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Papua New Guinea Tagging Project: 2014 Summary Report

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Overview

The WCPO tuna fishery stretches across more than 20% of the earth's circumference and produces over half of the world's marketed tuna. Tagging programs in the WCPO have contributed to the understanding of the dynamics of this fishery and the data derived are routinely used in the assessments of skipjack, yellowfin and bigeye stocks.

Throughout the WCPO, total annual catches of target tuna species (skipjack, yellowfin and bigeye and albacore tuna) are now approaching 2.5 million metric tons. The fishery comprises a variety of fishing gears, the most important of which, in terms of volume and value, are the industrial-scale purse seine and longline fisheries.

Tuna tagging is widely accepted as a critical activity in the monitoring of tuna stocks and their exploitation. Tagging provides information on rates of tuna movement and mixing, natural and fishing mortality, and growth that are difficult to obtain through analysis of fishery-dependent data such as catch, effort and size composition.

Three large scale tuna tagging programme in the Western and Pacific Ocean have been conducted in the past from 1977-1981 (Skipjack Survey and Assessment Programme), 1989-1992 (Regional Tuna Tagging Project) and 2006-2010 (Pacific Tuna Tagging Project). Data from these programmes have been routinely incorporated into the into regional tuna stock assessments for the main species of tropical tuna which are skipjack (*Katsuwonus pelamis*), yellowfin (*Thunus albacares*), and bigeye tuna (*Thunus obesus*).

In each of the three programmes, Papua New Guinea (PNG) has been a key location for both tag releases and recaptures. As an example during the PTTP, a total of 262,142 tuna were tagged and released, and 103,244 (39%) of these were in PNG waters. A large number of recaptures have been reported from PNG waters and beyond.

Tuna tagging data are important for stock assessment for two main reasons. First, the explicit spatial context of the data allows spatial structure to be better captured in the stock assessment. This is important for WCPO tuna assessments, as a number of existing or potential management measures are spatially explicit. It also allows particular regions of interest, e.g. the PNG EEZ, to be embedded as a discrete sub-region within a regional stock assessment so that local dynamics and fishing impacts can be modelled in the context of the entire stock and spatial interaction effects captured.

Second, tuna tagging data can provide important information on fishing mortality and absolute stock size that can only be obtained indirectly from other data. This is because we know the size of the initial tagged population (the number of tagged fish released), which allows more powerful inferences to be made regarding fishing mortality of the tagged fish, and by extension, of the untagged population. It is clear that tagging conducted continuously, as opposed to episodically, has the potential to deliver even greater benefits for the assessment of tuna stocks. Since the PTTP a three-year tagging project has been conducted in 2011-2013 in PNG, the PNGTP (Papua New

Guinea Tagging Project) which has extended the time series of tagging in PNG since the beginning of the PTTP in mid-2006 to 7+ years.

The PNGTP has primarily focused on providing the data resources to assess the status of tuna resources in PNG, and thus provide critical information for national tuna fisheries management. The assessments however have been designed to include the wider WCPO such that stock-wide exploitation and spatial interaction effects will be accounted for. While tagging was the focus of this work, the PNGTP is working in synchrony with other data collection systems – logbook, port sampling, observer and vessel monitoring systems – to provide a rich suite of data on which to base assessments meeting international best practice. A major additional objective of the programme iss to further enhance the capacity of the PNG National Fisheries Authority to mount major field programmes, manage and analyse the data, and use the results to formulate recommendations for the management of the fishery. Capacity building occurs with the continued mentoring of several existing NFA staff in key areas of the programme, and through the involvement of several new local staff recruited by the programme.

Purpose of report

The purpose of this report is to provide a summary on the implementation of tagging experiments of the PNGTP. The information provided includes a general description of tagging activities undertaken. A list of cruises is provided in Table 1 and tracks of each cruise provided in Figure 1.

Table 1: List of tagging cruises undertaken in PNGTP. *as defined in the PTTP database

Project	Cruise*	Vessel	Start	End
PNGTP - Papua New Guinea #1	PG2-1	Soltai 105	11-Apr-11	04-May-11
PNGTP - Papua New Guinea #1	PG2-2	Soltai 105	04-May-11	08-Jun-11
PNGTP - Papua New Guinea #1	PG2-3	Soltai 105	08-Jun-11	12-Jul-11
PNGTP - Papua New Guinea #2	PG3-1	Soltai 105	17-Jan-12	19-Feb-12
PNGTP - Papua New Guinea #2	PG3-2	Soltai 105	09-Feb-12	29-Feb-12
PNGTP - Papua New Guinea #2	PG3-3	Soltai 105	29-Feb-12	18-Mar-12
PNGTP TAO trial Cruise	PG4-1	FTV Pokajam	15-Aug-12	20-Aug-12
PNGTP - Papua New Guinea #3	PG5-1	Soltai 101	06-Apr-13	27-Apr-13
PNGTP - Papua New Guinea #3	PG5-2	Soltai 101	28-Apr-13	19-May-13
PNGTP - Papua New Guinea #3	PG5-3	Soltai 101	20-May-13	06-Jun-13

