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PACIFIC TUNA TAGGING AND PNG TAGGING PROJECT PROGRESS REPORT AND WORKPLAN FOR 2012-2013

WCPFC-SC8-2012/RP-PTTP-02

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Introduction

The steering committee report for the Pacific Tuna Tagging Programme (PTTP) for 2012 reports upon the tagging activities undertaken in 2011 under the banner of the PTTP, tag recoveries, and tag seeding activities. The objectives of the PTTP are specified in SC6-GN-IP-04. Funding support for the PTTP has been provided by the PNG National Fisheries Authority, New Zealand Aid Agency, the Government of the Republic of Korea, Australian Centre for International Agricultural Research, European Community 8th European Development Fund, European Community 9th European Development Fund, European Community 10th European Development Fund, the French Pacific Fund, the Government of Taiwan, Heinz Australia and the Global Environment Facility.

In 2011, SPC and the PNG National Fisheries Authority (NFA) began a three-year tag release programme in the PNG EEZ, funded by NFA. This new project, referred to here as the PNG Tagging Project (PNGTP) is considered under the umbrella of the PTTP and is reported in this annual report. The PNGTP will extend the time series of tagging in PNG since the beginning of the PTTP in mid-2006 to 7+ years. The objectives of this work are consistent with those of the PTTP; however the work will be primarily focused on providing the data resources to assess the status of tuna resources in PNG for national tuna fisheries management. The data will also contribute to the wider WCPO assessment of tuna stocks.

The overall operational structure of the PTTP is as follows (with planned work for 2012-13 shown in red):

	Time period	**Operational area**	**Tagging vessel**
Phase 1	Aug – Nov 2006	PNG	*Soltai 6*
	Feb – May 2007	PNG	*Soltai 6*
	Oct – Nov 2007	Solomon Islands	*Soltai 6*
	Feb – Mar 2008	Solomon Islands	*Soltai 6*
	Apr 2008	Solomon Islands	*Soltai 105*
Phase 2 (to date)	May – Jun 2008	Central Pacific (CP1)	*Double D*
	Jun – Nov 2008	Western Pacific (WP1)	*Soltai 105*
	Mar – Jun 2009	Western Pacific (WP2)	*Soltai 105*
	May – Jun 2009	Central Pacific (CP2)	*Double D*
	Jul – Oct 2009	Western Pacific (WP3)	*Soltai 105*
	Oct – Nov 2009	Central Pacific (CP3)	*Aoshibi Go*
	May – Jun 2010	Central Pacific (CP4)	*Aoshibi Go*
	Oct – Nov 2010	Central Pacific (CP5)	*Pacific Sunrise*
	Oct 2011	Central Pacific (CP6)	*Pacific Sunrise*
	Nov – Dec 2011	Central Pacific (CP7)	*Aoshibi Go*
	Sep – Oct 2012	Central Pacific (CP8)	*Pacific Sunrise*
PNGTP	Apr – Jul 2011	PNG (PNGTP1)	*Soltai 105*
	Jan – Mar 2012	PNG (PNGTP2)	*Soltai 105*
	Aug 2012	PNG (TAO trial)	*FTV Pokajam*
	Feb- Apr 2013	PNG (PNGTP3)	*Soltai 105*

The report provides a review of work undertaken in 2011-12, an update of the overall programme results to date and the proposed workplan for the PTTP (including the PNGTP) for 2012-2013.

Summary of PTTP Activities in 2011-2012

Since SC7, PTTP activities comprised two handline cruises, CP6 and CP7, in the tropical central Pacific, the second pole-and-line cruise of the PNGTP, continued implementation and refinement of tag recovery processes and tag seeding, and data preparation for use in WCPO skipjack, yellowfin and bigeye tuna stock assessments.

CP6 was a cruise of 4 weeks duration conducted in Oct 2011 targeting bigeye tuna aggregations associated with the TAO oceanographic moorings (Figure 1) straddling the Equator at 170ºW and 180º. The Tonga-based multipurpose vessel *Pacific Sunrise* was chartered for the cruise. A total of 3,929 tuna (3,804 bigeye, 123 yellowfin and 2 skipjack) were tagged (Table 1). All releases were made at the Equator and 2°S moorings of the 170°W and the 180°. Within these releases, 51 and 2 archival tags were deployed respectively on bigeye and yellowfin tuna.

CP7 was a cruise of 6 weeks duration conducted in collaboration with the IATTC in Nov-Dec 2011 targeting bigeye tuna aggregations associated with the TAO oceanographic moorings (Figure 1) straddling the Equator at 155ºW and 140ºW. The Hawaii-based multipurpose vessel *Aoshibi Go* was chartered for the cruise. A total of 4,509 tuna (4,212 bigeye, 245 yellowfin and 52 skipjack) were tagged (Table 1). Most of the releases (88%) were made at the Equator/140°W mooring. Within these releases, 207 archival tags were deployed respectively on 92 bigeye, 85 yellowfin and 30 skipjack tuna.

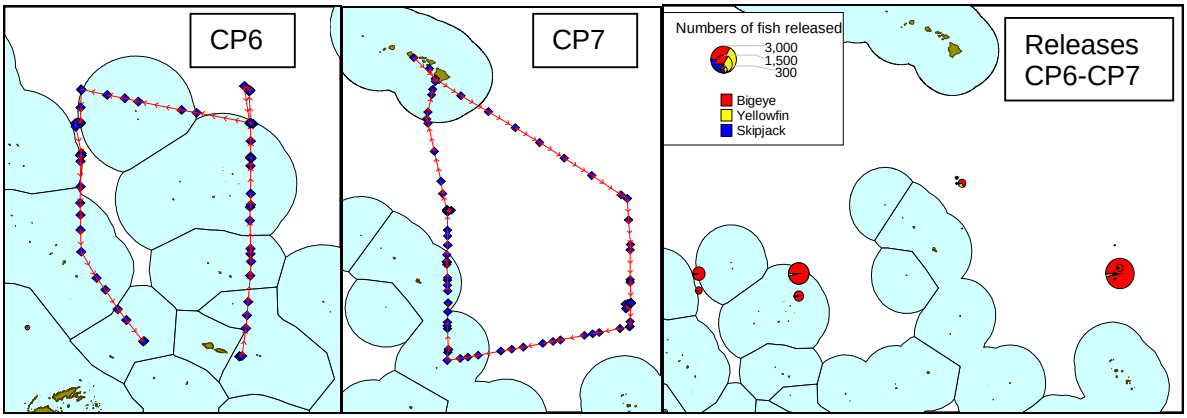


Figure 1. Cruise tracks and distribution of tag releases during CP6 & CP7.

The second cruise of the **PNGTP** (PNGTP2) was conducted over two months from Jan to March 2012, using the chartered pole-and-line vessel, *Soltai 105*. The cruise was designed to release conventional tags across 4 areas within the PNG EEZ (Figure 2). A total of 39,925 tuna (28,310 skipjack, 9,607 yellowfin, 2,008 bigeye) were tagged during PNGTP2 (Table 1). The distribution of releases is shown in Figure 2. Within these releases, 27 fish (19 yellowfin and 8 bigeye) received an archival tag. Archival tagging in Solomon Sea region for yellowfin was undertaken in collaboration with CSIRO.

Table 1. CP6, CP7, PNGTP2 and total PTTP releases to date of conventional and archival tags.

Project	Tag type	Skipjack	Yellowfin	Bigeye	Total
CP6	**Conventional**	2 (0.05%)	121 (3.1%)	3753 (96.8%)	**3876**
	Archival		2	51	**53**
CP7	**Conventional**	22 (0.5%)	160 (3.7%)	4120 (95.8%)	**4302**
	Archival	30	85	92	**207**
PNGTP2	**Conventional**	28310 (70.9%)	9588 (24%)	2000 (5.1%)	**39898**
	Archival		19	8	**27**
Total PTTP	**Conventional**	223,182 (63%)	99,456 (28%)	33,534 (9%)	**356172**
	Archival	127	529	656	**1,312**

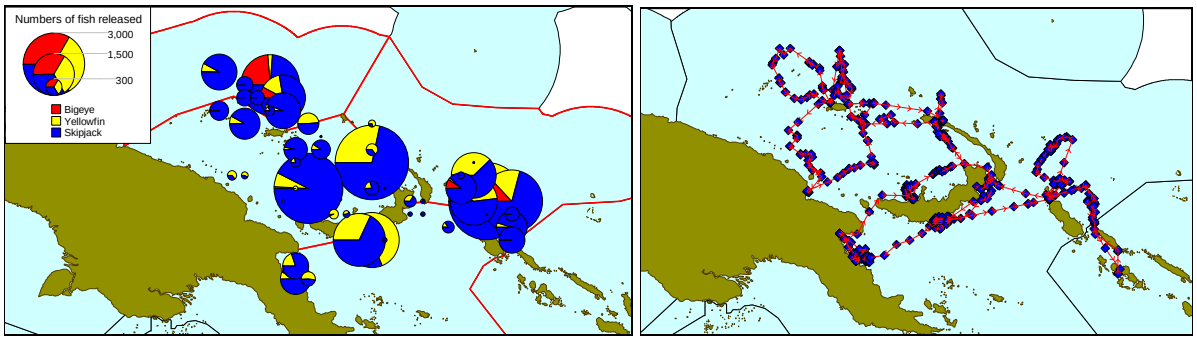


Figure 2. Left Panel. Distribution of tag releases during PNGTP2. The red lines show the delineation of the EEZ and sub regions. Right Panel. Cruise track during PNGTP2.

PNGTP2 also provided an opportunity to collect an additional 414 stomach samples (Table 2) as part of a long-term project to characterize the trophic status of the western and central Pacific pelagic ecosystem. Since the beginning of the PTTP in 2006, 4,575 stomach samples have been collected, mainly from skipjack, yellowfin, bigeye and albacore tuna (Table 3). The examination of the stomachs is an ongoing process and is conducted in the laboratory at SPC headquarters. A total of 3,375 stomach, representing 74% of the samples collected, have been examined and corresponding data entered in a dedicated database (see Table 3).

