

PACIFIC TUNA TAGGING PROJECT
Summary Report
Phase 2 (Central Pacific)
Cruise 4: 1 May – 12 June 2010

David Itano¹

EXECUTIVE SUMMARY

The Pacific Tuna Tagging Programme (PTTP) is a WPCFC endorsed project being implemented through a variety of funding sources by the SPC-OFP to tag tropical tuna throughout the WCPO. The primary tag release platforms used by the PTTP were chartered Japanese-style pole-and-line vessel(s) operating west of the Date Line to the Philippines and Indonesia. Tag releases in the Central Pacific were accomplished through a combination of PTTP funded charters and externally funded PTTP affiliated national tagging programs.

The first PTTP funded Central Pacific tagging cruise (**CP-1**) chartered the Hawaii-based commercial fishing vessel *FV Double D* to release tags on the NOAA TAO oceanographic buoys south of Hawaii along the 155° W meridian. Central Pacific cruises **CP-2** and **CP-3** operated collaboratively with fishery scientists from the IATTC to achieve tag releases on TAO buoys at 155°W line and also on the 140°W longitude meridian that is located within the IATTC regulatory area. The objective of the Central Pacific cruises and other sub-regional components of the PTTP is to target difficult to access areas of the Central Pacific (including French Polynesia) to improve overall spatial coverage of PTTP tag releases. The **CP-4** cruise used the Honolulu-based fishing vessel *Ao Shibi Go* to extend tag release coverage westward from the **CP-1** to **CP-3** areas, concentrating on the TAO oceanographic buoys deployed along the 170° and 155°W meridians.

The *Ao Shibi Go* is a Honolulu-based tuna longline vessel equipped with a 40 mile monofilament longline reel. The vessel was fitted with steel davits to allow Hawaiian-style dangler gear and carried additional handline and troll gear as well as sport poles for jigging. One fibreglass tuna lift pole was also rigged and used during fishing/tagging operations.

A total of 2411 tropical tuna were tagged and released during CP-4 comprising 2284 bigeye (94.7%), 7 skipjack (0.3%) and 120 yellowfin tuna (5.0%). These totals include 39 bigeye tuna and 20 yellowfin tuna that were released with orange dart tags and Wildlife Computers MK9 archival tags. This cruise was unusual in that ninety six per cent (96%) of all tuna were tagged and released on one TAO buoy: the 2N 170W TAO or tuna from that aggregation that had been re-associated to the tagging vessel. Larger yellowfin for archival tagging were targeted near oceanic islands to compensate for the general lack of tuna aggregated to TAO buoys visited during CP-4.

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INTRODUCTION

This report summarizes activities during a 42 day tuna tagging cruise of the *FV AO SHIBI GO* to the NOAA TAO oceanographic buoys² southwest and south of Hawaii along the 170°W and 155°W meridian and the waters of Kiribati; in the Phoenix and Line Islands and adjacent high seas areas (**Figure 1**). This tagging cruise represented the fourth Central Pacific Cruise of the *Tuna Tagging Programme* and given the Tagdager database Cruise designation CP-4-01. The proposed objective of sub-regional components of the PTTP is to target difficult to access areas of the Central Pacific (including French Polynesia) to improve overall spatial coverage of tag releases and investigate movement parameters and vertical habitat utilization of tuna in the central Pacific region.

The vessel sailed from Honolulu under command of Captain Tim Jones with scientific direction provided by cruise leader David Itano assisted by PTTP tagging technician Hearty Matamaru. Vessel crew consisted of Swinden Ezra, Tiweity Dewey and Ehren Ernest, all FSM nationals and regular crewmembers of the vessel. Swinden and Tiweity had crewed the vessel during PTTP CP-3.

GENERAL DESCRIPTION OF VESSEL AND GEAR

The *Ao Shibi Go* is an 18.9 m steel monohull vessel launched in 1974 and normally engaged in the Hawaii longline fishery for tuna and mixed pelagics operating under US Federal longline fishing permit (**Figure 2**). The vessel is equipped with a 40 mile Lindgren Pitman monofilament longline reel and was also equipped for Hawaiian-style dangler and short troll/handline gear as described below. For purposes of the cruise, the vessel was granted a research permit to conduct tuna tagging within the Kiribati EEZ by the Kiribati government (**Attachment I**).

Vessel and gear details are itemized in **Appendix I**. The fish hold is split into a larger section for iced storage and an aft section with freezer plates used in CP-4 for storing frozen bait for chum. A household chest freezer kept frozen food for crew consumption and to preserve biological samples. An efficient reverse osmosis water maker provided ample water for daily showers and a saltwater flush toilet was a welcome unit onboard. Fuel capacity of 9000 gallons was augmented by carrying four 250 gallon portable diesel storage tanks on deck.

The vessel is well equipped with a full suite of marine electronics and two PC desktop computers running chartplotting (HIPlotLL) and remote sensing software (OrbMap). The 48 mile range radar was very efficient in alerting the watch to the presence of vessels in the area and was capable of picking up the TAO buoys at around 3 NM range. The echo sounder units were the old style Furuno 200 series CRT units that were very effective for surveying schools associated with the TAO buoys. An IRIDIUM phone was linked to a desktop PC to provide basic email communications.

Vessel accommodations were comfortable if a bit cramped. The three crewmen and two scientific staff stayed in the single bunkroom while the Captain stayed in a watchman's bunk on the bridge. The galley and dining table were also cramped but suitable and a very efficient air conditioner provided a comfortable living environment. **Figure 3** shows the *FV Double D* used during CP-1 and CP-2 and the *Ao Shibi Go* that was chartered for CP-3 and CP-4.

FISHING GEARS

The *Ao Shibi Go* holds a US limited entry permit for pelagic longline in the Hawaii western Pacific fleet. Normally the vessel uses a 40 mile LP monofilament longline reel to deploy around 2500 hooks per set targeting bigeye tuna. The vessel had been modified for CP-3 by the addition of four stainless steel davits to deploy Hawaiian-style dangler gear. These gears were again fitted to the vessel for use during CP-4. For tagging operations, the vessel was also equipped with simple handline/troll lines from the stern. The longline gear was not used during the cruise.

² <http://tao.noaa.gov/refreshed/index.php>

The vessel was rigged to deploy tuna “dangler” gear which consists of metal davits that extend at right angles from the hull for 1.5 meters and rigged to deploy two very short surface trolling lines. A 3m fiberglass tuna pole with barbless feathered hook typical of pole-and-line fisheries was also used during tagging operations. **Figure 4** shows two of the three starboard dangler davits and tuna pole in use. Three dangler davits were rigged on the starboard from midships to stern and one davit was set up on the port stern. Bigeye and yellowfin both respond to dangles but the gear is most effective on bigeye tuna. For the tagging work, longer leaders with #7/0 stainless steel troll hooks were used with the barb bent down to minimize capture trauma.

Four or five rope handlines were rigged across the stern for trolling and adjusted in length depending on the biting response of the school. These lines were fitted with brown “tube” squid lures rigged with 7/0 barbless hooks and three round leads. One heavy trolling rod with Penn International 130 trolling reel was also used for trolling and fished with standard “jet head” style trolling lures. The plastic squids used on the dangles and stern trolling ropes are shown in **Figure 5**.

Handline baskets were available for Hawaiian-style ika shibi and palu ahi fishing but were not used during CP-4. Handreels and handcasters were also available for jigging larger fish, rigged with 400 lb test monofilament backed with Dacron line. An assortment of standup style sportfishing rods and reels were also with a variety of metal jigs that were used to target larger tuna for archival tagging. The most efficient jigging setups used 2-speed conventional fishing reels loaded with 80 and 100 lb test spectra line. Spectra is very effective at jigging sub-surface tuna due to the low drag and non-stretch qualities of the spectra. In order to leader and land the fish, jigs were rigged with 2 to 4 m of 80 – 130 lb fluorocarbon monofilament leader.

A variety of metal jigs were used during the cruise ranging in size from 200 – 350 g. All jigs were rigged with 30 cm of single strand wire to reduce loss to sharks and wahoo. It was found that wiring jigs this way also prevented them from foul hooking the mainline. All jigs were rigged with barbless single 5/0 live bait hooks that were wired to the upper ring of the jig. This setup was found to be far superior to bottom rigged hooks for reducing hooking trauma. Chrome diamond jigs, chrome and luminous and “butterfly” style jigs proved very effective for hooking bigeye tuna, especially during the evening hours. **Figure 6** shows a variety of jigs used during the cruise.

An important consideration in contracting this particular vessel is that the captain of the *Ao Shibi Go* was active in the handline/dangler fishery of the Cross Seamount for several years. This experience was essential for fishing the TAO buoys with the short dangler, handline and jigging gear used during the cruise.

TAGGING and DATA RECORDING

The tagging and data recording gears used during CP-4 are detailed in **Appendix II**. The cruise was supplied with SPC yellow dart tags manufactured by Hallprint Ltd, Pty of Australia for the PTPP. Only size Y-13 tags for fish greater than or equal to 38 cm were used during the cruise. Forty nine Wildlife Computers MK9 archival tags were also available during the cruise for use on bigeye and yellowfin tuna. These tags were configured to sample all depth, temperature and light parameters every 30 seconds. Archival tagged tuna were externally marked with orange 13 cm conventional tags.