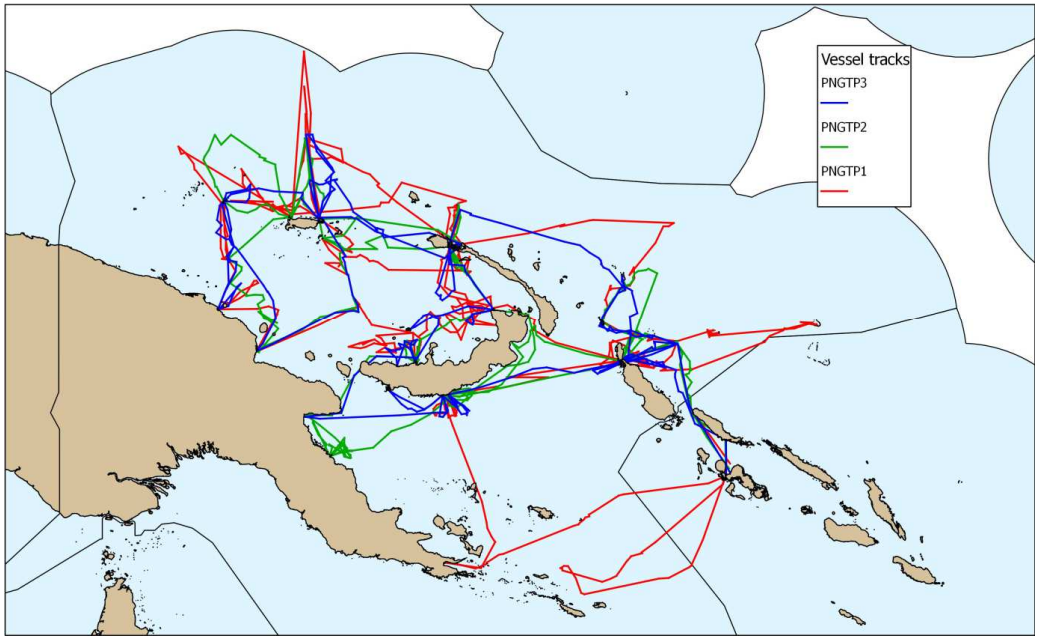


Figure 1: Vessel track of the tagging cruise during the PNGTP campaign

Baiting

Table 2 presents the baitgrounds visited during the different cruises with the average number of buckets collected. Figure 2 provides the locations of the baitgrounds visited.

Table 2: Baitgrounds visited with the average number of buckets and the type of species

Location	Average buckets	Nb. of visits		Location	Average buckets	Nb. of visits
Analaua Island, NH	252	5		Nares Habour	217	6
Arawe	10	1		Nissan Is	162.4	5
Bialla	115	1		Nuguria	168	3
Borgen	120	1		Nukumanu	100	1
Byron baie	257	1		Nusandaula	161	6
Cape Lambert inshore	136	8		Perter Haven, Garove Is	39	1
Carteret	169	4		Pondo	225	1
Eleonora Bay	285	2		Rasch Passage, Madang	77.5	4
Emeline Bay	188	5		Ropa, Choiseul	214	3
Fulleborne Hbr	27.5	2		Seadler Habour	189	11
Gasmata	176	4		Sherburne	129	4
GiliGili, MilneBay	63	1		St Andrews	62	3
Hansa Bay	57.5	4		Taiof	221	15
Hermit Is	214	6		Walanguo Is	310	2
Iboki	161	3		Ysabel Pass	240	2
Lindenhaven	237	8				
Manus Seeadler	240	1				
Morobe Hbr	240	5				