Table 2. Number of stomach samples collected during PNGTP2.

PREDATOR SPECIES		COLLECTED
SKJ	SKIPJACK	194
YFT	YELLOWFIN	143
KAW	KAWAKAWA	22
RRU	RAINBOW RUNNER	12
BET	BIGEYE	22
BUM	BLUE MARLIN	2
DOL	DOLPHINFISH	2
	TOTAL	414

Table 3. Total number of stomach samples collected and analysed to date.

PREDATOR SPECIES		COLLECTED	ANALYSED	% ANALYSED
SKJ	SKIPJACK	2201	1614	73.3
YFT	YELLOWFIN	1789	1290	72.1
BET	BIGEYE	278	275	98.9
RRU	RAINBOW RUNNER	98	52	53.1
KAW	KAWAKAWA	93	57	61.3
FRI	FRIGATE TUNA	78	60	76.9
DOL	MAHI MAHI / DOLPHINFISH / DORADO	20	16	80.0
WAH	WAHOO	5	3	60.0
MSD	MACKEREL SCAD / SABA	5	0	0.0
FAL	SILKY SHARK	4	4	100.0
CFW	POMPANO DOLPHINFISH	2	2	100.0
YTL	AMBERJACK (LONGFIN YELLOWTAIL)	1	1	100.0
BUM	BLUE MARLIN	1	1	100.0
	TOTAL	**4575**	**3375**	**73.8**

Conventional and archival tag recoveries for the PTTP

As at 16 July 2012, a total of 54,699 tagged tuna had been recaptured and the data reported to SPC. The numbers of conventional tag recoveries by species and by main tagging cruise are given in Table 4. Tag recoveries have occurred over the duration of the project, and are expected to continue for several years. Tag attrition follows the expected declining pattern (Figure 3) with the rate of decline in skipjack tag returns indicating their shorter expected lifespan and higher natural mortality when compared to yellowfin and bigeye tuna. The recovery rates of yellowfin and bigeye tagged with archival tags and conventional tags vary depending on cruise (Table 5). Initial observations of this data suggest increased tag rejection/fish mortality with archival tagging on some cruises.

The majority of total recoveries have come from purse-seine vessels (89%), followed by pole and line and other gear types (5%), unknown (5%) and longline recoveries <1% (114 in total). Table 6 shows the number of recoveries by gear type for yellowfin and bigeye that have been at liberty for at least 1 year before recapture. After 1 year at liberty, the fish should be approximately 80cm-100cm in length and available to purse-seine and longline fleets. The disproportionately low number of tag returns is evident for longline vessels. The same trend is observed if the analyses is restricted to just the spatial domain of the purse-seine fleet (10°N to 10°S).

Table 4. Tag releases and recaptures for the PTTP to date.

Cruises	Releases				Recoveries (numbers and %)			
	SKJ	YFT	BET	Total	SKJ	YFT	BET	Total
PNG 1 Aug-Nov 2006	13,948	7,806	562	22,316	2,638 (18.9%)	1,805 (23.1%)	229 (40.7%)	4,672 (20.9%)
PNG 2 Feb-May 2007	26,493	12,845	129	39,467	2,493 (9.4%)	1,702 (13.3%)	8 (6.2%)	4,203 (10.6%)
SOL 1 Oct-Nov 2007	7,479	3,565	139	11,183	1,974 (26.4%)	783 (22%)	18 (12.9%)	2,775 (24.8%)
SOL 2 Feb-Apr 2008	15,327	14,405	414	30,146	1,760 (11.5%)	2,414 (16.8%)	62 (15%)	4,236 (14.1%)
WP1 Jun-Nov 2008	37,693	17,650	1,467	56,810	6,360 (16.9%)	2,048 (11.6%)	362 (24.7%)	8,770 (15.4%)
WP2 Mar-Jun 2009	34,207	13,919	3,145	51,271	4,587 (13.4%)	2,309 (16.7%)	476 (15.1%)	7,372 (14.4%)
WP3 Jul-Oct 2009	30,723	7,340	735	38,798	6,655 (21.7%)	1,410 (19.2%)	191 (26%)	8,256 (21.3%)
CP1 May-Jun 2008	57	116	1,736	1,909	4 (7%)	25 (21.6%)	569 (32.8%)	598 (31.3%)
CP2 May-Jun 2009	169	205	2,307	2,681	5 (3%)	26 (12.7%)	565 (24.5%)	596 (22.2%)
CP3 Oct-Nov 2009	66	237	4,802	5,105	2 (3%)	62 (26.2%)	1,730 (36%)	1,794 (35.1%)
CP4 May-Jun 2010	7	120	2284	2411	1 (14.3%)	11 (9.2%)	465 (20.4%)	477 (19.8%)
CP5 Nov-Dec 2010	40	228	6,091	6,359	7 (17.5%)	36 (15.8%)	1407 (23.1%)	1450 (22.8%)
PNGTP1 Apr-Jul 2011	28,736	11,574	355	40,665	4978 (17.3%)	1950 (16.8%)	50 (14.1%)	6978 (17.2%)
CP6 Oct 2011	2	123	3804	3929	-	15 (12.2%)	536 (14.1%)	551 (14%)
CP7 Nov-Dec 2011	52	245	4212	4509		7 (2.9%)	275 (6.5%)	282 (6.3%)
PNGTP2 Jan-Mar 2012	28310	9607	2008	39925	1383 (4.9%)	133 (1.4%)	173 (8.6%)	1689 (4.2%)
TOTAL	**223,309**	**99,985**	**34,190**	**357,484**	**32,847 (14.7%)**	**14,736 (14.7%)**	**7,116 (20.8%)**	**54,699 (15.3%)**

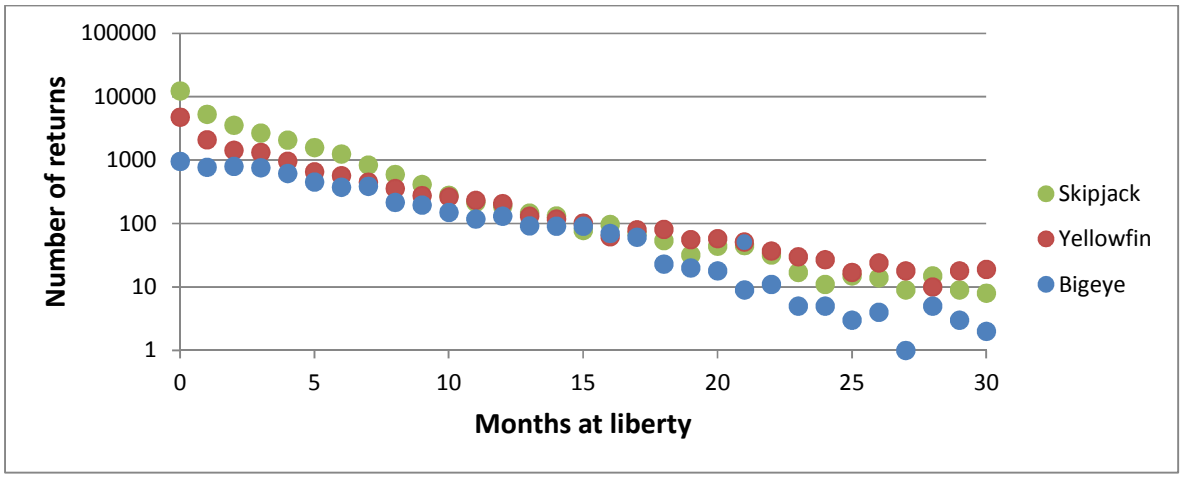


Figure 3. Tag recoveries by time at liberty for skipjack, yellowfin and bigeye tuna.

Table 5. Comparison of archival and conventional tag recoveries by species and cruise.

Cruises	ARCHIVAL Recoveries % (number tagged)				CONVENTIONAL Recoveries%			
	SKJ	YFT	BET	Total	SKJ	YFT	BET	Total
PNG 1 Aug-Nov 2006	100% (1)	37% (46)	44% (25)	40% (72)	18.9%	23.1%	40.7%	20.9%
PNG 2 Feb-May 2007	0% (1)	9% (187)	0% (23)	8% (211)	9.4%	13.3%	6.2%	10.6%
SOL 1 Oct-Nov 2007		0% (5)	0% (7)	0% (12)	26.4%	22.0%	12.9%	24.8%
SOL 2 Feb-Apr 2008		13.6% (22)	0% (1)	13% (23)	11.5%	16.8%	15.0%	14.1%
WP1 Jun-Nov 2008		0% (13)	38.9% (36)	28.6% (49)	16.9%	11.6%	24.7%	15.4%
WP2 Mar-Jun 2009	0% (39	1.8% (56)	3.7% (81)	2.3% (176)	13.4%	16.6%	15.1%	14.4%
WP3 Jul-Oct 2009	7.1% (56)	7.7% (13)	0% (1)	7.1% (70)	21.7%	19.2%	26%	21.3%
CP1 May-Jun 2008		40% (5)	22% (45)	24% (50)	7.0%	21.6%	32.8%	31.3%
CP2 May-Jun 2009		0% (9)	12.7% (79)	11.4% (88)	3.0%	12.7%	24.5%	22.2%
CP3 Oct-Nov 2009		10.7% (28)	15% (107)	14.1% (135)	3.0%	26.2%	36.0%	35.1%
CP4 May-Jun 2010		10% (20)	5.1% (39)	6.8% (59)	14.3%	9.2%	20.4%	19.8%
CP5 Nov-Dec 2010			10.3% (58)	10.3% (58)	17.5%	15.8%	23.1%	22.8%
PNGTP1 Apr-Jul 2011		0% (19)	0% (3)	0% (22)	17.3%	16.8%	14.1%	17.2%
CP6 Oct 2011		0% (2)	5.9% (51)	5.7% (53)		12.2%	14.1%	14.0%
CP7 Nov-Dec 2011	0% (30)	0% (85)	2.2% (92)	1% (207)		2.9%	6.5%	6.3%
PNGTP2 Jan-Mar 2012		0% (19)	0% (8)	0% (27)	4.9%	1.4%	8.6%	4.2%
TOTAL	3.9% (127)	8.5% (529)	11.7% (656)	9.7% (1312)	14.7%	14.7%	20.8%	15.3%

Tag recoveries have been received from all vessel nationalities involved in the purse seine fishery.