Tag release data was recorded on Olympus Digital Voice Recorders (model VN-6200 PC), transcribed to PTPP data sheets and entered into the TAGDAGER Access database. The voice recorder was made waterproof during fishing and tagging operations by protecting the unit with a West Marine waterproof pouch for small cel phones. TAGDAGER files were backed up to a Lacie 80 GB external hard drive.

Three tagging stations were set up on the rear deck of the *Ao Shibi Go* and fitted with closed cell foam pads fitted with vinyl covers marked to 110 CM for measuring fork length of every tag release. A 1.5m measuring caliper and tagging mattress was available for larger tuna. Conventional tagging

stations were set up in the center stern and starboard midships positions. Tags loaded into stainless steel applicators were fastened to the front of tagging cradles for access during tagging operations (**Figure 7**).

A third tagging cradle was set up amidships specifically for archival tagging and supplied with a saltwater hose for irrigating tuna during archival tagging procedures. **Figure 8** shows this tagging cradle with a bigeye tuna being irrigated with the seawater hose and archival tagging supplies fitted to the front of the cradle. One of the bent stalk MK9 archival tags has already been inserted and sewn into the peritoneal cavity.

Aluminum scoop nets with 90 cm ring purpose built by the IATTC were used to land medium size tuna for tagging. These scoop nets were hung with knotless webbing to minimize abrasion and were very efficient at landing tuna up to approximately 100 cm (**Figure 9**). Larger tuna were landed in a 1.8 m sling built on a design developed by Bruno Leroy (SPC-OFP) that has been used successfully on longline vessels and on pole-and-line vessels with high freeboard. **Figure 10** shows the lifting sling in operation.

The cruise leader and tagging technician manned the stern and starboard conventional tagging stations.

Maximum benefit of two taggers was achieved by two crewmen pulling fish for the stern station and one crewman and the Captain landing fish for the starboard tagging cradle. If a tuna suitable for archival tagging was landed it was quickly transferred to the archival tagging cradle and tagged by the cruise leader. Most archival tagging took place at night with fish captured using jigs and sport rods.

GENERAL DESCRIPTION OF CRUISE TRACK AND FISHING ACTIVITY

The track of Cruise CP-4 is found below as **Figure 11** and can be summarized by the following schematic:

Hawaii → NOAA weather buoy 51003 → 170W TAO line (8N, 5N, 2N, 00, 2S, 00, 2N) → Christmas Island → 155W TAO line → (2N, 00, 2S, Malden Island, 5S, Malden Island, 2S, 00, 2N, 5N, 8N) → Washington Island → Palmyra Atoll → Honolulu, Hawaii

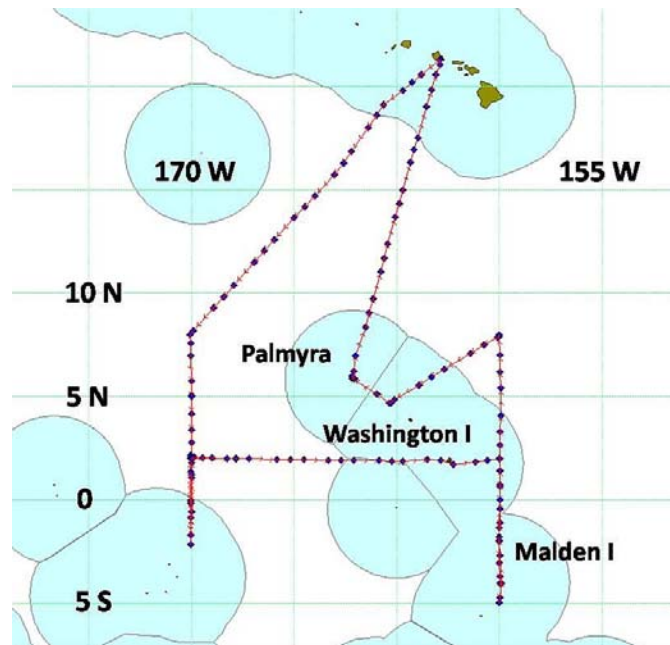


Figure 11. Cruise track during Cruise CP-4, May 1 – June 12, 2010

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

Of the 42 days of charter during CP-4, 21 days were spent steaming from point to point while TAO buoys were checked on 8 other days but had no tuna present. Active searching or fishing occurred on 13 days with tuna being tagged on 12 of those days.

The *Ao Shibi Go* left Honolulu Harbor on the evening of May 1, 2010 with six onboard including Captain Tim Jones, three crewmen, cruise leader David Itano and tagging technician Hearty Matamaru. On May 3 the vessel arrived at NOAA weather buoy 51003 (**Figure 12**) and tested dangler and troll gear landing some bycatch species for consumption. The vessel then steamed directly for the TAO array that lies along the 170°W meridian arriving at the TAO 8N 10W buoy on May 8. No tuna present. Arrived at TAO 5N 170W on May 9 finding a very small school fished for 7 BE and 4 YF. The aggregation was fished at night landing several small fish for biological sampling but none were suitable for tagging due to hook damage with double hook hung from bottom of jig. Steamed south, rigging jigs with single hanging hooks to reduce hook damage.

Arrived at TAO 2N 170W before dawn on May 11 and noted large school of bigeye on sounder. Approached buoy at dawn and fast biting school till noon produced 1520 conventional tag releases, mostly bigeye. Jigged the school that night for 11 archival releases. Fished the school on May 12 but poor biting response for about 200 bigeye releases and 7 bigeye archival tags. Aggregated the school to the vessel and moved a good portion of it south for most of the afternoon. Arrived at TAO 00 170W on May 13 finding a small school resulting in 3 YF releases. Ran south to the 2S 170W position where two TAO buoys are moored finding very strong east current and no tuna present, passing the 00 170W TAO buoy that had no sign of tuna.

Returned to the TAO 2N 170W evening of May 15 and fished it day and night for additional conventional and archival releases (39 BE, 1 YF total). Biting response during day was much reduced. Successfully drifted the aggregation off the TAO buoy on May 17 and was able to tag additional 382 mostly bigeye. The aggregation abruptly left the vessel for unknown reasons and could not be re-located. The TAO 2N 155W was checked again but no tuna were present.

Steamed due east on the 2N line encountering east current that slowed progress to 6 knots. Encountered area of birds and bait at 167 52'W where one YF 132 cm trolled but not tagged and one lost. Passed Christmas Island on May 22 and arrived at TAO 2N 155W on May 23. One small YF jigged but none tagged in strong east current. Noted large school of small pompano dolphinfish (*Coryphaena equiselis*) present and some caught for samples and consumption. Proceeded to TAO 00 155W finding deep layer of DSL, west current, cold SST and lots of squid but no tuna. Proceeded to TAO 2S 155W finding strong SE current and no tuna present.

Trolled Malden Island on May 26 tagging 12 YF with conventional tags and 6 archival tags on good sized fish some over 100 cm. Checked TAO 5S 155W on May 27 but no tuna present. This buoy marked the southernmost point surveyed on the 155W line. Headed north, revisiting to Malden Island where 31 YF conventional tags and 2 archival tags were deployed from troll gear and several were taken for biological samples.

The TAO buoys at 2S, 00 and 2N were revisited with only 2 YF and 1 BE tagged on the Equator TAO and some mahi mahi retained for consumption. Checked TAO buoys at 5N and 8N but no tuna school were present at either location. Two buoys were set at the TAO site at 8N 155W and both were tangled with a longline. Some time was spent clearing and cutting away the longline from both buoys.

On June 1 having checked all the TAO buoys in the area, the vessel turned southwest to visit Washington Island to attempt troll tagging of large yellowfin to use up the remaining archival tags onboard. Washington Island was visited on June 3. Trolling around the entire island produced only

one yellowfin that could not be tagged due to eye damage but was sampled for otoliths and gonads. Fishermen in three aluminum skiffs were contacted and given Kiribati language tagging posters.

The vessel proceeded to Palmyra Atoll where permission to tag tuna was granted under conditions of a research permit arriving on June 4. Pure schools of 8 – 25 kg yellowfin actively feeding on ocean anchovy were located along the south and west coasts within 1 – 3 nm from the reef. 28 yellowfin were trolled and tagged including 11 yellowfin released with archival tags that finished the stock of archival tags onboard. The scientists and crew of the Ao Shibi Go were provided a tour of the facility by the refuge manager and chance to get on dry land for a while.

The vessel departed Palmyra Atoll early June 6 and steamed directly for Honolulu, arriving on June 12 to conclude the cruise.

FISHING TECHNIQUES

The primary fishing gear used during CP-4 was troll and dangler gear during the day and jigging with sport poles and handreels at night. Longline gear was not used during the cruise. Troll and dangler lures were rigged with single 7/0 stainless steel hooks with the barb crimped down for easy removal. Four inch plastic squids were used on the danglers while 7” brown tube squids were rigged to the four rope handlines run from the transom. A 3m fiberglass pole was also used during fishing operations rigged with a feathered, barbless lure typical of tuna pole-and-line operations.

Trolling and dangling commenced before dawn as soon as light was visible on the eastern horizon. Normally, the buoy was circled at 6.5 knots while small quantities of bait (California anchovy or chopped saury) was used to chum forward of the first dangler davit. At times the aggregation was drawn away from the TAO buoy and the school was trolled and jigged while associated with the tagging vessel.