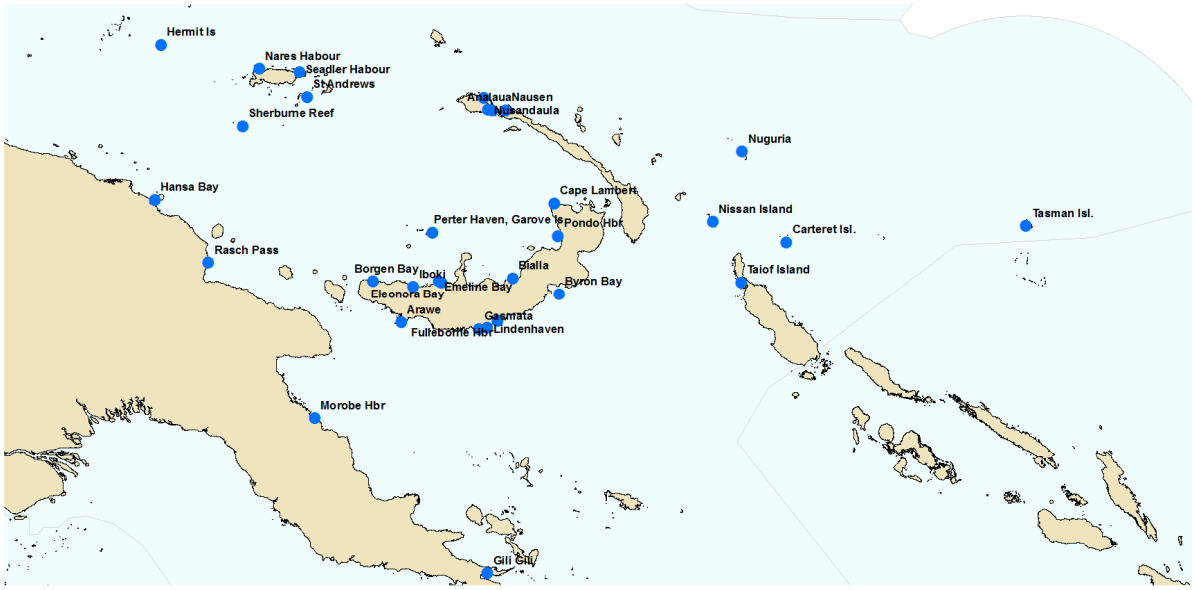


Figure 2: Map of bait grounds visited during the PNGTP cruises

Conventional Tag Releases

A total of 110,503 tuna were tagged and released during PNGTP (Table 3). Skipjack tuna was the dominant species with 80,438 conventional tag releases, followed by yellowfin tuna with 27,138 tags and bigeye tuna with 2,927 tags. Bigeye tuna was a difficult species to catch with the pole-and-line gear which targets mostly surface schools. Most of the bigeye tuna were tagged on weather buoys in the Northern and Eastern Sea sub-areas (Figure 3). To facilitate spatial analysis, 4 sub-areas were defined within the PNG EEZ; Northern Sea, Eastern Sea, Bismarck Sea and Solomon Sea (Figure 4, Table 3). The majority of fishing time was spent in the Bismarck (68/160 days) resulting in 34% of all the releases, however fishing was not very productive resulting in the lowest number of tags released per day out of the four sub-areas (Table 3).

Table 3. Tag releases by sub-area and species for the PNGTP

Areas	Days	SKJ	YFT	BET	Total	Tags/day
Northern	20	13634	867	936	15437	772
Bismarck	68	26299	11362	193	37854	557
Eastern	35	19689	7358	1664	28711	820
Solomon	37	20816	7551	134	28501	770
Total	160	80438 (72.8%)	27138 (24.6%)	2927 (2.6%)	110503	**691**

