters, possibly large fish. Back at the buoy at 07h45 but no taker. Tried again the school which looked more dispersed but no luck. Stopped fishing at 09h00 and set course for the 8 S in rolling 20 knt E winds and 2m swells.*

**5/12/2010** - Fishing TAO 8S-180 and steaming towards Wallis

*Met a school 4 miles from the buoy; tried to chum but no bite even if fish seemed to come close to the surface; yellowfin? Arrived at the TAO at 07h45 and as expected, nothing around. Started steaming at 08h45. Washing and storing equipment for rest of day.*

**6/12/2010** - Steaming towards Wallis



*Steaming towards Wallis, packing equipment, finalising entry documents. Electric shortcut resulted in the computers crashing. Had to remove spare parts from old computers and managed to restore one for navigation programme. But we lost the possibility of sending and receiving Emails.*

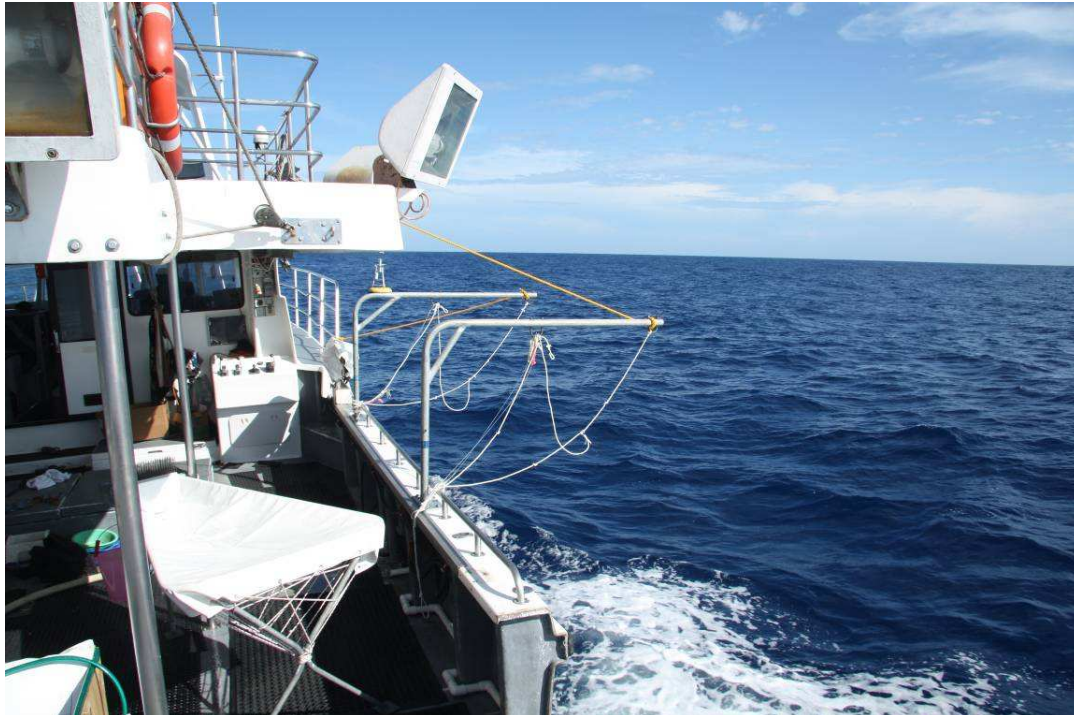
**7/12/2010** – In port at Wallis

*Arrived in front of main pass at 08h45 (07h45 local time), contacted Wallis radio and received the welcome green light to come in. Tied up to wharf at Mata'utu at 09h00 local time. Clearance by 10h00, sorted samples and placed in freezer.*

#### **APPENDIX IV: Pictures**



**Picture 1:** F.V. Pacific Sunrise docked in Mata'Ututu with empty fuel drums stocked on upper deck.



**Picture 2:** The two forth starboard dangles and the mid-deck conventional tagging cradle.



**Picture 3:** Captain and crew handling a bigeye tuna (95cm) landed on the tagging cradle using a scoop net after being caught on a jigging rig at night.





**Picture 4:** Deck set up showing the first conventional tagging cradle in the foreground, the archival cradle in front of fish holds and the second conventional tagging cradle at the stern.



**Picture 5:** Juvenile bigeye marked with conventional 13cm yellow tag



**Picture 6:** Crew hauling two bigeye tuna from the first starboard dangle station. Note spray system in the background.



**Picture 7:** Crew and Cruise leader re-filling tagging blocks.





**Picture 8:** End of cruise group photo. Left to right: Bruno, Hopo, Mani, Nuku, Malo, Lulu and Eti.