Sub-surface jigging was carried out primarily at night on tuna aggregated to the TAO buoy or the tagging vessel. Jigging usually commenced at 0230 AM and continued until just before dawn when the vessel was prepared for dangling gear and trolling. Jigs were rigged with single hooks on a short section of spectra line or 45kg multistrand wire (see **Figure 6**). The sport poles with spectra line out fished the heavy handline gear most of the time.

TAG RELEASES

Conventional tagging summary

A total of 2411 tropical tuna were tagged and released during CP-4 comprising 2284 bigeye (94.7%), 7 skipjack (0.3%) and 120 yellowfin tuna (5.0%). These totals include 39 bigeye tuna and 20 yellowfin tuna that were released with orange dart tags and Wildlife Computers MK9 archival tags. Y-13 tags were used for conventional tag releases for tuna \geq 38cm accounting for 2245 bigeye, 7 skipjack and 100 yellowfin releases (**Table 1**).

This cruise was unusual in that ninety six per cent (96%) of all tuna were tagged and released on one TAO buoy: the 2N 170W TAO or tuna from that aggregation that had been re-associated to the tagging vessel. The school at this buoy consisted of a dense aggregation of bigeye tuna and bigeye made up 94.7% of all tag releases. The trip was essentially defined by this one aggregation and practically by a single day when 1520 tuna were tagged.

A very small number of tuna were tagged on three other TAO buoys. For example, only one bigeye and two yellowfin were tagged from the 0 155W TAO which were the only tuna tagged from any TAO buoy on the entire 155W line of longitude. Due to the lack of any tuna on the 155W line, three atolls were visited. Yellowfin tuna were found around Malden Island and Palmyra Atoll where the

remaining archival tags were deployed. This information is summarized in **Table 1** and detailed in **Appendix III**. **Figure 13** indicates the distribution of tag releases during the cruise.

Table 1. Tag releases by area and association

Association	Conventional Tags				Archival Tags			Total
	BET	SKJ	YFT	Tot	BET	YFT	Tot	
TAO 5N 170W	7	0	4	11	0	0	0	11
TAO 2N 170W	1861	5	27	1893	39	1	40	1933
Tagging vessel from 2N 170W	376	2	4	382	0	0	0	382
TAO 00 170W	0	0	3	3	0	0	0	3
TAO 00 155W	1	0	2	3	0	0	0	3
Malden Island	0	0	43	43	0	8	8	51
Palmyra Atoll	0	0	17	17	0	11	11	28
TOTALS	2245	7	100	2352	39	20	59	2411

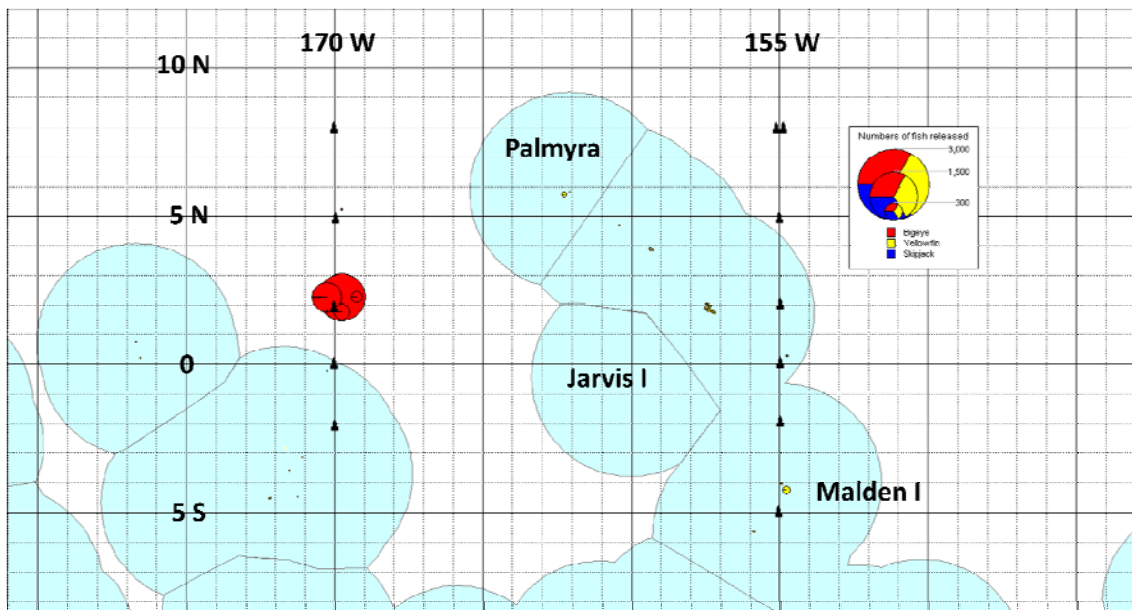


Figure 13. Distribution of tag releases by buoy or location

Archival tagging summary

The cruise was supplied with 59 Wildlife Computers MK9 archival tags. Archival tags were implanted into the peritoneal cavity of yellowfin or bigeye tuna and secured with two sutures. Tuna receiving an archival tag were placed upside down on the central tagging cradle, irrigated with a seawater hose, eyes covered with synthetic chamois, measured and also tagged with an orange 13 cm Hallprint dart tag immersed in Betadine (**Figure 8**). All archival tagging was conducted by the cruise leader assisted by H. Matamaru.

Archival tag release strategy proposed a release of 10 YF and 30 BE on the 170W TAO buoys and 5 YF and 14 BE on the 155W TAO buoys. Unfortunately the reality of tuna large enough for archival tagging resulted in all 39 bigeye archival tags being released on the 2N 170W TAO. Only one

yellowfin large enough for archival tagging was found on the 170W line. The remaining 19 archival tags were all used on yellowfin trolled around Malden Island and Palmyra Atoll.

TAGS DEPLOYED DURING CP-4

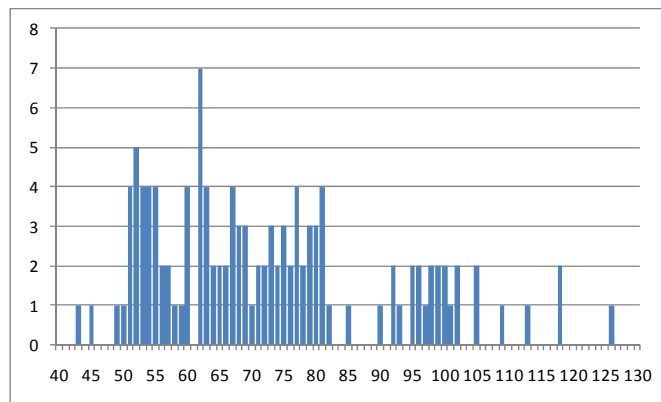
The conventional and archival tags that were used during CP-4 are listed in **Appendix V**.

TAG RECOVERIES

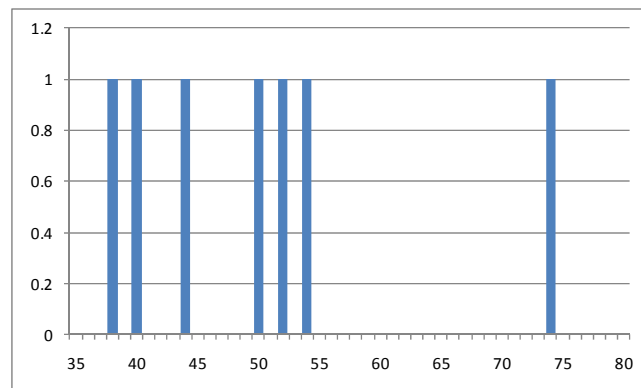
Eleven bigeye tuna that were tagged during the cruise were recaptured by the tagging vessel. All recaptures were made on the TAO buoy at 2N 170W where the bulk of tags were released after one or a few days at liberty. Three of the recaptures were retained and recorded as normal for recaptured tuna. Eight of the recaptured tuna were judged in good condition at time of recapture and were re-released after the original tag number was recorded and the fish re-measured. One of the recaptures was re-released with an archival tag and red conventional tag. Detailed data for all eleven recaptured tuna is recorded in **Appendix VI**.

SIZE DISTRIBUTION OF TAGGED FISH

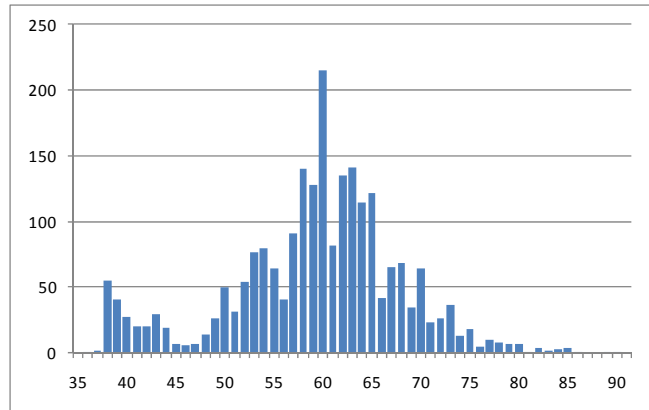
Figure 14 shows the size distribution of all skipjack, yellowfin and bigeye tuna tagged during the cruise. The abundance of bigeye between 55 – 65 cm on the TAO buoy vs the larger yellowfin tagged near oceanic islands is apparent.