In Table 7, we present the number of tags returned and reported as recaptured by different purse seine vessel nationalities, in relation to the catch of those vessels during the period of the PTTP (August 2006 – present). To aid interpretation, we also present the distribution of catch by vessel nationality in the WCPO and the distribution of tagged tuna at release (Figure 4). The pattern of recoveries is very similar to that reported to the steering committee at SC7 in 2011:

- The numbers of tags reported by Indonesia, Philippines, PNG and Solomon Islands vessels has been very high in relation to their catches.
- In the case of Indonesia, this is thought to be a combination of a large number of tag releases in Indonesian waters, the proximity of intensive fishing effort to the tag releases and good tag recovery procedures in Bitung, Sorong, Kendari, Ambon and Ternate.
- In the case of Philippines, this has been due to the proximity of tag releases in PNG to Philippines purse seiners fishing in PNG, considerable fishing effort by Philippines vessels

adjacent to the large number of tag releases in Indonesia, and good tag recovery procedures in the main Philippines tuna unloading port of General Santos City.

- For PNG, large numbers of tags were recovered by the domestic purse seine fleet fishing in the Bismarck Sea, particularly in 2006 and 2007, and also by PNG purse seiners fishing more widely in the region but unloading their catch in Wewak – see PNG panel in Figure 4. High returns have been facilitated by excellent cooperation of the PNG-based fishing companies – Frabelle, RD Tuna and South Seas Tuna Corporation.
- Similarly in Solomon Islands, the large number of returns from Solomon Islands vessels reflects the large number of releases in Solomon Islands archipelagic waters, highly concentrated fishing effort in that area by Solomon Islands purse seiners – see Solomon Islands panel in Figure 4 – and very good cooperation in tag recovery by the two locally-based companies Soltai and NFD.
- Japanese purse seiners fished relatively close to the main centers of tag release, which, in combination with good tag recovery procedures in the main unloading port of Yaizu and excellent assistance by the Japan National Research Institute of Far Seas Fisheries, resulted in a moderately high number of tags per 1,000 mt of catch.
- In the case of Vanuatu, a large number of tags have been recovered by several vessels fishing in Solomon Islands archipelagic waters.
- Chinese Taipei seiners reported a moderate level of tags per 1,000 mt from fishing in an area similar to the Japanese fleet. The lower rate of reported tags per 1,000 mt of this fleet compared to the Japanese probably reflects lower tag detection or reporting rates in transshipment operations compared to direct unloading at home port.
- United States purse seiners reported a moderate level of tags per 1,000 mt despite the fact that its main area of activity was somewhat displaced to the east of the main tag release centers in PNG and Solomon islands. Most US recoveries came from fish that had been transshipped to Thailand, probably recaptured by vessels fishing closer to the main tag release sites. Very few tags have been recovered from vessels unloading in American Samoa (see following section).
- Korean vessels had a relatively low number of tags recovered, despite their fleet recording the highest overall catch since the start of the tagging programme. While the fishing activity of this fleet is largely to the east of the main tag release areas, it is similar to the areas fished by the United States and Vanuatu fleets.
- Some of the smaller fleets, such as Marshall Islands and New Zealand, reported a very low numbers of tags per 1000 mt, possibly due to their more easterly distribution of fishing effort.

Overall, most of the variability in numbers of tags returned in relation to the catch of the various fleets are potentially explainable due to the operational characteristics of these fleets.

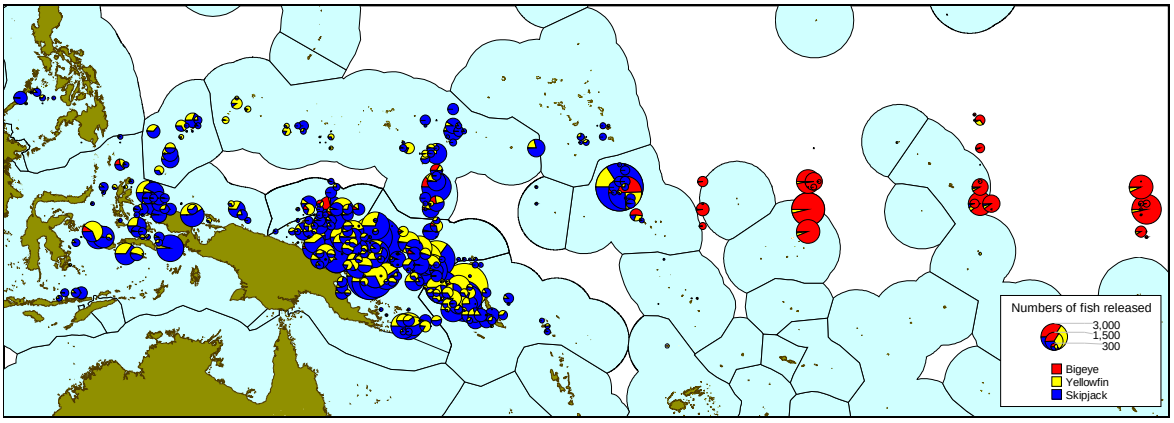
The accuracy of information returned from tags recovered on fishing vessels remains higher than that received from canneries or via transshipment (Figure 5). The information from transshipment on date and location of recovery is typically reported as unknown.

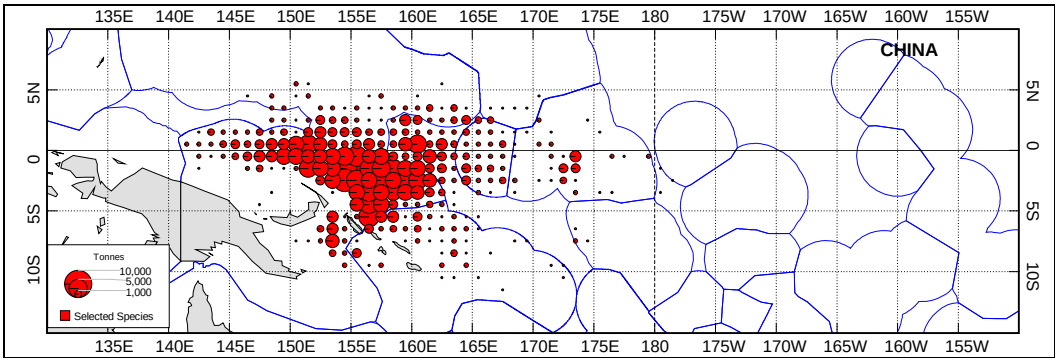
Table 6. Tag returns by gear type and by project for fish at liberty for at least 1 year before recovery

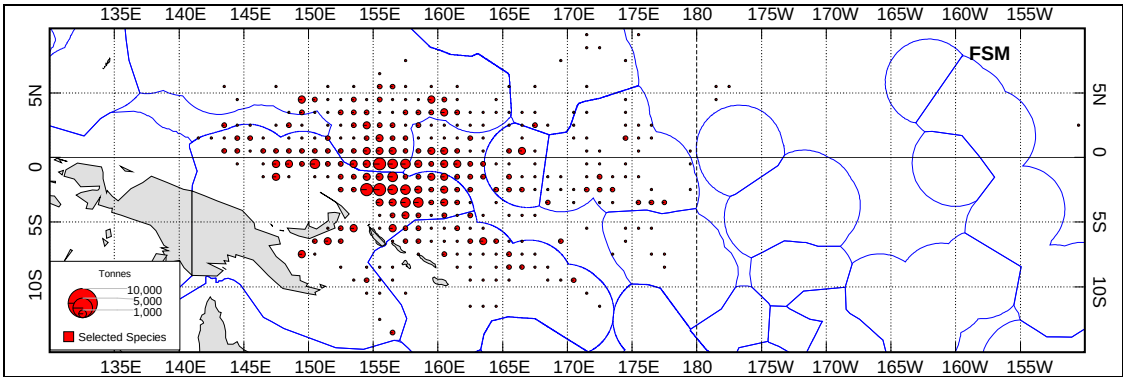
Project	No. RECOVERIES		PURSE SEINE		LONGLINE		POLE & LINE		OTHER		UNKNOWN	
	YFT	BET	YFT	BET	YFT	BET	YFT	BET	YFT	BET	YFT	BET
PTTP Phase 1 - Papua New Guinea tagging project	395	9	347	6	13	1	1	0	18	0	16	2
PTTP Phase 1 - Solomon Islands tagging project	268	8	262	8	2	0	0	0	1	0	3	0
PTTP Phase 2 - Central Pacific #1		83		78		1		0		0		4
PTTP Phase 2 - Central Pacific #2	4	83	3	64	0	0	0	0	0	1	1	18
PTTP Phase 2 - Central Pacific #3	1	188	0	139	0	2	0	0	0	1	1	46
PTTP Phase 2 - Central Pacific #4	1	30	1	24	0	0	0	0	0	0	0	6
PTTP Phase 2 - Central Pacific #5	2	172	1	63	0	0	0	0	0	0	1	109
PTTP Phase 2 - Western Pacific #1	142	13	123	11	1	0	2	0	13	0	3	2
PTTP Phase 2 - Western Pacific #2	233	33	212	17	8	9	0	0	2	4	11	3
PTTP Phase 2 - Western Pacific #3	140	17	131	16	1	1	0	0	5	0	3	0

Table 7. Tag returns by purse-seine vessel nationality per 1,000 mt of total purse-seine catch of that nationality for the period 1 August 2006 to 31 December 2011 within the boundary of 130°E to 180°E longitude and 10°N to 15°S latitude.