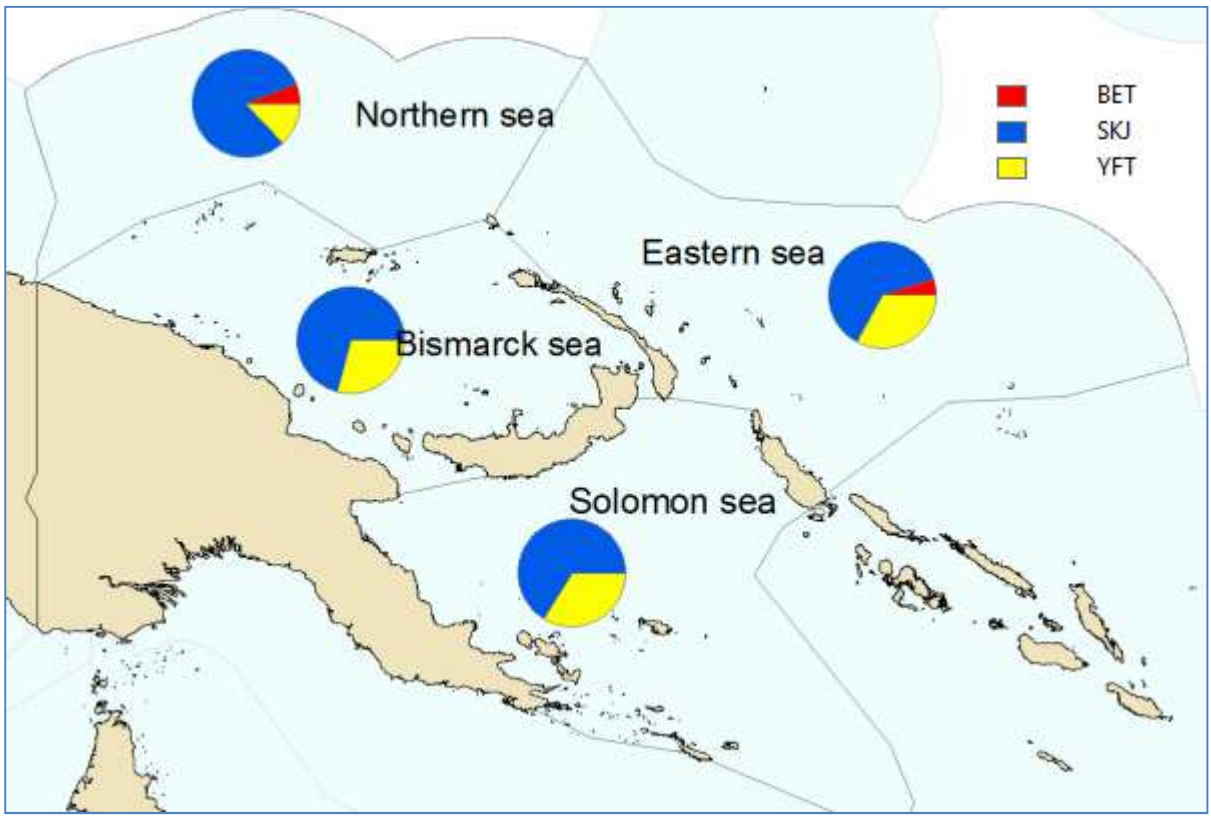


Figure 3: Releases by species for PNGTP cruises

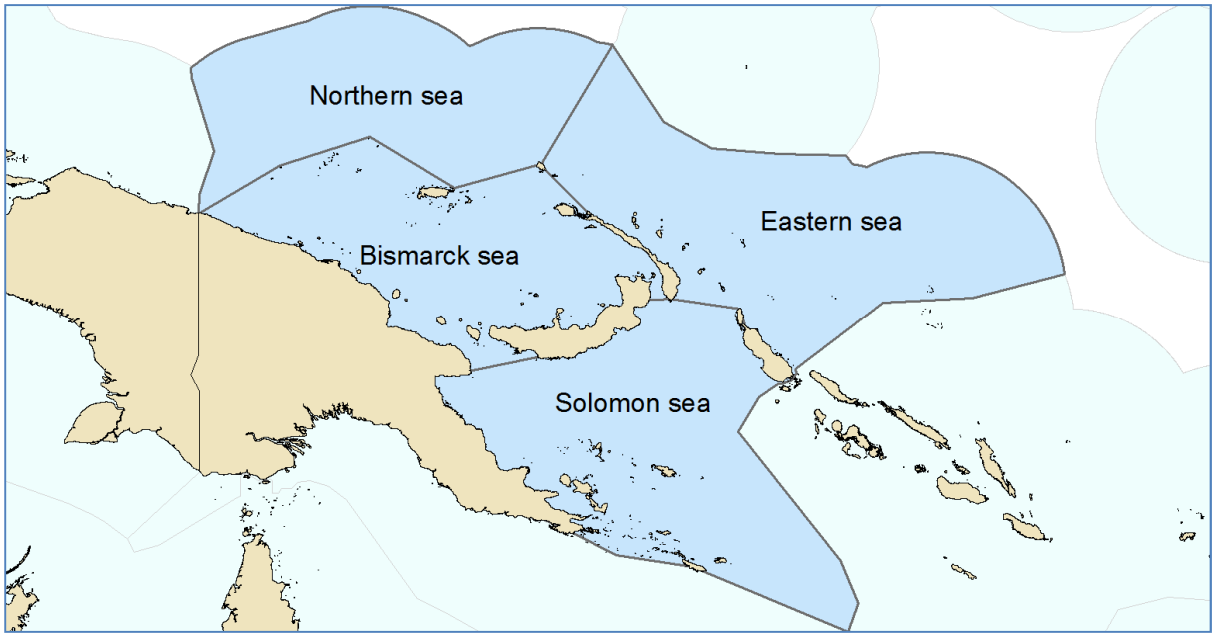


Figure 4: PNG sub-areas as defined for this analysis

The number of releases by school association is summarised in Table 4. Free-school, anchored FADs and seamounts were the dominant associations. The distribution of school association by sub-areas was biased with a dominance of anchored FAD releases in the Bismarck Sea and Free-school releases in the other sub-regions

Table 4. Releases per school type for PNGTP cruises

School association type	Bigeye	Yellowfin	Skipjack	Total
Free school	101	6895	31038	38034 (34.4%)
Log	745	6578	8221	15544 (14.1%)
Anchored FAD	1757	7550	23951	33258 (30.1%)
Drifting FAD	126	1343	4064	5533 (5.0%)
Marine mammal or whale shark	139	617	1023	1779 (1.6%)
Current line	25	793	2237	3055 (2.8%)
Seamount	34	2829	9869	12732 (11.5%)
Island or reef	0	533	35	568 (0.5%)
Total	**2927 (2.7%)**	**27138 (24.6%)**	**80438 (72.8%)**	**110503**

Size distribution

Figure 5 summarize the size distribution of tagged fish by species. During PNGTP, the size distribution comprised one mode for skipjack and yellowfin and two modes for bigeye. The size range of skipjack, yellowfin and bigeye varied between 28-93 cm, 28-76 cm and 29-80 cm respectively. The size frequency of releases by set type (Table 5), demonstrates that smaller fish are generally tagged from associated sets and bigger fish from free sets.