Yellowfin n = 120



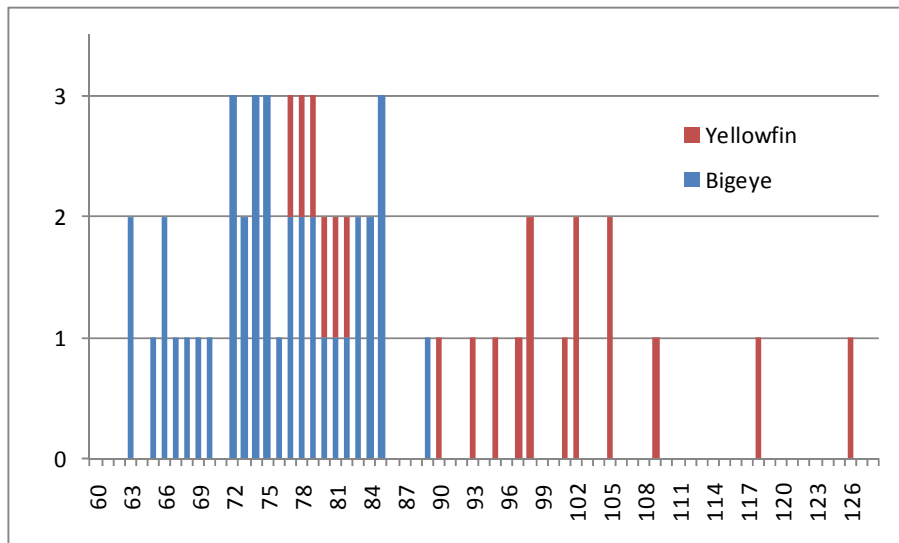
Skipjack n = 7



Bigeye n = 2284

Figure 15 shows the size distribution of archival tag releases that ranged from 63 – 89 cm for bigeye and 77 – 126 cm for yellowfin. For the most part the figure shows the split between the smaller bigeye available on the TAO buoy 2N 170W and larger yellowfin that were caught on troll gear around Malden and Palmyra atolls.

Figure 15. Size distribution of archival tag releases (BE n=39; YF n=20)



BIOLOGICAL SAMPLING

Bigeye and yellowfin tuna judged to be unsuitable for tagging due to injury were retained for biological sampling in support of ongoing research by the SPC on the reproductive biology of bigeye tuna in the WCPO and for PFRP funded NOAA/JIMAR project #651106, examining nursery origin and degrees of movement of yellowfin and bigeye tuna in the central Pacific. Saggital otolith pairs and gonads were extracted and stored for later analysis (**Figure 16**). Otolith sampling was conducted from 33 yellowfin and 46 bigeye tuna of which 21 yellowfin and 22 bigeye gonad samples were taken.

Additional biological sampling was conducted at the request of other researchers that included:

1. whole squid samples, frozen for Dr. William F. Gilley, Stanford University, likely *Sthenoteuthis oualaniensis*
2. whole pompano dolphinfish *Coryphaena equiselis*, frozen for Anela Choy, UH, JIMAR
3. ocean anchovy, *Encrasicholina punctifer*, frozen for Don Kobayashi, PIFSC, NMFS.

UNDERWATER VIDEO AND CRUISE DOCUMENTATION

Cruise CP-4 was well documented with hundreds of digital still pictures (examples used to illustrate this report), digital video (HERO Naked high definition digital video system) and with a Splashcam Marine Video system by Ocean Systems Inc³ (Deep Blue Professional system). The unit consists of a color video camera head tethered to an LCD screen and DVD recording unit that remains on the vessel (**Figure 17**).

RECOMMENDATIONS

The success of this cruise was based entirely on a single aggregation of bigeye tuna on one TAO buoy where 96% of all tags were released. Fortunately these releases were made on the 170W line, which represent a new area of tag releases for the PTPP. This aggregation consisted of a dense aggregation of bigeye that was highly vulnerable to the simple gear types used on the cruise.

Recommendations made following CP-1 suggested that CP cruises should only be considered when conditions on the TAO buoys appear optimal, considering SST, vertical sea temp profiles, local productivity, etc. In reality, these considerations would be difficult to implement due to the need to schedule manpower and personnel far in advance of cruise dates. Also, it is impossible to predict when purse seine vessels may appear and clean out a large school.

For these reasons, the Central Pacific cruises will always be a high risk proposition. However, the chance to tag large numbers of bigeye tuna justify their funding on a regular basis.

Alternatives to tagging yellowfin and bigeye in this region on aggregations other than on the TAO buoys need to be considered and the vessel equipped to accommodate alternate fishing strategies. This cruise proved that troll tagging yellowfin near the oceanic islands is a viable way to target larger yellowfin tuna for archival tags. However, the only small numbers of tuna that can be tagged in this way. Palmyra Atoll seems to be very productive for yellowfin tuna. Future cruises should gain access to Palmyra as a fishing option if the TAO buoys are empty.

Another option would be to make use of other floating object aggregations such as natural logs or drifting FADs. Future cruises should be equipped with GPS locating buoys to mark floating objects if

³ <http://www.splashcam.com/index.htm>

they are located. Another option may be to deploy drifting FADs earlier in the cruise upcurrent of areas that would be visited later.

It is important to keep track of purse seine activity to reduce chances of vessels setting on tagged aggregations and to locate productive areas with drifting FADs. Communication with the FFA VMS office was very good during this cruise and should be established for every CP cruise. A high level of cooperation was also received from the NDBC who provided daily updates of TAO buoy positions to the tagging vessel via email.

The vessel was well equipped this cruise with rubber squids and metal jigs. Terminal gear was fine tuned this trip that should assist future CP cruises. A broader range of hook sizes, steel leader and trolling lures would be advisable for future cruises. Also, the stern could be rigged with two heavy trolling rods instead of the one rod used on this cruise.

Otherwise, the vessel was found to be very well suited to the tagging work. The captain and crew performed extremely well in all aspects of the cruise including assistance with jigging for archival tags and biological sampling. Likewise the tagging technician provided excellent support in all aspects of tagging, biological sampling and data recording. It is recommended that this vessel, captain and tagging personnel be considered for future tagging cruises in the central Pacific.

Attachment I.

REPUBLIC OF KIRIBATI



***License Permit for a Foreign
Fishing Vessel to conduct Tuna
Tagging in the Exclusive
Economic Zone of the Republic
of Kiribati***

License No: KI10-US900212O-748

Issued to: SPC
Address: DP 5
Noumea Cedex, New Caledonia

Vessel Name : **AO SHIBI GO**
Radio Call sign : **WDD 4078**
Registration Number : **554581**
Type of Vessel : **RESEARCH VESSEL**
Gross Tonnage (mt) : **84**
Engine Horsepower : **265**
Registered Length (m) : **18.9**
License Issue Date : **01-May-2010**
License Expiry Date : **15-Jun-2010**



Signature:..........

APPENDIX I. Vessel and gear details

Construction site	Mobile, Alabama
Date of launch	1974
Call sign	WDD4078
Hull style, material	Steel, monohull
Net tonnage	57
Length (overall)	62.1 ft (18.9 m)
Breadth	20.0 ft (6.1 m)
Draft	9.6 ft (2.9 m)
Fuel Capacity	9000 gal
Operating range	6000
Freshwater capacity	500 gal
Speed (cruising)	6.5 kts
Main engine	3406 Caterpillar
Auxiliary generators	John Deere 40 kw, Detroit 371 30 kw
Fresh ice maker	Howe 1 t/day
Desalinator	Offshore Marine Laboratories, 800 gal/day
Fish hold capacity	18 ton
ELECTRONIC GEARS	
Global Positioning System	Garmin 128, Furuno GP 32
Autopilot	ComNav Compilot Commander
Radar	Furuno 48 mile
Fish finder	Furuno 271 (2 units)
Radios vhf	Westmarine 550, ICOM IC-M304
SSB	Furuno FS-1503
Satellite communications	Iridium (2 units) linked to laptop computer
Remote Sensing	Orbmap from Orbimage
Integrated chartplotter and navigation	HIPlotLL
Vessel Monitoring System	Faria Watchdog
FISHING GEARS	
Longline reel	LP 40 mile
Dangler poles	Starboard (3) Port (1)
Misc handlines, short troll lines	
Misc jigs and trolling lures	
Misc sport rods and fishing reels	

APPENDIX II. Tagging and data recording gear

Conventional tags – supplied by SPC	Hallprint plastic dart tags (yellow and orange) Y-13, O-13
Stainless steel applicators	Y-13 size, 170 mm length overall (600)
Archival tags	Wildlife Computers, MK9 (59 pcs) Modified short light stalk, bent at 90°
Archival tagging cradle	110 cm, 107 cm high at highest point
Conventional tagging cradles (2)	110 cm, 107 cm high at highest point
Tagging mattress	100 x 40 cm
Archival tagging sutures	Ethicon PDS II, CP-1 ½ circle, 70 cm violet absorbable suture, # Z467
Tuna lifting sling	1.8 m long x 1.5 m opening
Landing net (2)	90 x 90 cm ring with 1.8 m handle
Laptop PC with TAGAGER software	Dell Latitude E6400
Data recorders	Olympus Digital Voice Recorder VN-6200 PC
Backup hardware	Lacie 80 GB external HD

APPENDIX III. Summary of cruise activity, with number of tagged fish released per day