Vessel Nationality	Number of tags returned	Tags returned/1,000 mt of catch
China	428	1.2
Spain	1330	46.3
FSM	472	4.2
Indonesia	3007	2.9
Japan	456	6.2
Kiribati	1763	1.4
Korea	419	1.5
Marshall Islands	40	0.5
New Zealand	10036	9.1
Papua New Guinea	6579	56.2
Solomon Islands	3181	3.0
Chinese Taipei	3069	3.7
USA	2313	11.5
Vanuatu	428	1.2



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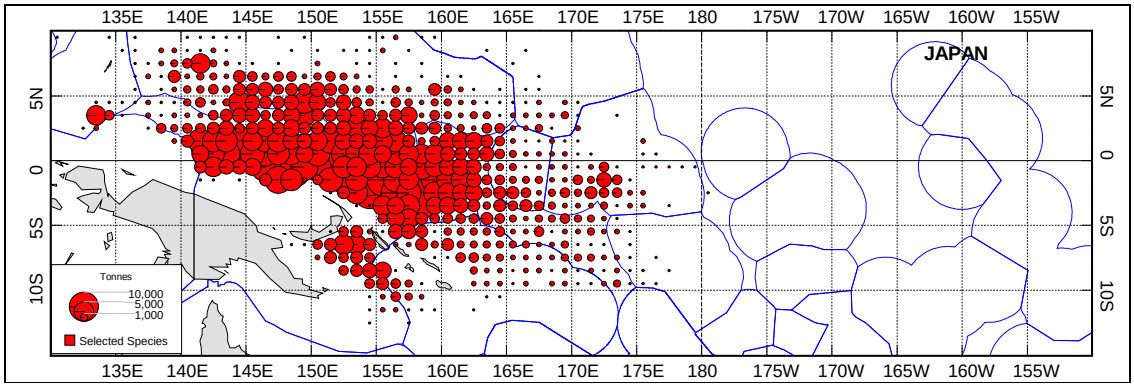
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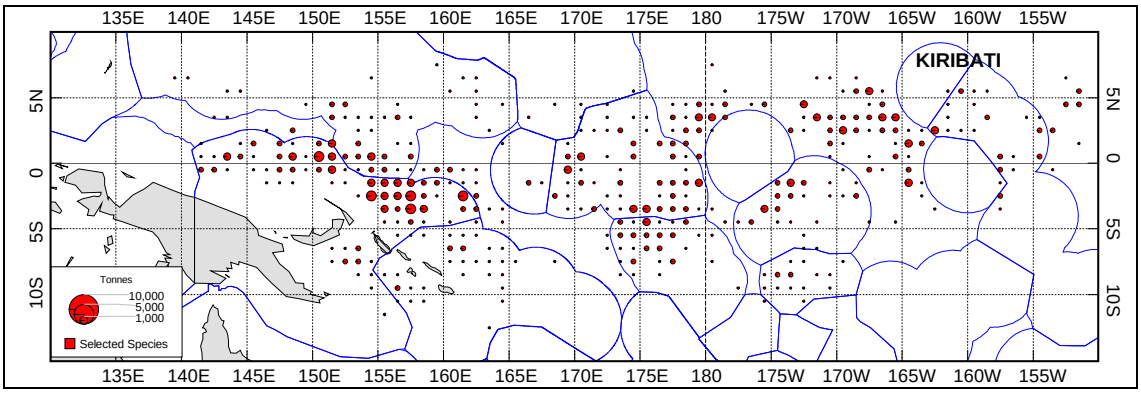
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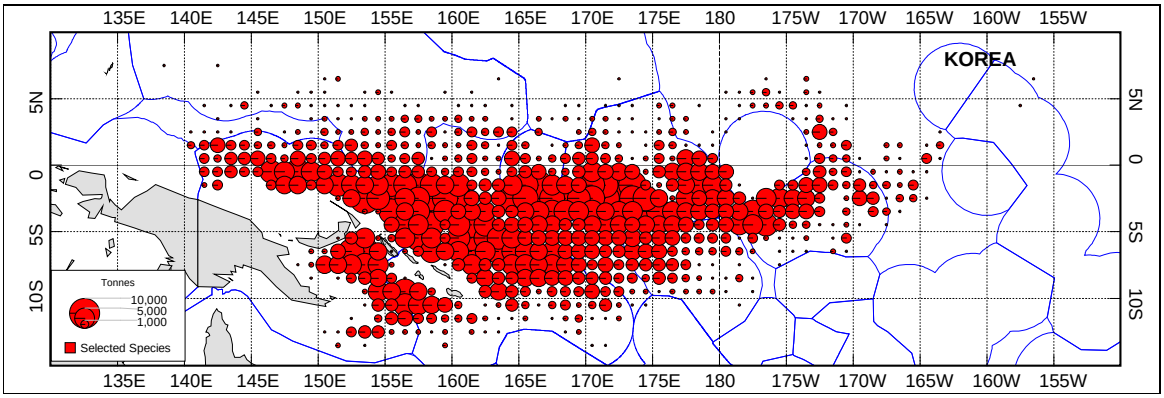
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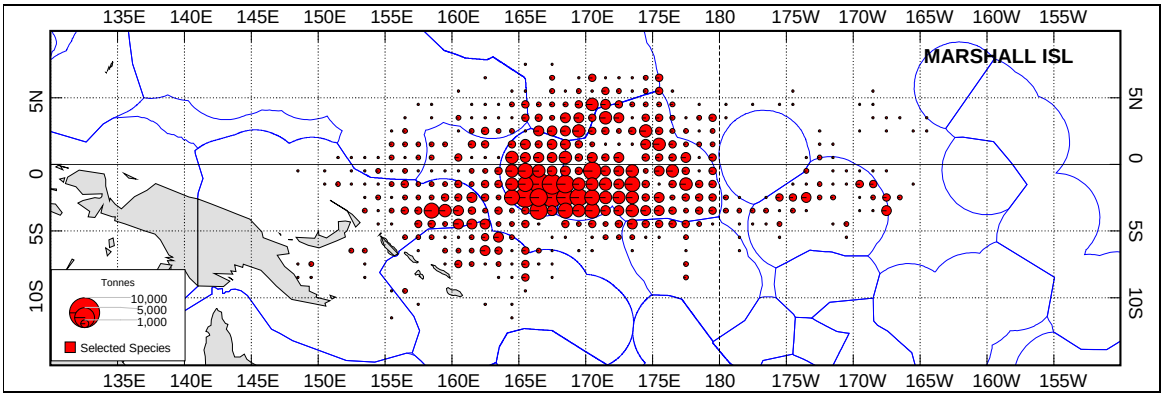
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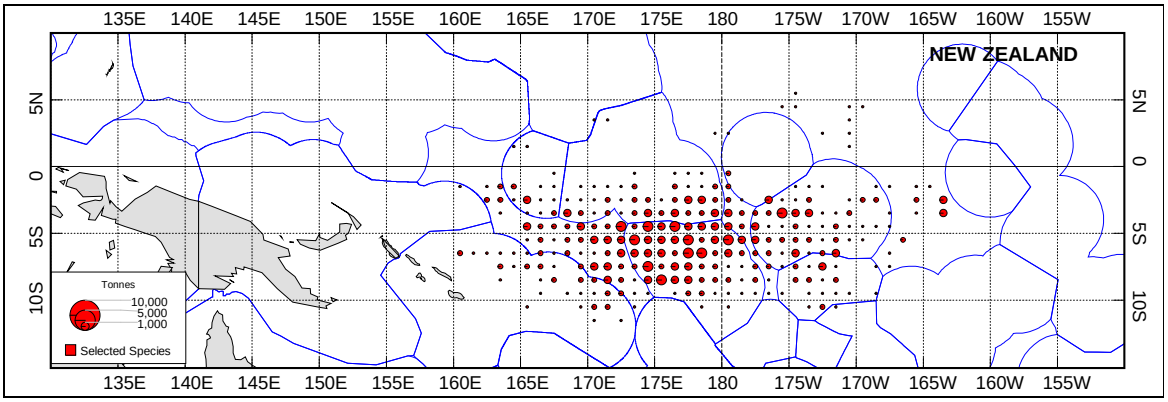
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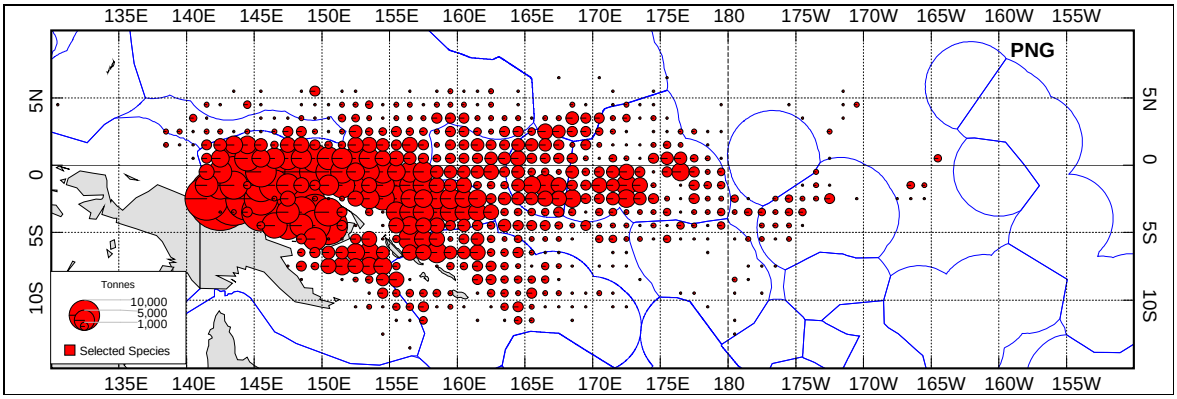
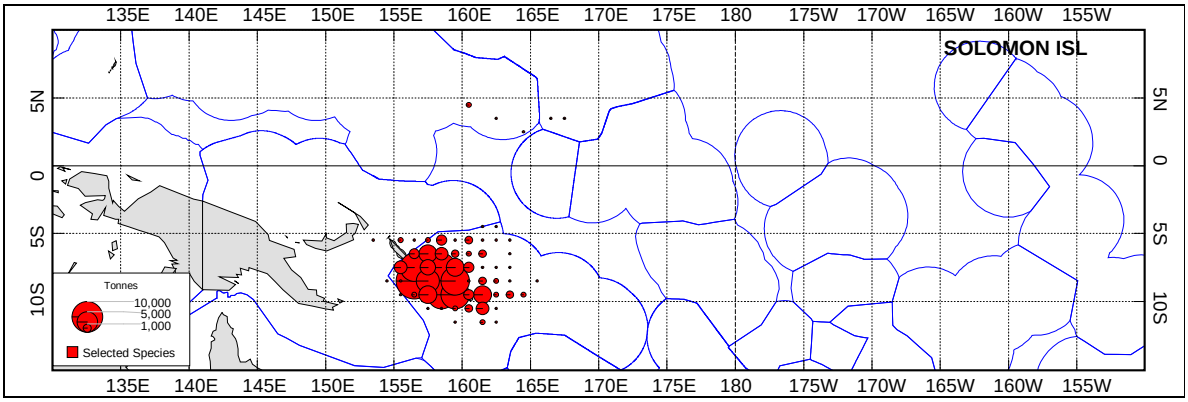
Selected Species