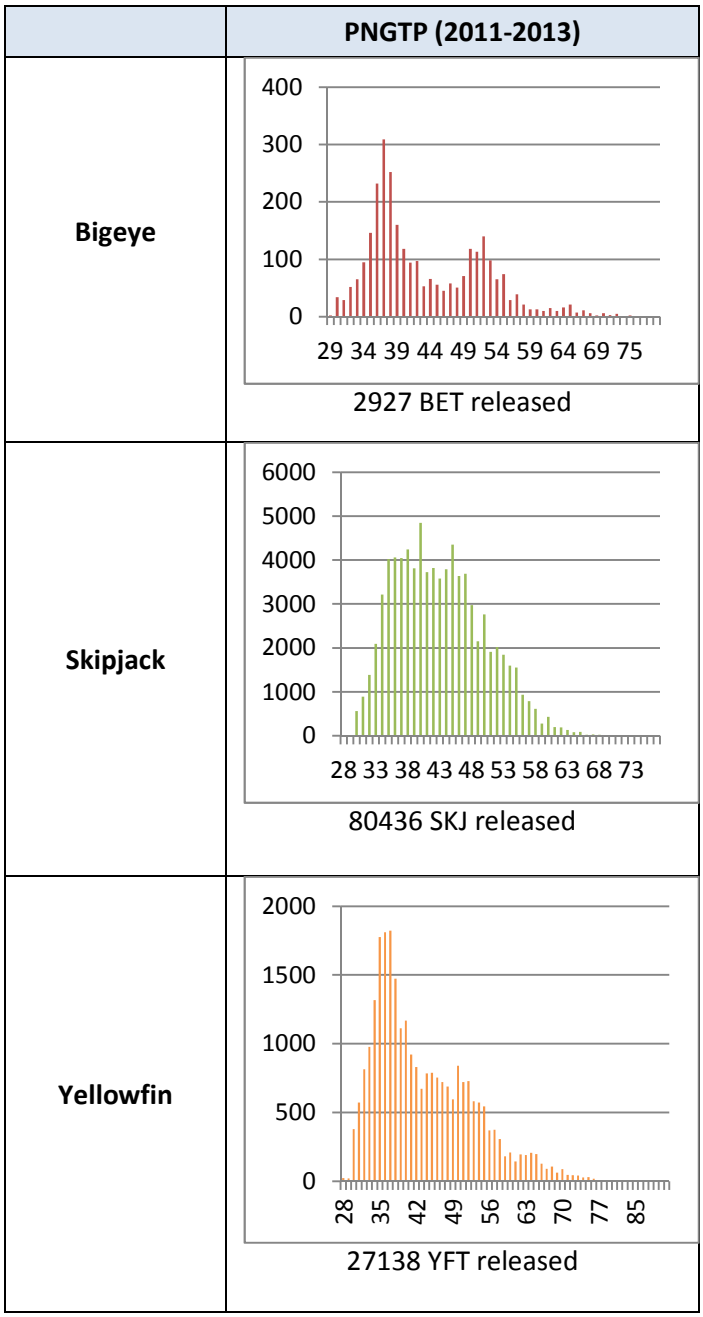


Figure 5: Comparison of size distribution for the 3 species

Table 5: Average length (Avg) and standard deviation (StDev) per school type, species and PNG Seas for all cruises *Sample size insufficient for calculation of summary statistics for some school types

	PNG Sub-Area	Free Schools		Anchored FADs		Drifting Objects	
		Avg	StDev	Avg	StDev	Avg	StDev
Bigeye	Bismarck	50.4	5.8	36.2	4.5	41.2	7.2
	Eastern	43.7	7.5	39.6	5.4	38.7	4.5
	Northern*			51.7	8.0		
	Solomon*	43.1	9.3			40.0	9.0
Skipjack	Bismarck	43.9	5.2	37.3	4.5	39.6	7.9
	Eastern	47.0	7.1	42.0	5.0	45.2	8.0
	Northern	43.8	7.7	42.0	5.9	44.3	8.7
	Solomon	44.3	6.8	37.3	3.6	45.2	5.9
Yellowfin	Bismarck	47.5	6.8	36.7	5.1	36.9	5.6
	Eastern	52.4	6.4	42.3	7.0	41.2	8.3
	Northern	39.1	9.2	41.6	5.4	37.4	3.5
	Solomon	51.0	9.9	37.2	6.1	43.8	10.2

Conventional Tag Recovery

As at 15 July 2014, 20731 fish tagged in PNGTP have been recovered (Table 6, Table 7). The spatial location of recoveries (Figure 6) mirrors the distribution of releases and is consistent with the distribution of commercial fishing effort. The majority of fish have been recovered at anchored FADs (55%) regardless of the school type at release (Table 8), which may simply reflect that that most fishing in PNG waters occurs on FADs and by purse-seine vessels (Table 9).

Table 6: Recoveries (numbers and %) per PNG cruises

Project	BET	SKJ	YFT	Nb. Tags
PNGTP	591	15446	4694	20731

Table 7: Overview of number of recoveries in PNG EEZ and outside per year and species (all tagging projects):

Year of Release	Species	Total releases	Releases in EEZ	Released & recovered in EEZ	Released in EEZ & recovered outside
2011	B	355	355	44	8
2011	S	28730	28730	3994	1033
2011	Y	11571	11571	2030	207
2012	B	2008	2008	366	42
2012	S	28312	28312	5230	432
2012	Y	9607	9607	1233	118
2013	B	564	564	21	0
2013	S	23396	23396	2104	156
2013	Y	5960	5960	576	22