Date 2010	General Area	Principal Activity	Conventional Tags				Archival			Total Tagged
			(includes archival releases)				Release detail			
			BET	SKJ	YFT	Tot	BET	YFT	Tot	
1-May-10	Depart Honolulu	Steaming	-	-	-	-	-	-	-	-
2-May-10	S Hawaii EEZ	Steaming	-	-	-	-	-	-	-	-
3-May-10	NOAA weather buoy 51003	Test gear	-	-	-	-	-	-	-	-
4-May-10	SSW of Hawaii	Steaming	-	-	-	-	-	-	-	-
5-May-10	SSW of Hawaii	Steaming	-	-	-	-	-	-	-	-
6-May-10	SSW of Hawaii	Steaming	-	-	-	-	-	-	-	-
7-May-10	SSW of Hawaii	Steaming	-	-	-	-	-	-	-	-
8-May-10	TAO 8N 170W	Checking buoy	-	-	-	-	-	-	-	-
9-May-10	TAO 5N 170W	Fishing	7	0	4	11	0	0	0	11
10-May-10	N of Phoenix Is	Steaming	-	-	-	-	-	-	-	-
11-May-10	TAO 2N 170W	Fishing	1493	4	23	1520	0	0	0	1520
12-May-10	TAO 2N 170W	Fishing	255	0	0	255	18	0	18	273
13-May-10	TAO 00 170W	Fishing	0	0	3	3	0	0	0	3
14-May-10	TAO 2S 170W TAO 00 170W	Checking buoys	-	-	-	-	-	-	-	-
15-May-10	TAO 2N 170W	Fishing	2	0	2	4	0	0	0	4
16-May-10	TAO 2N 170W	Fishing	111	1	2	114	21	1	22	136
17-May-10	TAO 2N 170W and southward	Fishing	376	2	4	382	0	0	0	382
18-May-10	High Seas pocket	Steaming	-	-	-	-	-	-	-	-
19-May-10	High Seas pocket	Steaming	-	-	-	-	-	-	-	-
20-May-10	High Seas pocket	Steaming	-	-	-	-	-	-	-	-
21-May-10	High Seas pocket	Steaming	-	-	-	-	-	-	-	-
22-May-10	Christmas Island	Steaming Trolling	-	-	-	-	-	-	-	-
23-May-10	TAO 2N 155W	Checking buoy	-	-	-	-	-	-	-	-
24-May-10	TAO 2N 155W	Checking buoy steaming	-	-	-	-	-	-	-	-
25-May-10	TAO 00 155W TAO 2S 155W	Checking buoy steaming	-	-	-	-	-	-	-	-
26-May-10	Malden Island	Fishing	0	0	12	12	0	6	6	18
27-May-10	Malden Island TAO 5S 155W	Checking buoy fishing	0	0	31	31	0	2	2	33
28-May-10	TAO 2S 155W	Checking buoy	-	-	-	-	-	-	-	-
29-May-10	TAO 00 155W TAO 2N 155W	Fishing checking buoy	1	0	2	3	0	0	0	3
30-May-10	155W longitude	Steaming	-	-	-	-	-	-	-	-
31-May-10	TAO 5N 155W	Checking buoy	-	-	-	-	-	-	-	-
1-Jun-10	TAO 8N 155W	Checking buoys	-	-	-	-	-	-	-	-
2-Jun-10	Kiribati EEZ	Steaming	-	-	-	-	-	-	-	-

3-Jun-10	Washington I	Searching Fishing	0	0	0	0	0	0	0	0
4-Jun-10	Palmyra Atoll	Searching Fishing	0	0	3	3	0	4	4	7
5-Jun-10	Palmyra Atoll	Searching Fishing	0	0	14	14	0	7	7	21
6-Jun-10	North of Palmyra	Steaming	-	-	-	-	-	-	-	-
7-Jun-10	South of Hawaii	Steaming	-	-	-	-	-	-	-	-
8-Jun-10	South of Hawaii	Steaming	-	-	-	-	-	-	-	-
9-Jun-10	South of Hawaii	Steaming	-	-	-	-	-	-	-	-
10-Jun-10	South of Hawaii	Steaming	-	-	-	-	-	-	-	-
11-Jun-10	Hawaii EEZ	Steaming	-	-	-	-	-	-	-	-
12-Jun-10	Oahu, Hawaii	In port	-	-	-	-	-	-	-	-
TOTALS			2245	7	100	2352	39	20	59	2411

APPENDIX IV. Daily activities summary from Daily Log entries

1-May-10

Final loading and preps this afternoon. Depart Honolulu Harbor to begin CP4 at 1930 hrs. Onboard David Itano, Cruise Leader, Hearty Matamaru, tagger and SPC contractor. Captain Tim Jones. Crew consists of Swinden Ezra, Tiweity (Dwight) Dewey and Ehren Drnest.

2-May-10

Uneventful, steaming sw all day in light rain. Rigged jigging rods, line and jigs. Set up dangles and dangler squids in evening.

3-May-10

Arrived at NOAA weather buoy 51003 at 0400. Tested dangle and short troll gear, landing 5 mahi, 1 small bigeye and some rainbow runner for kai kai fish. Good shakedown test for the gear. School of small 2-3 kg bigeye and yellowfin present. Steaming SSW all day in light rain. Rigged more tagging and fishing gear.

4-May-10

Steaming all day with seas quartering from port stern. General preps, marked tagging mattresses, rigged baiting leaders, wired jigs, rigged PL gear. Updated Tagdager with tag inventory.

5-May-10

Steaming all day with minor gear preps and rigging. Passed one vessel in night and passed close to Honolulu based US longline vessel at 0900 on opposite course (red hull, white lettering)

6-May-10

Steaming all day, uneventful. Passed vessel #3 Kyung Yang at 2030 hrs, likely DWFN longline vessel.

7-May-10

Steaming all day. Transferred 500 gallons of diesel from deck storage to tanks. Made final rigging adjustments to tagging stations and fishing gear.

8-May-10

Arrived at TAO buoy 8N 170W around 0750. Fished school #2 but apparently no tuna present and no tagging. One juvenile amberjack caught on starboard stoll handline and retained for consumption. Only a small mark on sounder down to 10 f, likely non-tuna bycatch species. Buoy in good condition. One white Sampson braided line tied to A frame but likely from the NOAA ship. No signs of tampering.

9-May-10

Arrived at the 5N 170W TAO buoy and started fishing 1221. Small mark on sounder down to 20 fathom. A few fish bit, slow and apparently not a lot present. Total 7 BE, 4 YF tagged. Tied up in evening to jig, landing a dozen BE and YF but most only suitable for bio samples. Underway at 2200 headed south.

10-May-10

Steaming south all day.

11-May-10

Checked TAO 2N 170W at 0200 with sounder. Large dense red mark from 20 - 30 fathoms and covering a good area surrounding the buoy. Pulled away and approached at dawn. Almost pure school of bigeye came up and bit hard for most of the morning amid intermittent ran squalls. Most fish around 60 cm with a few up to 80. Afternoon threw the parachute and fished school for slower biting school. Returned to TAO buoy in afternoon and tied up. Took care of many bio samples (otoliths and gonads) and ended up with total conventional tag releases for day BET 1493, YF 23, SJ 4 for 1520 total releases.

12-May-10

Up at 0300 jigging. Better sized bigeyes bit well and archival tagged 11 up to 85 cm. Morning bite was disappointing compared to yesterday but managed around 200 bigeye releases. Drifted the school away and jigged up 7 more bigeye archival tag releases. Moved the school south with current and ran with them at 5

knots for over ten miles. The school remained with the vessel several more hours at 7 knots until the school no longer appeared on sounder or in front of vessel.

13-May-10

Arrived at TAO 00 170W at 0200, small mark on sounder. Fished at dawn, a few on troll gear, tagged 3 YF, sampled 2. No mahi, ono or other fish seen. Left buoy and headed south to check TAO 2S 170W.

14-May-10

Running south from equator to 2S all day. At 0200 checked two TAO buoys at 2S 170W position. Very strong east current and no fish sign at all. Turned around and headed back north at 0230. The Spanish purse seine vessel Panama Tuna (Albacora company) crossed our course at 1000 on easterly course. Captain of vessel contacted by vhf, stated they had Kiribati access, no fish in area, headed to Christmas Island and then probably headed east. Checked TAO 00 170W at 2030. One knot ENE current, no fish on sounder.

15-May-10

Steaming all night and day back north to the TAO 2N 170W, arriving in mid afternoon. Decent mark on sounder, dark red to 40f. Tried drop camera and took video and watched school at 20 fathoms, observing several tagged tuna. Tried trolling and dangling the school from 1730 but only two small yellowfin tagged trolling a popper on light line. Tied up at 1945 to jig.

16-May-10

Started at 0300 jigging bigeye for archival tags, switching to trolling and dangles at sunrise for slow biting school, mostly small fish. Drifted away from TAO buoy during day but tested drop camera and underwater GoPro video on buoy aggregation. Many tagged fish seen in video. After sunset more jigging on TAO buoy to finish quota of MK9 archival tags on the 170W line for 39 BET and 1 YFT. Disappointing only one yellowfin but simply no larger yellowfin on these aggregations.