PNG
135E 140E 145E 150E 155E 160E 165E 170E 175E 180 175W 170W 165W 160W 155W
5N 0 5S 10S
Tonnes
10,000
5,000
1,000
Selected Species


SOLOMON ISL
135E 140E 145E 150E 155E 160E 165E 170E 175E 180 175W 170W 165W 160W 155W
5N 0 5S 10S
Tonnes
10,000
5,000
1,000
Selected Species

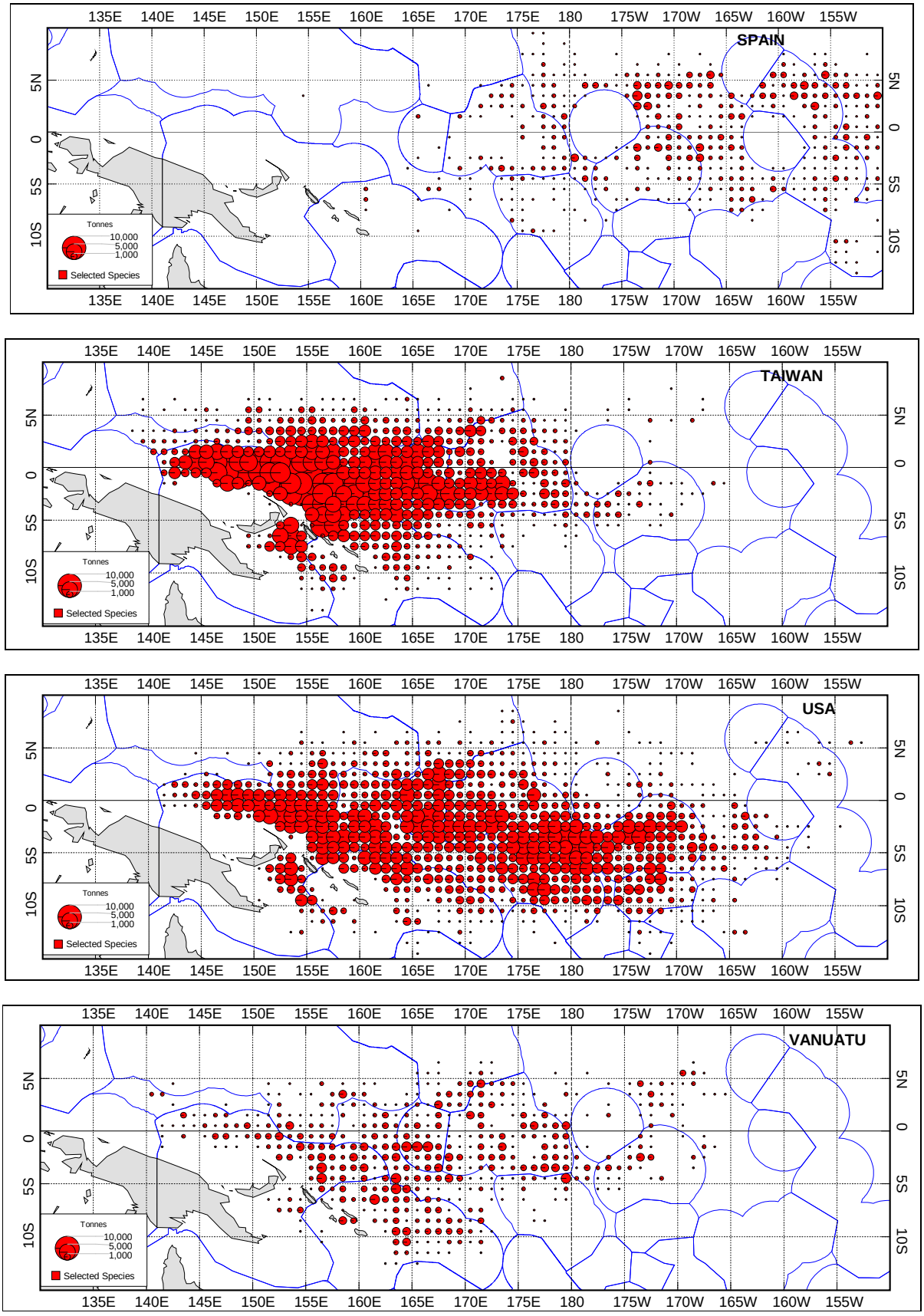


Figure 4. Top Panel. Distribution map of tag releases from 2006-2011. Lower panels. Maps showing the distribution of total catch between 1 August 2006 and 31 December 2011 for the major purse-seine fleets operating in the WCPO.

Information on Position of Capture **Information on Date of Capture**

Fishing Vessel

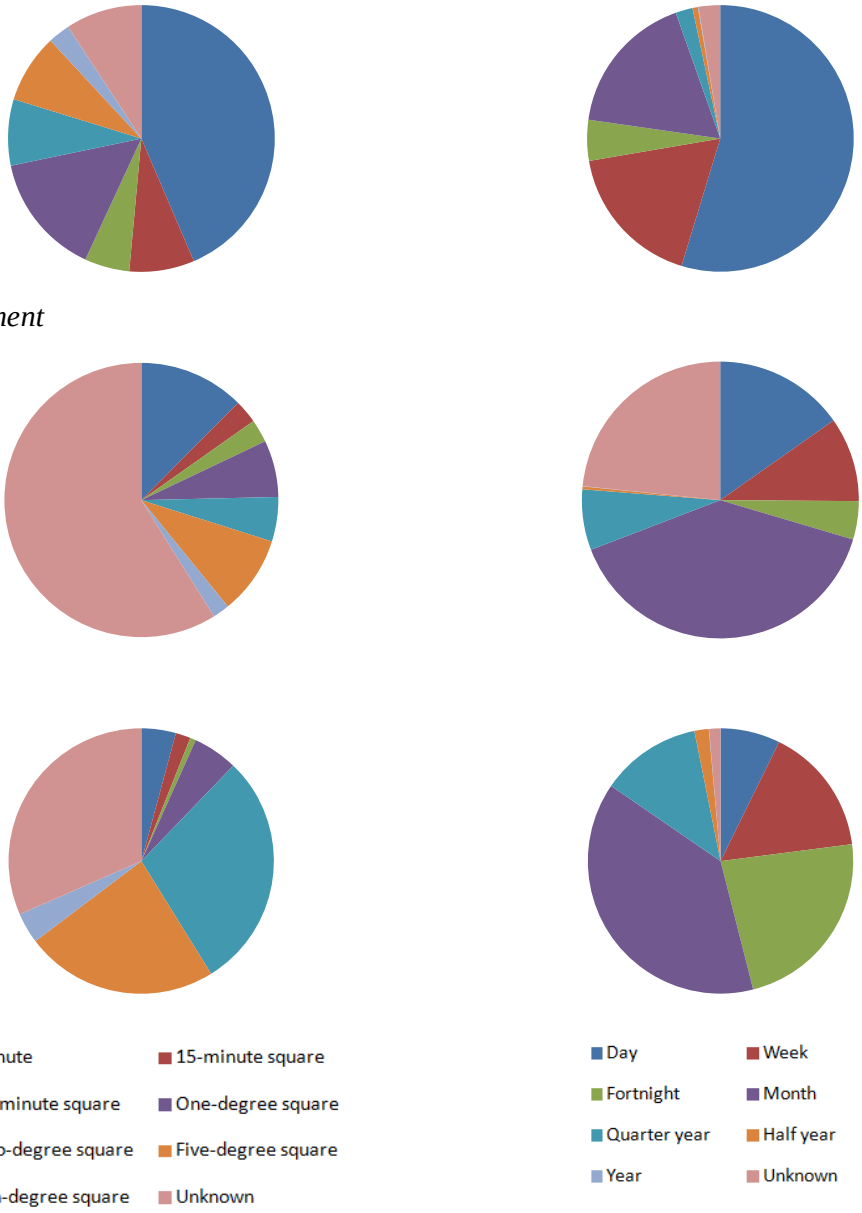


Figure 5. Location and date of tag recovery accuracy information for recoveries on fishing vessels, during transshipment and at canneries.