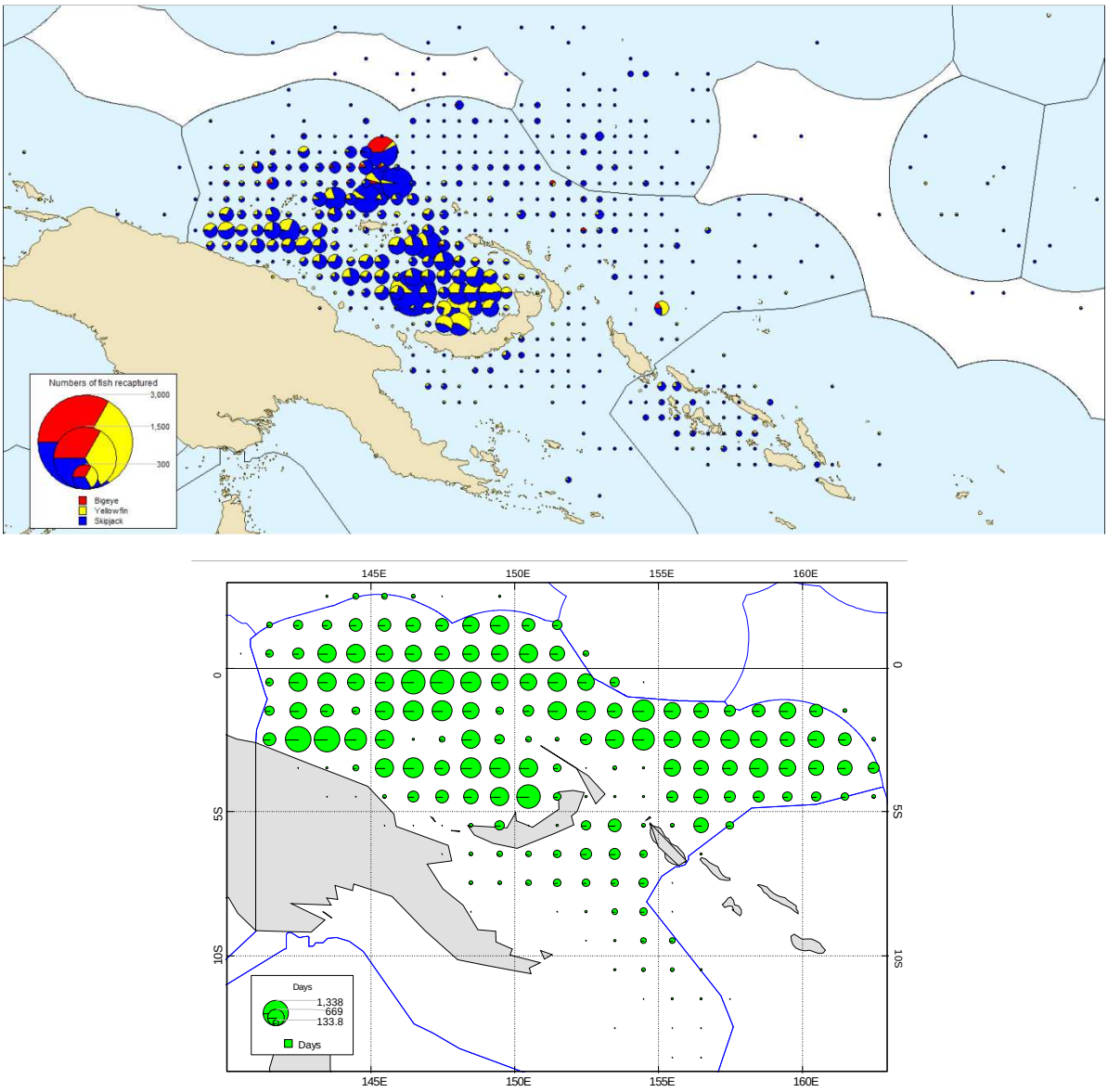


Figure 6: Recovery positions of fish released during all cruises (top panel) and purse seine effort for the period 2011-2013 in the lower panels.

Table 8: Number of recoveries by school type per species.

Species	School assoc.	No. releases	Anchored FADS at recovery	Free schools at recovery	Drifting object at recovery
Bigeye	Anchored	1757	73	192	70
	Drifting	1035	8	24	9
	FreeSchool	135	4	8	7
Skipjack	Anchored	23951	1581	1393	627
	Drifting	15545	373	785	206
	FreeSchool	40942	897	2883	829
Yellowfin	Anchored	7550	799	396	154
	Drifting	9331	246	361	94
	FreeSchool	10257	262	788	177

Table 9: Number of recoveries per fishing method

EEZ	Fishing Method	Nb. Of Recoveries
PG	Gillnet	15
PG	Handline (Large Scale)	5
PG	Longline	1
PG	Pole-and-line	25
PG	Purse seine	10256
PG	Unclassified/Unspecified	30

Tagging recapture data were provided in PNG by different companies (Table 10), with Frabelle, RD and TPJ the main sources of tag recoveries. The Philippines and Thailand have been the principal sources for tag recovery outside of PNG (Table 10). In order to verify the data provided by the finder and collected by the TROs, Vessel Monitoring System data (VMS) or logsheet information is used to verify the position of the fishing vessel at a specific period of time. Of the 20731 recoveries provided by TROs in PNG, 13635 have been validated (74% of the total) mostly using VMS data (78%) and logsheet data (17.5%).

Table 10: Recoveries (numbers) per data provider

tag_source	Tags	tag_source	Tags
PNG Locations		***Other Locations***	
PNG (Frabelle)	4171	Philippines (direct)	3280
PNG (RD)	2197	Thailand	2631
PNG (TPJ Fishing)	1710	Japan	794
PNG (RBL Fishing)	899	Solomon Islands (Taiwan Deep Sea Assoc)	554
PNG (other)	895	FSM	439
PNG (TSP Marine)	416	IATTC	403
PNG (SST)	253	Solomon Islands (Soltai)	351
PNG (Pacific Blue Sea Fishing)	234	Solomon Islands (NFD)	263
PNG (NFA)	226	Philippines (Frabelle)	158
PNG (RR Fishing)	29	Fishing vessel	103
PNG (Fairwell Fishery)	23	Marshall Islands	83
PNG (Luminar Fishing)	12	Kiribati (Tarawa)	81
PNG (Sepik Coastal Agencie)	10	Solomon Islands (Korean Deep Sea Assoc)	80
PNG (Fong Seong Fishery)	7	Indonesia	62
PNG (China Fisheries Assoc)	6	American Samoa	39
PNG (Taiwan Deep Sea Assoc)	6	Solomon Islands (MFMR)	36
PNG (Korean Overseas Assoc)	2	Solomon Islands (other)	35
PNG (Dologen ltd)	1	Philippines (NFRDI)	31
		FSM (SPC)	30
		Taiwan	24
		Other	19
		Solomon Islands (Global Investment)	13
		Tagging vessel	12
		Vanuatu	9
		Kiribati (Kiritimati)	4
		Solomon Islands (Wst. Solomon ventures Ltd)	2
		Nauru	1

For recoveries in PNG, as illustrated in Figure 7 and 8 the quality and accuracy of data associated with date and position of recovery information are high (most of them have a precision of less than 1 degree for the position and less than 1 month for the date) for tags recoveries processed by TROs. However there have been some corrections made during the validation process, catch positions of 3124 recoveries (23% of the validated records) have been corrected to provide a more accurate catch location and the catch date has been corrected for 1456 recoveries (10% of the total). Information on gear, date and location of recapture and vessel name are generally accurate. The species identification and length quality fields the quality of data deteriorates to approximately 80%. The location (tag discovery site) where the tag was found (cold storage, deck, etc), the activity and the fish state are never or rarely provided.