17-May-10

Gathered aggregation under boat with all deck and boom lights. Several small silky sharks, rainbow runner and triggerfish seen. Drifted aggregation off TAO buoy at 0230 and set parachute drifting far from TAO by sunrise. Large dense red mark on sounder. Good dangler and troll bite at dawn but mostly smaller fish. Started steaming at 3.5 knots NNE and larger bigeye came up for good troll bite. Continued to move school northeast for twelve miles when it abruptly left the boat for unknown reasons. Returned to TAO 2N 170 W to check but no school or bycatch present; the sounder screen completely blank. Uncertain as to where the school was but set course toward Christmas Island at 1330. Steaming east in rough head seas all day and night.

18-May-10

Steaming east all day headed toward Christmas Island and the 170W TAO line. Encountered area of birds around 2N 167 52W in mid morning. Put out troll lines and double hookup. Landed one yellowfin on heavy troll gear 132 cm FL retained for consumption. Second yellowfin similar in size lost at boat. Large ocean anchovy in fresh condition found in stomach of retained YF. Noted at 1600, 2N 167W very green surface water. Steaming eastward all night.

19-May-10

Steaming east all day toward 170W TAO buoys.

20-May-10

Steaming east all day toward Christmas Island. Slow going, around 6 knot average. Email communications down for three days due to problem with service provider. Entered the Kiribati EEZ today of the Line Islands. Notified Kiribati Fisheries of entry by relay through home office.

21-May-10

Steaming east all day toward Christmas Island.

22-May-10

Steaming east today, sighting SW end of Christmas Island at 1300. Steamed along south shore of atoll all afternoon, clearing the SE point of the atoll at 1900. Proceeded ENE toward 2N 155W all night.

23-May-10

Arrived at the 2N 155W TAO buoy at 1830. Bird school of noddies and frigate birds upcurrent of buoy at sunset. Small mark on sounder and very strong easterly current. Tried jigging in evening one YF at 32 cm caught. School of small pompano dolphinfish (*Coryphaena equiselis*) around buoy and several caught for consumption. Interesting to note that males and females appeared to be mature at only 20 cm FL.

24-May-10

Tried trolling TAO 2N 155W at dawn but no response at all. Departed buoy at 0630 headed south toward equator TAO.

25-May-10

Arrived at TAO 00 155W at 0130 hrs. Very little current discernable with wide band of DSL from 0-20 fathoms on sounder. No evidence of any tuna or bycatch on sounder, visually on surface or by jigging. Lots of squid came to the lights of vessel and one jigged and preserved as sample. Appears to be *Sthenoteuthis oualaniensis*. SST very cold at 26.7 C. Left buoy at 1340 and steaming south all day toward next TAO buoy at 2S 155W. Arrived at TAO 2S 155W at 1940. Strong SE current. Tiny mark on sounder, no DSL present. Four mahi and 8 rainbow runner observed next to buoy swimming hard against current. One mahi caught on jig and retained for consumption. Left buoy at 2035 headed south.

26-May-10

Steaming south from the TAO 2S 155W, arriving at Malden Island at 1400. Trolled north and east shores in NW to SE direction. Trolled 12 conventional and 6 archival YF. Headed south at sunset toward 5S TAO.

27-May-10

Arrived at TAO 05S 155W at 0230. Moderate SW current. No tuna on sounder or caught. About 8 mahi mahi and some rainbow runner seen near buoy. Left the TAO at 0300 steaming north to arrive at Malden Island at 1125 AM. Trolled around the atoll from southeast corner, up west coast and around north and east shores. Sighted ruins of house and buildings on northwest corner. Trolled YF: 31 conventional and 2 archival tags deployed. Left Malden Island at 1850 headed north toward TAO 2S 155W.

28-May-10

Steaming north to arrive at TAO 2S 155W at 1200. Small school of mahi present with two caught on bait. No tuna seen on sounder or caught. Moderate west current. At 0114' S a strong westerly current encountered, likely the Equatorial countercurrent. Steaming north for the rest of the day.

29-May-10

Arrived at TAO 00 155W at 0445. Moderate SW current, low SST at 27.1 with thick layer of DSL as before. One YF jigged and tagged. Trolled at dawn and tagged one more YF and one small BE. Left the TAO buoy at 0640 running north. Arrived at TAO 02N 155W at 2250. No tuna sign but large school of pompano dolphinfish on surface. Baited 62 mahi, all very small fish around 20 - 35 cm. Retained 6 for samples and the rest for consumption. Running north toward 5N 155W.

30-May-10

Steaming north all day toward TAO 5N 155W. Passed area of vessels near 3N to 3 10'N on the 155W line. Three confirmed as asian longline vessels, one radar target likely same. Believed to be Taiwanese but no confirmed identity.

31-May-10

Arrived at TAO 5N 155W at 0140. Almost no current, calm but no tuna present. One squid (*S. oualaniensis*) jigged and one jig lost to shark biteoff. Steaming all day north toward TAO 8N 155W. Steaming northward all day in NE Trades and increasing Trade Wind swell.

1-Jun-10

Arrived at the first of two TAO 8N 155W buoys at 0200 at position 0755.3N, 15459.9W. Longline gear tangled in buoy. No tuna present, only mahi mahi. Checked the second TAO buoy at position 0758.8W, 15500.4W, also tangled with some longline gear. Retrieved LL gear and cut free. Returned to first TAO buoy and retrieved 4 floats, several branchlines and mainline with radio buoy. Large

school of mahi mahi present but not biting bait. Two caught on surface jigs. Left buoy at 0530 steaming SW toward Washington Island.

2-Jun-10

Steaming SW all day in rain towards Washington Island.

3-Jun-10

Arrived at SE corner of Washington Island and started trolling 0800. Circled atoll in clockwise direction. Landed one 65 cm YF that was sampled, lost two YF and had two ono hits but no catch. Trolled around extensive shallow shelf off western end of island. Contacted three aluminum skiffs that were trolling the shelf, gave them cigarettes and PTPP tagging posters in Kiribati language. Steaming toward Palmyra all afternoon and evening.

4-Jun-10

Arrived off Palmyra before dawn and started trolling off SW corner at dawn. Found bird schools and yellowfin about 2 miles south of western reef, tagging 3 with archival and 4 with conventional tags. Entered lagoon at mid-day and met with the US Fish and Wildlife Service refuge manager and The Nature Conservancy staff. Tied up on mooring buoy off Cooper Island and were allowed ashore to look around and were given orientation tour. Dinner ashore hosted by TNC and USFWS.

5-Jun-10

Underway by 0430 and out of Palmyra channel at 0500. Ran to SE corner of atoll south of Barren Island where large bird schools were reported yesterday. Followed birds east but no fish sign. Searched east and found boiling schools of yellowfin 4 miles south of the atoll feeding on small ocean anchovy. Three yellowfin archival tagged quickly before schools went down and dispersed. Ran in to channel entrance where we picked up USFWS and The Nature Conservancy staff Amanda Meyer, Kydd Pollock and Jordon Jokiel. Found yellowfin schools off west end and finished all archival tags; total 7 archival and 14 conventional tags to end cruise. Tied up at Palmyra main wharf at 1700 for the evening.

6-Jun-10

Depart Palmyra Atoll at 0830. Steaming all day north toward Hawaii.

7-Jun-10

Steaming north all day toward Hawaii. Increasing tradewinds and seas.

8-Jun-10

Steaming north towards Hawaii.

9-Jun-10

Steaming north all day towards Hawaii.

10-Jun-10

Entered Hawaii EEZ, steaming north all day.

11-Jun-10

Steaming north all day toward Honolulu

12-Jun-10

Arrive and dock in Honolulu Harbor, end of CP-4

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APPENDIX V. Conventional and archival tags used during CP-4

Tag type	Tag Prefix	No. From	No. To	Quantity
Y13	P	65464	65498	35
Y13	P	65582	65599	18
Y13	P	165891	165999	109
Y13	P	166186	167882	1697
Y13	P	167901	167950	50
Y13	P	168001	168200	200
Y13	P	181001	181250	250
Total Y13 Releases				2359
Total Unused Tags				6
O13	P	168598	168599	2
O13	P	168601	168657	57
Total Orange 13				59

School No	Location	Species	FL	Date	Time released	Red tag	MK 9
6	TAO 02N-170W	B	72	5/12/2010	0309	P168598	1090052
6	TAO 02N-170W	B	78	5/12/2010	0324	P168599	1090081
6	TAO 02N-170W	B	80	5/12/2010	0339	P168601	1090082
6	TAO 02N-170W	B	85	5/12/2010	0347	P168602	1090083
6	TAO 02N-170W	B	78	5/12/2010	0355	P168603	1090085
6	TAO 02N-170W	B	81	5/12/2010	0407	P168604	1090084
6	TAO 02N-170W	B	74	5/12/2010	0502	P168605	1090086
6	TAO 02N-170W	B	73	5/12/2010	0519	P168606	1090087
6	TAO 02N-170W	B	85	5/12/2010	0528	P168607	1090090
6	TAO 02N-170W	B	75	5/12/2010	0537	P168608	1090091
6	TAO 02N-170W	B	82	5/12/2010	0542	P168609	1090088
8	TAO 02N-170W	B	83	5/12/2010	1037	P168610	1090089
8	TAO 02N-170W	B	74	5/12/2010	1042	P168611	1090092
8	TAO 02N-170W	B	75	5/12/2010	1051	P168612	1090093
8	TAO 02N-170W	B	76	5/12/2010	1056	P168613	1090095
8	TAO 02N-170W	B	79	5/12/2010	1103	P168614	1090096
8	TAO 02N-170W	B	84	5/12/2010	1109	P168615	1090115
8	TAO 02N-170W	B	89	5/12/2010	1120	P168616	1090116
12	TAO 02N-170W	B	70	5/16/2010	0323	P168617	1090097
12	TAO 02N-170W	B	85	5/16/2010	0330	P168618	1090098
12	TAO 02N-170W	Y	78	5/16/2010	0340	P168619	1090099
12	TAO 02N-170W	B	69	5/16/2010	0346	P168620	1090100
12	TAO 02N-170W	B	73	5/16/2010	0353	P168621	1090111
12	TAO 02N-170W	B	79	5/16/2010	0354	P168622	1090112
12	TAO 02N-170W	B	65	5/16/2010	0403	P168623	1090113
12	TAO 02N-170W	B	67	5/16/2010	0427	P168624	1090114
12	TAO 02N-170W	B	65	5/16/2010	0459	P168625	1090117
12	TAO 02N-170W	B	72	5/16/2010	0602	P168626	1090119
14	TAO 02N-170W	B	77	5/16/2010	1635	P168627	1090120
14	TAO 02N-170W	B	75	5/16/2010	1640	P168630	1090121