Tag Recovery

Full-time Tag Recovery Officers continue their duty in Wewak, Madang, Lae, Honiara, Pohnpei and Majuro. Full-time TRO appointments have also recently been made in Tarawa and in Manta, Ecuador. These officers are coordinated by the central TRO at SPC. All full time TROs as well as TROs in the Philippines and Thailand are now entering data in a specialized database that allows importation of recovery information directly into an SPC Database. Recovery information is received at SPC on a monthly basis. The establishment of these positions has provided greater opportunity for collection of tags during unloading, transhipments and processing in canneries with more complete and reliable capture information. Major unloading and processing facilities have been visited by TROs over the last 12 months and lotteries have been conducted in Wewak, Madang, Lae, General Santos and Bangkok.

Advertisements were made for the 50000th tag recovery through newspaper articles and internet website. Videos of tagging activities as well as recovery procedures for general public have been developed, distributed and posted on the internet. These products can be viewed at www.spc.int/tagging

PIRFO standards for tag recovery and seeding have been revised for PIRFO Observer training courses. Tag recovery material has been developed and approved for PIRFO Debriefer training courses.

Tag Seeding

From February 2007 to July 2012, 273 tag seeding kits (consisting of seeding tags, applicators, guide books and data forms) have been given to observer coordinators in PNG, Solomon Islands, Fiji, FSM, Marshall Islands, Kiribati, New Zealand and American Samoa for deployment aboard purse seine vessels by senior observers. Since 2011, kits have been modified to contain a mix of steel head and plastic barb tags to test the effect of tag type.

When a kit is not completely deployed during a trip, the kit is either kept aside or used in another kit for deployment. Table 8 details the list of kits distributed and the number of tags contained in each kit. A total of 6721 tags have been distributed to observer coordinators.

Number of tags in a kit	Nb of kit
<10	20
11	1
12	4
13	2
15	7
17	2
18	5
19	1
20	5
22	1
23	2
24	2
25	120
29	1
30	99
34	1

Table 8: Number of kits distributed per number of tags contained

To aid in the implementation of tag seeding experiments, training is provided as part of the PIRFO Observer training courses. Tag Recovery Officers in the ports of Majuro, Pohnpei, Honiara, Lae, Madang, Wewak and Tarawa also liaise closely with Observer coordinators, Observer debriefers and observers to implement tag seeding experiments and to recover the tag seeding logs for deployed kits. Tag seeding debriefing material has been now developed for TROs.

Of the 273 kits distributed to observer coordinators, 168 have been given to observers for deployment, of which 129 tag seeding datasheets have been received for these observer trips. Currently, SPC is holding returned seeded tags from an additional 39 kits for which the datasheets have not yet been provided. It is worth noting that it can take 6 months or more for datasheets to be returned. Logsheets have not been returned for 21 tag seeding kits that have been deployed since January 2012.

Since August 2011, 76 kits have been deployed, using a total of 1897 tags. This is a significant increase in the rate of deployment in comparison to previous years (e.g. between August 2010 to August 2011, 44 kits were deployed using a total of 1060 tags). The employment of TROs, greater emphasis on this task during observer training, and increased awareness of the importance of tag seeding by observer coordinators is responsible for this increase in deployment of seeding kits (79%).

As at 18th July 2012, there have been 2,429 reported tags that have been seeded and 1,220 of these have been returned to SPC. In addition to allowing estimation of tag reporting rates, the tag seeding data also allow the error rate in tag return information to be determined. Tables 8 and 9 detail the reporting of vessel name by location and cannery. The accurate reporting of vessel name is particularly important for validation of location and time of recapture using VMS and log book data. Vessel name was reported incorrectly for 314 tags, was absent from the recovery information for 103 tags and was correct for 803 tags.

Recovery location	All tag recoveries (excepted tag seeded)	Tag seeding recoveries (TSR)	Wrong vessel reported(TSR)	No vessel reported (TSR)	Correct vessel reported (TSR)	% correct vessel reported (TSR)
PNG, Madang	8694	199	26	0	173	87
THAILAND, Bangkok	8107	241	99	6	136	56
SOLOMON, Noro	7902	48	20	1	27	56
PHILIPPINES,General Santos	6039	53	21	13	19	36
USA, San Diego	5603	58	0	57	1	2
PNG, Lae	2968	51	15	3	33	65
JAPAN, Shimizu	2769	1	1	0	0	0
PNG, Wewak	2315	59	48	0	11	19
MARSHALL, Majuro	833	51	20	0	31	61
SOLOMON, Honiara	488	91	11	1	79	87
A.SAMOA, Pago Pago	277	312	49	13	250	80
PNG, Port Moresby	247	1	1	0	0	0
NORMA FSM, Pohnpei	18	10	0	0	10	100

Table 9: Vessel reported per locations of recovery

Cannery name (Thailand only)	Tag seeding recoveries	Wrong vessel reported	No vessel reported	Correct vessel reported	% correct vessel reported
THAI UNION	34	6	1	27	79
UNICORD	29	17	1	11	38
PATAYA FOOD	27	18	0	9	33
SOUTHEAST ASIAN PACKAGING AND CANNING (SEAPAC) Samutsakorn	20	2	0	18	90
SONGKHLA CANNING	16	6	0	10	63
ASIAN ALLIANCE INTERNATIONAL	13	2	0	11	85
CHOTIWAT CANNERY	10	1	0	9	90
ISA VALUE	10	4	0	6	60
R.S CANERY CO.,LTD.	8	2	0	6	75
MMP International	6	6	0	0	0
SOUTHEAST ASIAN PACKAGING AND CANNING (SEAPAC) both location	6	1	0	5	83
Eksakhon Cold Storages Co.Ltd.	5	2	0	3	60
SOUTHEAST ASIAN PACKAGING AND CANNING (SEAPAC) Bangpoo	5	2	0	3	60
GOLDEN PRICE	2	0	0	2	100
OCEANIC CANNERY	1	0	0	1	100

Table 10: Vessel reported per cannery (Thailand)

Preliminary analyses of the tag seeding data also indicates that there are often substantial errors in the reported tag recovery dates and positions (error distributions are shown in Figure 6). The errors are large enough to exaggerate the perceptions of movement. The tag seeding data allows us to quantify tag recovery errors in relation to the specific circumstances of the recovery (e.g. vessel, port, TRO, etc.), such that a reliability index can be assigned for each individual tag. Once the statistical uncertainties in the seeded tags are quantified, they can be applied to all of the PTTP tag recoveries and formally recognized within the stock assessment process. Furthermore, identification of the source of the errors allows resources to be prioritized to most effectively improve future tag recovery operations

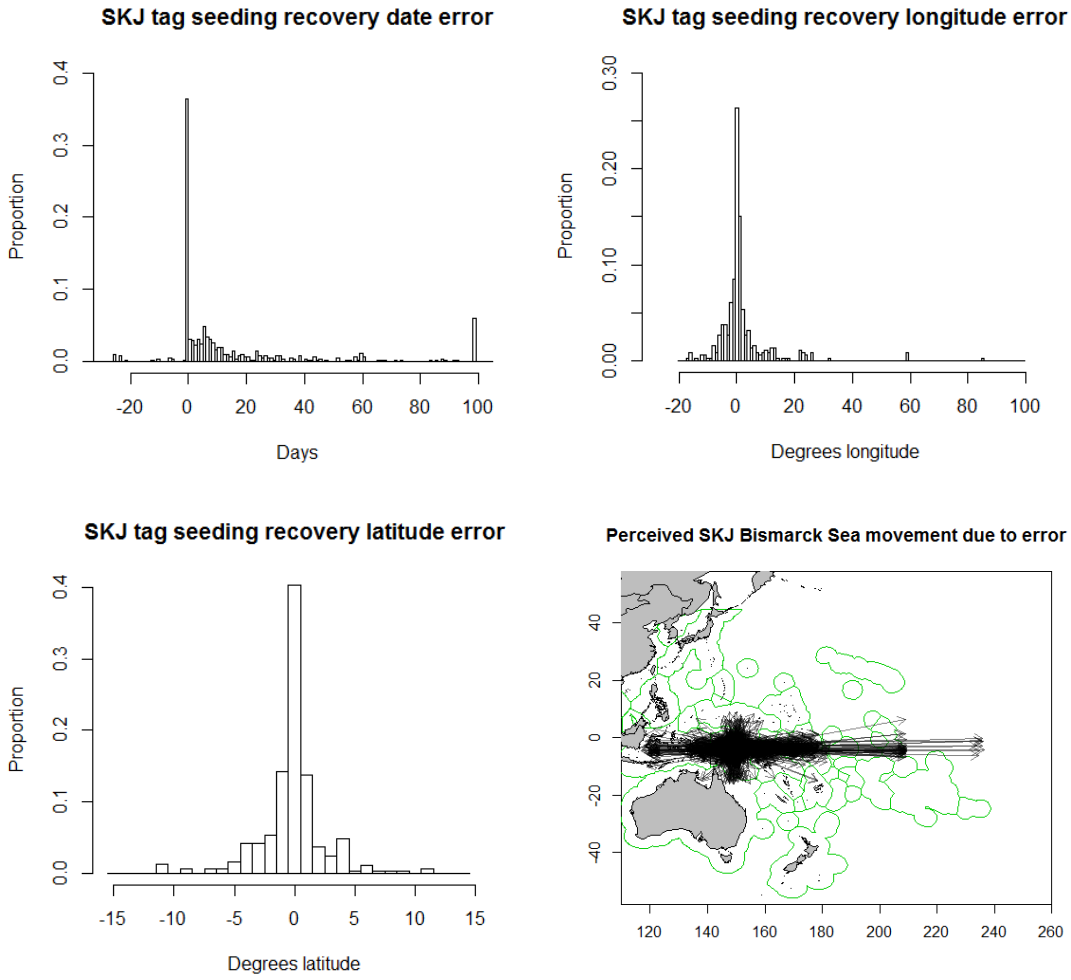


Figure 6. Summary of reported tag recovery date (top left), longitude (top right), and latitude (bottom left) error distributions estimated from tag seeding experiments. Bottom right panel shows what the Bismarck Sea tag release-recovery plot would look like if the fish did not move, but were recaptured with a random position error from these distributions.