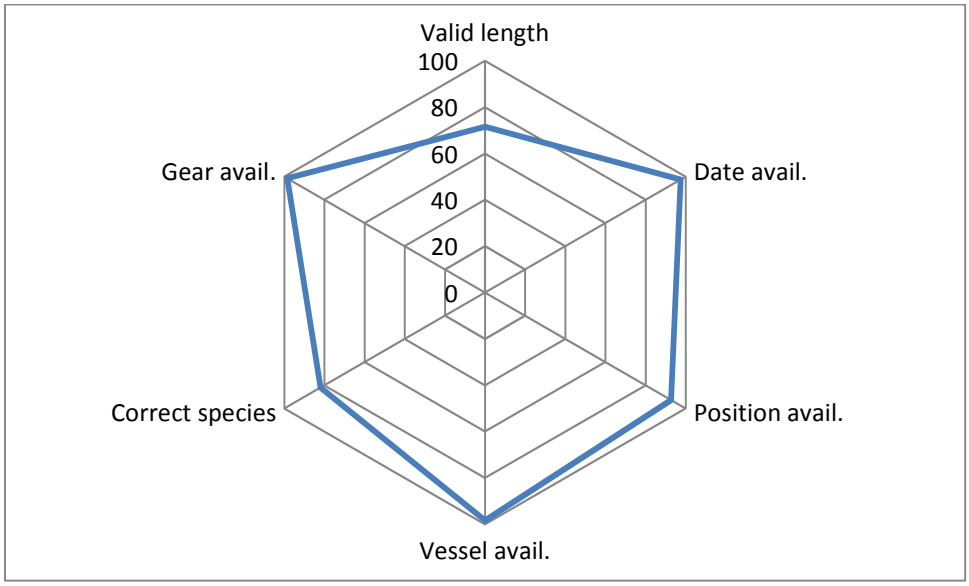


Figure 7 Quality of data provided by PNG TROs

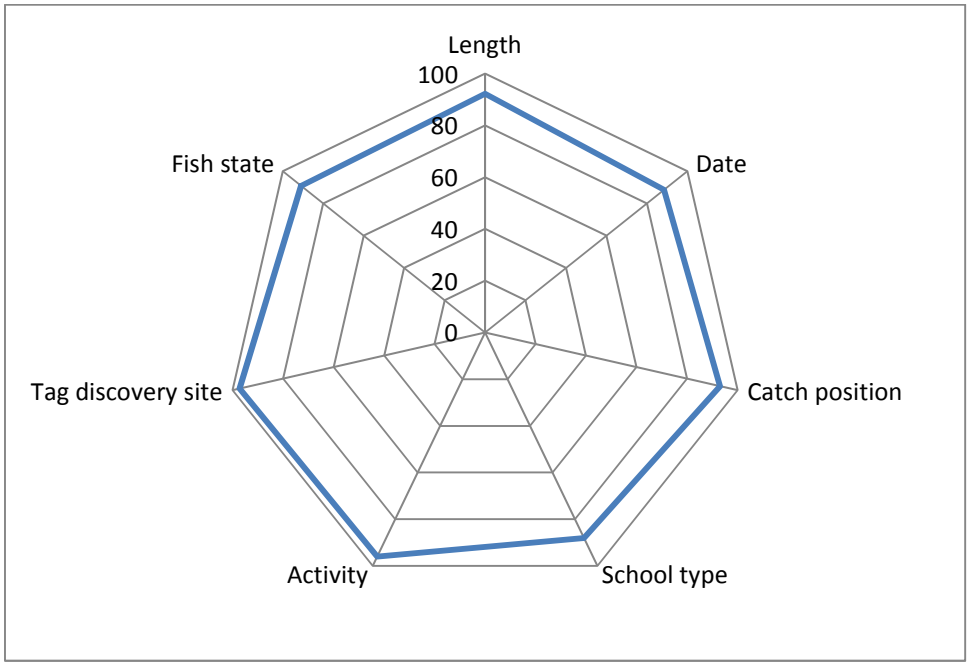


Figure 8: Accuracy of data provided by PNG TROs

There are differences in quality of data between the sources in PNG (Figure 9). However for the primary sources of tag recoveries (Frabelle, RD and TPJ), which constitute 73% of the recoveries, less than 2% of the information is inaccurate for date and location of recapture. Vessel is incorrect 8%, 3% and 2% for Frabelle, RD and TPJ respectively and fish length is poor for 24%, 14% and 15% for Frabelle, RD and TPJ respectively.