14	TAO 02N-170W	B	84	5/16/2010	1646	P168628	1090122
14	TAO 02N-170W	B	74	5/16/2010	1657	P168629	1090123
14	TAO 02N-170W	B	83	5/16/2010	1704	P168631	1090124
14	TAO 02N-170W	B	72	5/16/2010	1728	P168632	1090126
15	TAO 02N-170W	B	66	5/16/2010	2015	P168633	1090127
15	TAO 02N-170W	B	63	5/16/2010	2031	P168634	1090128
15	TAO 02N-170W	B	68	5/16/2010	2043	P168635	1090129
15	TAO 02N-170W	B	77	5/16/2010	2047	P168636	1090130
15	TAO 02N-170W	B	66	5/16/2010	2106	P168637	1090131
15	TAO 02N-170W	B	63	5/16/2010	2120	P168638	1090132
17	Malden Island	Y	77	5/26/2010	1415	P168639	1090144
17	Malden Island	Y	82	5/26/2010	1500	P168640	1090145
17	Malden Island	Y	90	5/26/2010	1605	P168641	1090133
17	Malden Island	Y	126	5/26/2010	1710	P168642	1090134
17	Malden Island	Y	118	5/26/2010	1732	P168643	1090135
17	Malden Island	Y	109	5/26/2010	1758	P168644	1090137
18	Malden Island	Y	95	5/27/2010	1235	P168645	1090140
18	Malden Island	Y	105	5/27/2010	1317	P168646	1090141
20	Palmyra Atoll	Y	102	6/4/2010	0650	P168647	1090142
20	Palmyra Atoll	Y	102	6/4/2010	0655	P168648	1090143
20	Palmyra Atoll	Y	97	6/4/2010	0715	P168649	1090146
20	Palmyra Atoll	Y	101	6/4/2010	0723	P168650	1090147
21	Palmyra Atoll	Y	81	6/5/2010	0815	P168651	1090148
21	Palmyra Atoll	Y	79	6/5/2010	0819	P168652	1090149
21	Palmyra Atoll	Y	98	6/5/2010	0821	P168653	1090136
21	Palmyra Atoll	Y	80	6/5/2010	0901	P168654	0990487
21	Palmyra Atoll	Y	98	6/5/2010	1038	P168655	1090125
21	Palmyra Atoll	Y	93	6/5/2010	1344	P168656	1090139
21	Palmyra Atoll	Y	105	6/5/2010	1408	P168657	0990004

APPENDIX VI. Tag recaptures during CP-4

Tag No.	Species	Fork Length (cm)	Date caught	School number	Position		Finder	Fish status
					Lat	Lon		
P166772	B	55	16-May-10	11	0159.800N	17000.100W	Dwight	re-released
P165993	B	na	16-May-10	12	0200.200N	17001.200W	Swinden	re-released
P166295	B	na	16-May-10	12	0200.200N	17001.200W	Tim	re-released
P166582	B	57	16-May-10	12	0201.200N	17001.700W	Swinden	retained
P181128	B	62	16-May-10	12	0201.200N	17001.700W	Ehren	retained
P181191	B	na	16-May-10	12	0200.200N	17001.200W	Ehren	re-released
P165942	B	57	16-May-10	14	0201.100N	17001.500W	Tim	re-released
P66599	B	57	16-May-10	14	0201.100N	17001.500W	Dwight	re-released
P166433	B	66	16-May-10	15	0201.200N	17001.700W	Dwight	re-released w archival
P167304	B	64	16-May-10	15	0201.200N	17001.700W	Swinden	re-released
P167568	B	44	17-May-10	16	0202.500N	17003.200W	Ehren	retained

FIGURES

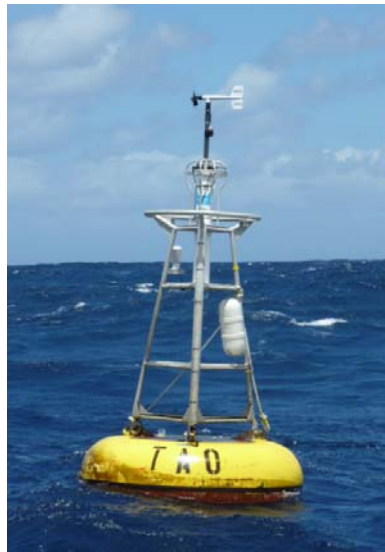


Figure 1. Typical NOAA/TAO buoy visited during CP-4



Figure 2. *Ao Shibi Go* provisioning in Honolulu



Figure 3. The Double D used for CP-1 and CP-2 and the Ao Shibi Go chartered for CP-3 and CP-4

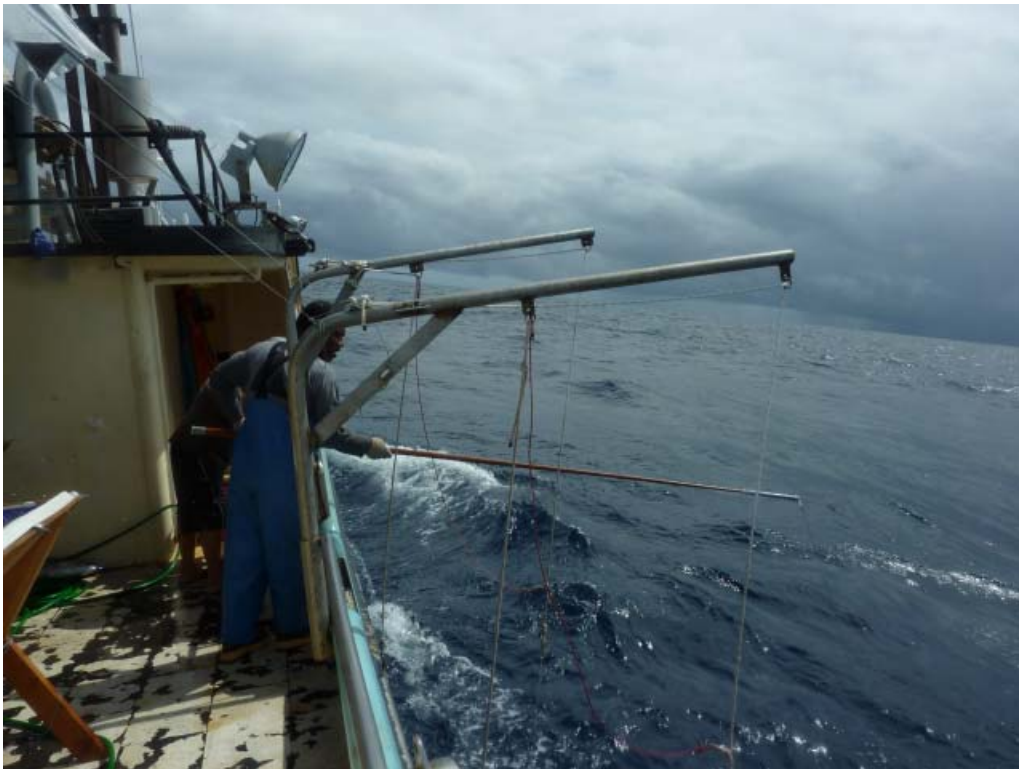


Figure 4. Two dangler poles and tuna pole in operation.