Preliminary Analyses of Movement

A number of analyses are being undertaken to use the PTTP tagging data to estimate movement and mortality rates. This includes the relatively coarse resolution (Multifan-CL), and relatively high resolution models (SEAPODYM, TAGEST). Figure 7 illustrates the release and reported recovery positions for SKJ released in different sub-regions. We are analysing the movements to identify the appropriate spatio-temporal resolution for assessment models that will be consistent with tag mixing assumptions.

Movement trends observed from both conventional and archival tags are consistent with expectations for highly migratory species with larger movements positively related to time at liberty (Figure 8). Vertical movements are reported in SC3-BI-WP-04.

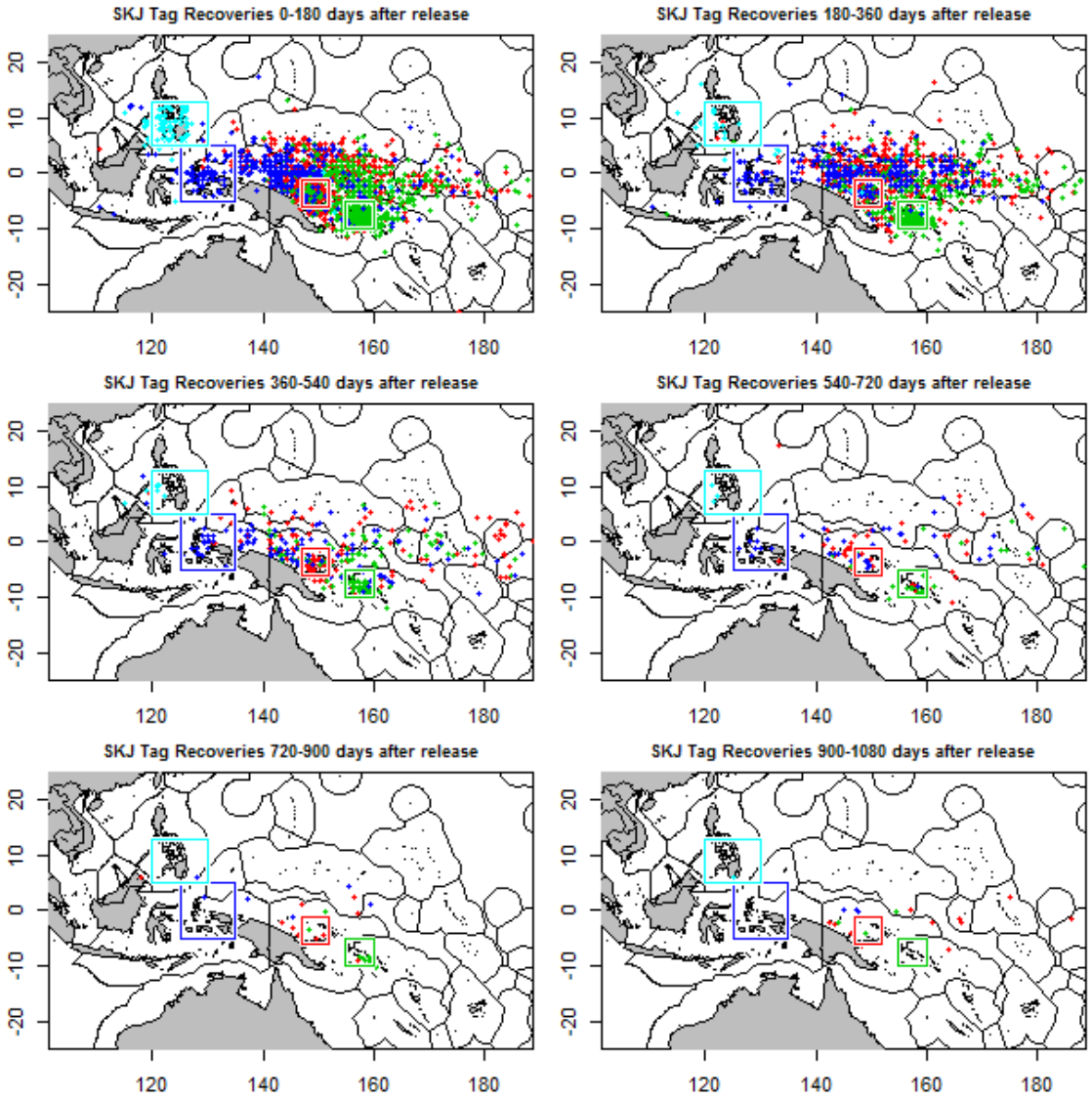


Figure 7. SKJ tag recovery positions (points), colour-coded by the release locations indicated by the coloured rectangles. Each panel represents a different time period after release, and suggests that mixing is a slow process across the equatorial WCPO.

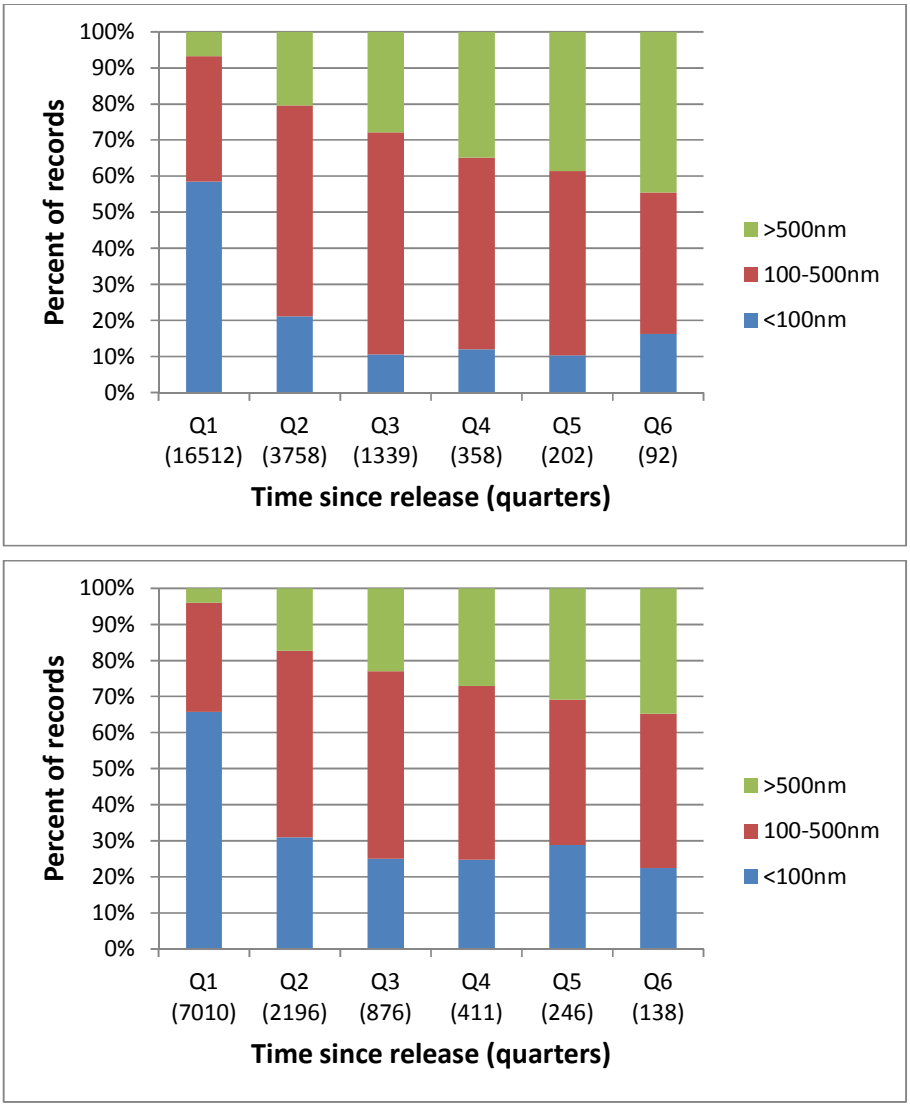


Figure 8. Reported recoveries within 100 nm, 100-500 nm and >500 nm in the first 6 quarters (18 months) since release for skipjack (upper graph) and yellowfin (lower graph). The sample size for each quarter is provided in the parentheses below the quarter label on the x-axis.

Stock Assessment Data Preparation

Verification of the large number of recoveries received (~ 54,700), mostly with good data, but all in need of corroboration from logsheet and VMS matching is an ongoing task. Approximately 26,200 recovery records have been verified with VMS. Verification of the remaining tags is expected to be completed in 2012. Table 11 documents the number verified and data quality associated with the tags by source.