Figure 5. Plastic squid lures used on dangles and short troll lines



Figure 6. Metal jigs used to capture larger tuna for archival tagging



Figure 7. Conventional tagging cradle



Figure 8. Archival tagging cradle and gear



Figure 9. Long handled scoop net in action



Figure 10. Lifting sling landing tuna for archival tagging

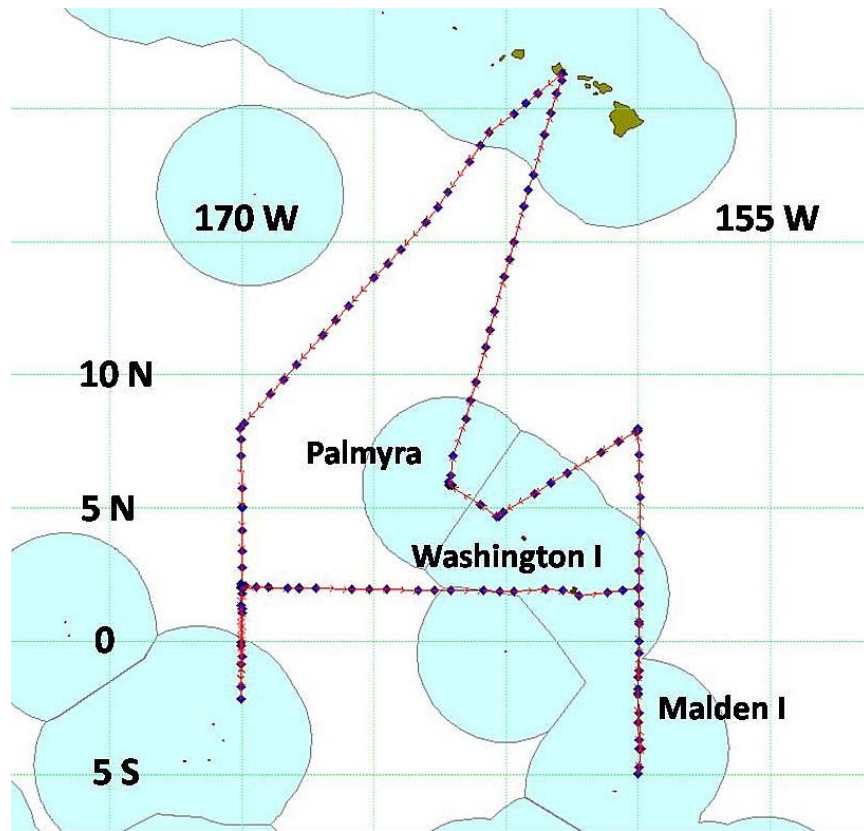


Figure 11. Cruise track during CP-04, May 1 - June 12 2010



Figure 12. NOAA weather buoy 51002 in the Hawaii EEZ

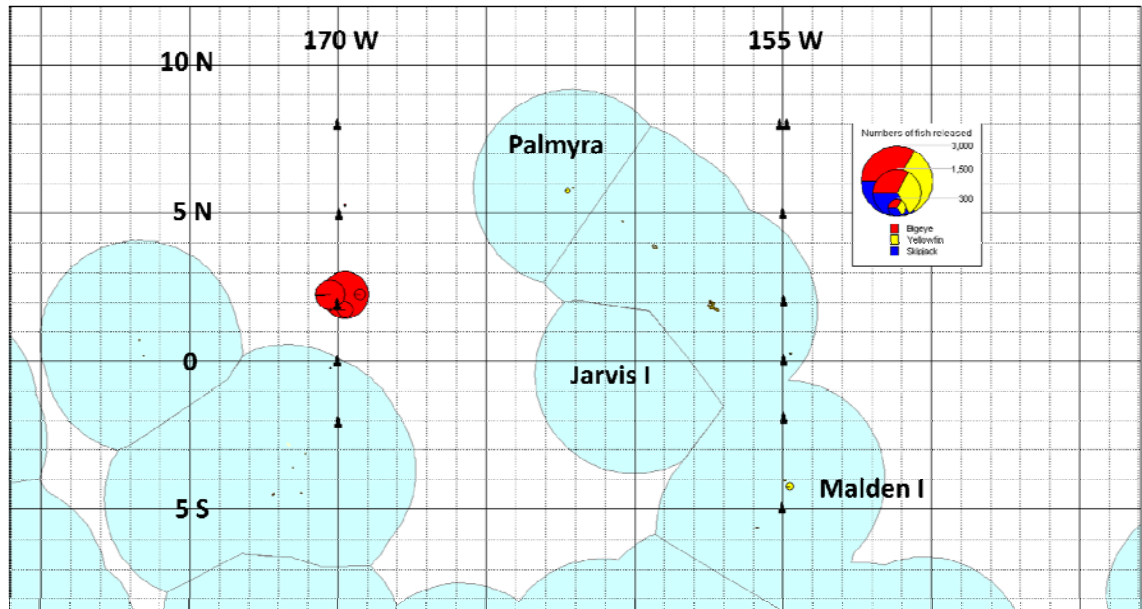
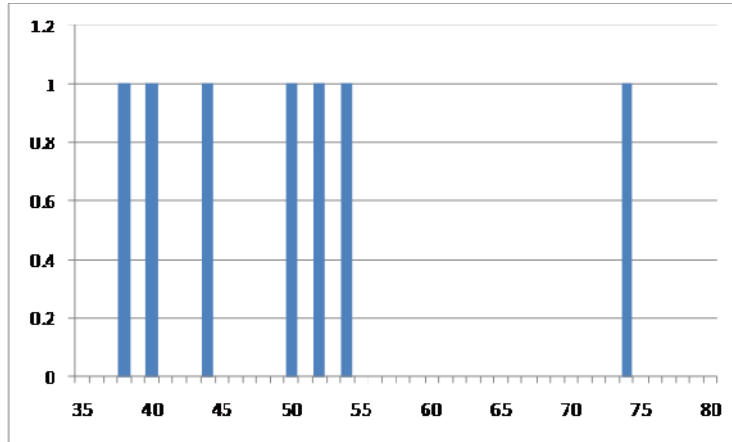
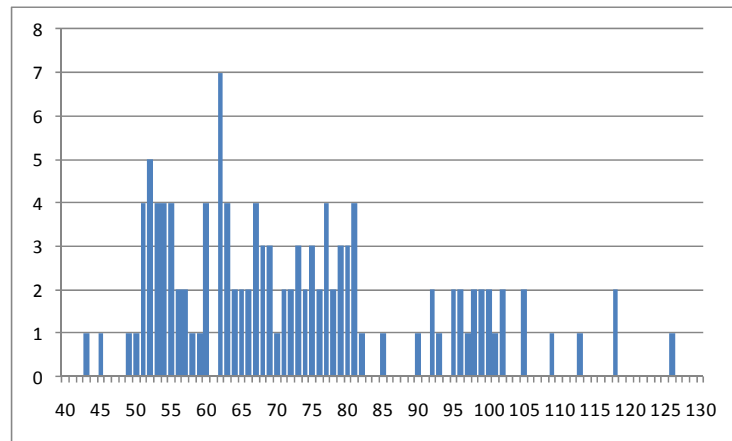


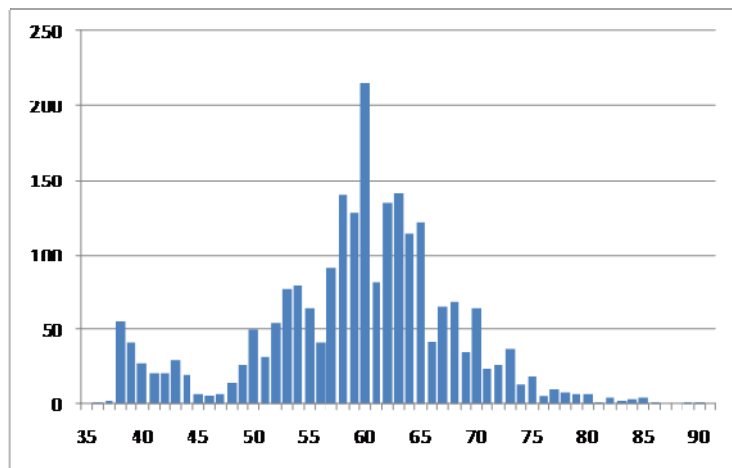
Figure 13. Distribution of tag releases by buoy or location



Skipjack n = 7



Yellowfin n = 120



Bigeye n = 2284

Figure 14. Length frequency of skipjack, yellowfin and bigeye tuna tagged during CP-4

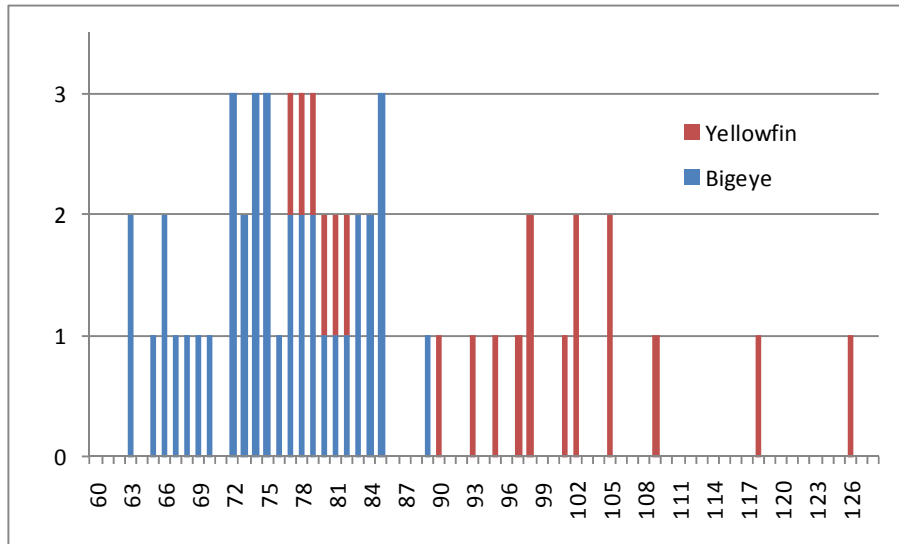


Figure 15. frequency of yellowfin and bigeye tuna released with archival tags during CP-4 (BE n=39; YF n=20)



Figure 16. Biological sampling of tuna for otoliths and gonads



Figure 17. SplashCam recording and viewing system (left) and camera head with GoPro Naked video camera attached (right)