Table 11. Tag recoveries by source and validation.

tag_source	Recov.	% Valid	% VMS	% Logsheet	% Archival	% Buffer	% Other	% None	% no vessel name	% Vessel but no date	% Vessel but no position	% No length	Valid	No vessel	Vessel but no date	Vessel but no position	No length
AS	604	87.9	86.4	0.8	0.0	0.0	0.0	12.8	8.4	0.5	52.5	42.6	531	51	3	317	257
CH	12	83.3	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	91.7	10	12	0	0	11
Fish Vess	521	92.7	80.8	2.7	0.0	0.0	16.4	0.2	1.7	0.2	3.3	3.5	483	9	1	17	18
FSM	279	62.0	50.3	49.1	0.0	0.0	0.6	0.0	5.0	0.0	6.8	19.4	173	14	0	19	54
FSM (SPC)	89	80.9	93.1	2.8	0.0	0.0	1.4	2.8	1.1	0.0	11.2	2.3	72	1	0	10	2
IATTC	6007	27.8	37.0	6.0	1.1	0.0	10.7	45.2	21.4	6.2	18.5	81.8	1667	1286	375	1110	4913
IND	5983	6.2	1.9	12.8	0.0	22.3	53.5	9.5	2.1	0.0	5.0	5.6	368	123	0	300	334
IOTC	8	12.5	100.0	0.0	0.0	0.0	0.0	0.0	62.5	0.0	37.5	0.0	1	5	0	3	0
JAP	2771	82.8	91.9	4.0	0.0	0.0	0.7	3.4	3.0	3.7	20.4	3.9	2295	84	103	565	107
KR(Kiritimati)	32	100.0	81.3	0.0	3.1	0.0	0.0	15.6	15.6	0.0	3.1	37.5	32	5	0	1	12
KR (Tarawa)	268	45.2	26.5	7.4	1.7	0.0	4.1	59.5	73.5	0.0	6.3	7.8	121	197	0	17	21
Korea	593	35.9	32.4	5.2	0.5	0.0	0.9	61.0	66.6	0.0	19.4	9.8	213	395	0	115	58
Mar Islands	720	86.3	84.2	14.0	0.3	0.0	0.6	0.8	1.0	0.4	10.1	25.1	621	7	3	73	181
Nauru	2	50.0	0.0	0.0	0.0	0.0	0.0	100.0	50.0	0.0	50.0	50.0	1	1	0	1	1
Other	92	51.1	48.9	4.3	2.1	0.0	12.8	31.9	28.3	0.0	17.4	32.6	47	26	0	16	30
PH(direct)	6098	53.0	61.4	7.8	0.1	0.0	9.9	20.8	11.8	0.0	33.1	72.1	3229	722	2	2019	4399
PH (Frabelle)	166	84.9	97.9	0.7	1.4	0.0	0.0	0.0	7.8	0.0	0.0	6.0	141	13	0	0	10
PH (NFRDI)	172	44.2	64.5	5.3	0.0	0.0	26.3	4.0	10.5	0.0	10.5	14.0	76	18	0	18	24

PNG (Fairwell Fishery)	5	20.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0	0.0	80.0	1	0	4	0	4
PNG (Frabelle)	2951	81.1	65.0	33.2	0.1	0.0	0.1	1.6	1.7	0.5	2.5	9.1	2392	50	16	73	269
PNG (Kr Overseas Ass)	1	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0
PNG (NFA)	429	62.2	75.3	11.2	0.4	0.0	0.0	13.1	20.3	0.5	13.5	26.3	267	87	2	58	113
PNG (other)	688	73.1	56.7	4.2	0.0	0.0	0.4	38.8	7.1	1.2	16.3	14.0	503	49	8	112	96
PNG (Pac Blue Sea)	66	16.7	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11	0	0	0	0
PNG (RBL Fishing)	15	86.7	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	6.7	13	0	0	1	1
PNG (RD)	8336	98.1	74.4	23.3	0.0	0.0	0.1	2.2	0.4	0.0	1.8	3.3	8181	37	0	147	271
PNG (SST)	1358	54.1	75.6	15.9	0.0	0.0	2.6	5.9	4.3	0.1	59.7	35.3	734	58	1	810	479
PNG (TPJ)	395	84.6	25.8	74.3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	334	0	0	2	1
SB (Global Investment)	1046	89.4	85.6	14.4	0.0	0.0	0.0	0.0	8.7	0.0	1.0	56.2	935	91	0	10	588
SB (Kr Deep Sea Ass)	59	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59	0	0	0	0
SB (MFMR)	271	61.6	71.9	27.0	0.6	0.0	0.0	0.6	15.5	0.0	9.6	9.2	167	42	0	26	25
SB (NFD)	3804	89.4	60.4	39.5	0.0	0.0	0.0	0.1	0.2	0.1	3.3	2.2	3399	8	3	125	85
SB (other)	47	59.6	89.3	7.1	0.0	0.0	3.6	0.0	38.3	2.1	25.5	38.3	28	18	1	12	18
SB (Soltai)	3017	83.9	86.5	12.1	0.0	0.0	0.0	1.3	7.2	0.2	1.5	2.0	2530	218	5	46	59
SB (T Deep Sea Ass)	393	95.4	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	375	0	0	0	0
Tag vessel	214	10.3	0.0	0.0	0.0	0.0	95.5	4.6	0.5	0.0	10.3	0.9	22	1	0	22	2
TW	64	65.6	92.9	0.0	0.0	0.0	0.0	7.1	0.0	0.0	21.9	0.0	42	0	0	14	0
TH	8347	72.0	93.3	3.9	0.1	0.0	0.1	2.7	1.2	0.0	94.7	1.3	6013	98	0	7907	109
VU	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0

ALBACORE TAGGING

A description of albacore tagging activities was outlined previously in SC6 GN IP-06 and SC5 GN IP-16. As of the 18th July 2012, there have been 10 conventional tag returns. Tag recovery details are specified in Table 12. Nine of the recoveries were recaptured in New Zealand waters, close to where they were tagged and released. However, the most recent recovery (19-May-12) was recaptured in northern Fijian waters, more than 3,000 km from where it was released over 3 years earlier.

Table 12. Recovery information for the 10 albacore tags reported to SPC

Release					Recapture					
Date	Lat	Lon	FL (cm)	OTC	Date	Lat	Lon	FL (cm)	Growth (cm)	Days at liberty
20-Jan-09	41°24.29S	171°04.51E	57	yes	25-Oct-11			73	16	1008
20-Jan-09	41°04.59S	171°09.40E	61	yes	05-Sep-11	41°01.00S	174°52.00E			958
28-Feb-09	43°31.80S	169°12.60E	61	yes	16-Feb-10	41°53.67S	170°43.68E	68	7	353
03-Mar-09	41°29.03S	170°53.60E	59	no	19-May-12	13°17.29S	176°54.17E	66	7	1173
05-Mar-09	42°22.99S	171°01.01E	50	yes	04-Jun-11					821
06-Mar-09	42°20.36S	171°03.44E	60	yes	15-Jan-12			89	29	1045
08-Mar-09	42°19.00S	170°59.46E	64	no	28-Feb-11	43°00.20S	169°18.00E	60		722
15-Mar-09	42°04.96S	170°48.46E	51	yes	23-Mar-12	43°56.34S	168°37.11E	82	31	1104
16-Mar-09	42°22.03S	170°42.79E	60	no	29-Mar-12	42°17.00S	170°00.00E			1109
10-May-10	39°43.68S	178°24.76E	78	yes	28-Mar-11	40°19.27S	177°10.86E	83	5	322

PTTP 2012-2013 work plan

	Task	2012	2013
TAGGING			
1.	**CP8** *Background*: 4 week cruise focusing upon the NOAA TAO Oceanographic Buoys along the 170°W meridian (waters of Kiribati, Phoenix Islands and High Seas) and along the 180°W meridian (High Seas, waters of Kiribati, Gilbert Islands and Tuvalu). This is the heighth Central Pacific cruise designed to improve overall spatial coverage of PTTP tag releases in areas difficult to access between the Date line and French Polynesia and investigate movement parameters and vertical habitat utilization of tuna in the central Pacific region. The cruise will charter the *FV Pacific Sunrise*, a multi-purpose pelagic handline/longline vessel which is based in Nuku'alofa, Kingdom of Tonga. *Target*: BET 1,000 conventional tags; BET & YFT 50 Archival Tags		
3.	**PNGTP cruise 3** *Background*: 3 month cruise focused upon tagging within the EEZ of PNG and managed by NFA in collaboration with SPC using a pole and line vessel. *Target*: 30,000 tuna conventionally tagged with an ideal species composition of skipjack: 60%; yellowfin 35%; and bigeye 5%.		
TAG RECOVERY			
1.	Establishment and support of TROs in PNG, Philippines, Thailand, Indonesia, key Pacific Island locations and in Ecuador		
TAG SEEDING			
1.	Prioritize continued tag seeding in order to improve understanding of the processes involved in tag reporting		
2.	Support locally based tag seeding co-ordinators		
3.	Undertake Observer training in tag seeding		
DATA MANAGEMENT			
1.	PTTP data verification with VMS and Logbook		
2.	Revision of PTTP web access		
3.	Migration of all WCPO tagging data into single database		
4.	Development of country specific PTTP web pages		
DATA ANALYSES			
1.	**Tag reporting and seeding** *Purpose*: Critical for any estimation of fishing mortality as it is a direct scalar for fishing mortality. *Tasks:* (1) Determine detection rate of double tags (test for impact on tag seeding returns); (2) Undertake an external analysis of seeding data to identify what influences recovery rate (vessel, flag/fleet, unloading locations);		
2.	**Movement (horizontal)** *Purpose*: Define regional structure of stock assessment models and provide estimation of mixing rates. *Tasks*: (1) Estimate movement from conventional tags and test for spatial variability in movement (use multiple models & compare ADR estimates); (2.) Estimate horizontal movement from archival tags; (3) Compare movement rate estimates among species & fish size from both archival and conventional tags, using AD models and simple approaches such as maximum displacement; (4) Add time structure to MFCL movements so that movements can be introduced from analyses outside the model and environmental covariates can be estimated; (5) Integration of archival tagging data into stock assessments		
3.	**Fishing and natural mortality** *Purpose*: Provide external validation to estimates from within MFCL and identify fishing mortality changes in response to expansion of the WCPO fisheries. *Tasks*: (1) Repeat RTTP analysis, including an overlay of PTTP tags on RTTP parameter estimates.		