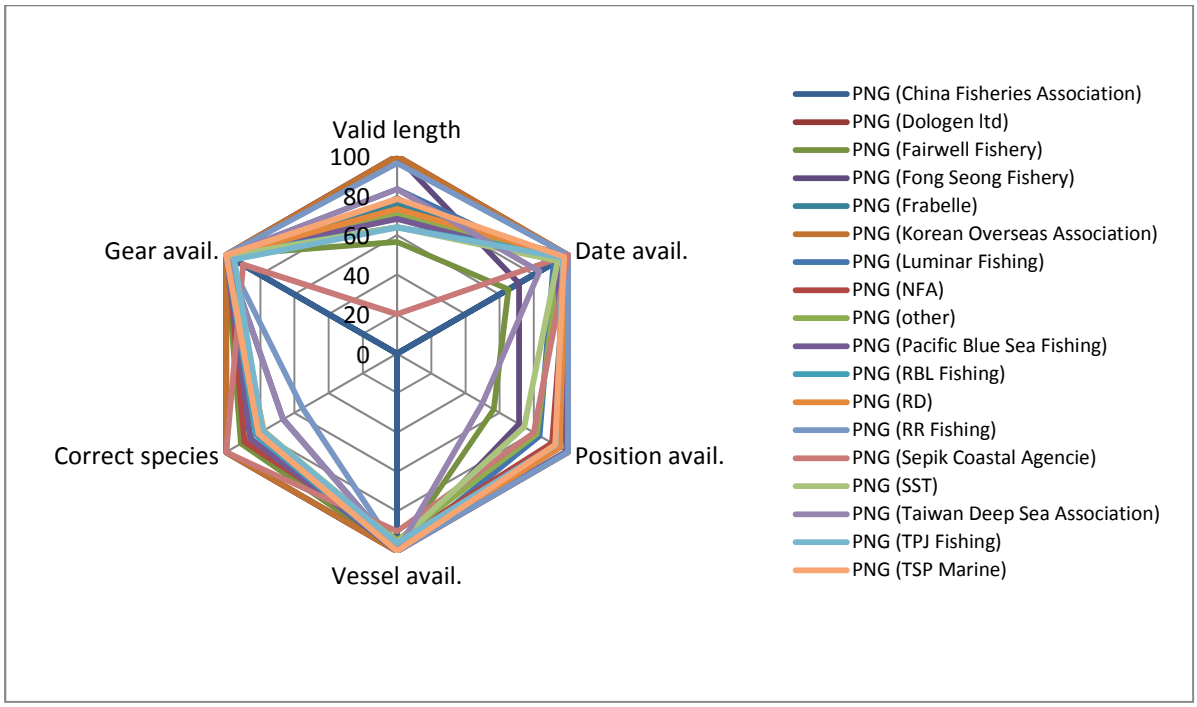


Figure 9: Quality of data provided by different source in PNG

The quality of data collected by the PNG TROs however is higher than the sources of tags outside of PNG (Figure 10). Philippines (direct) is the largest source of tags outside of PNG and recovery date, location and vessel ID are only provided for 88%, 71% and 90% of recoveries. Thailand which is the second largest source of recoveries outside of PNG the location of recovery is never provided and is inferred typically using VMS from the date (provided for 90% of recoveries) and vessel (provided 99% of recoveries).

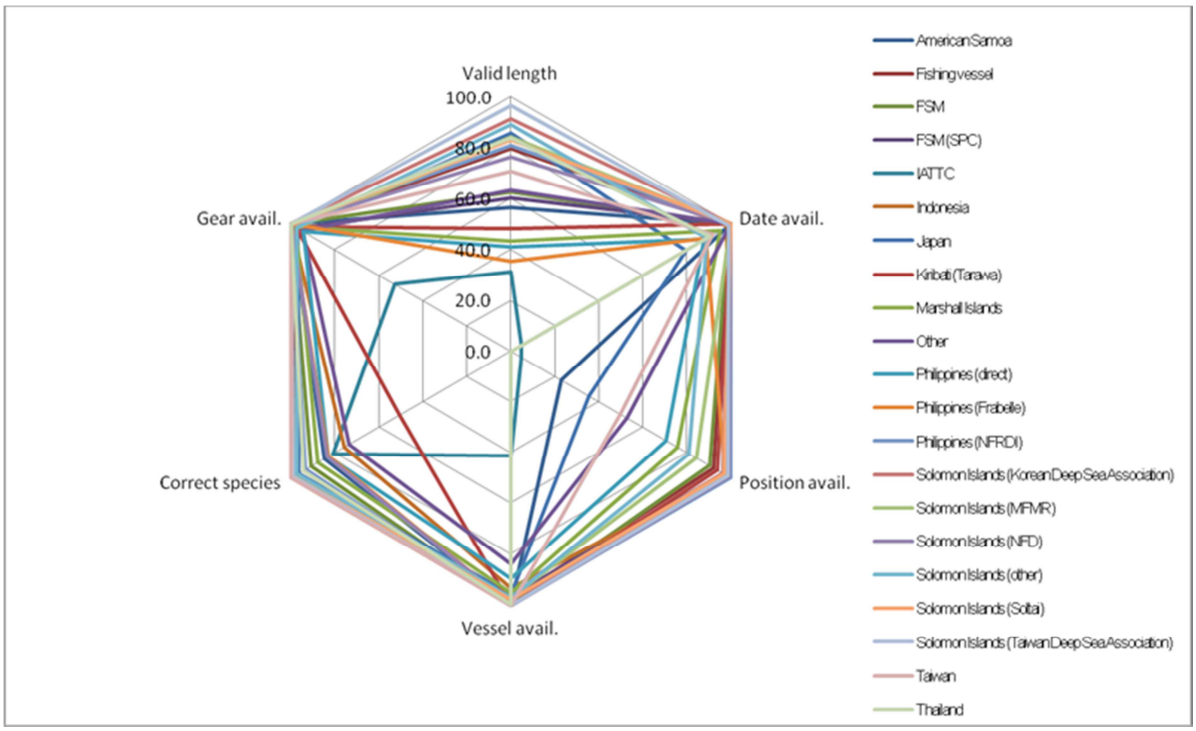


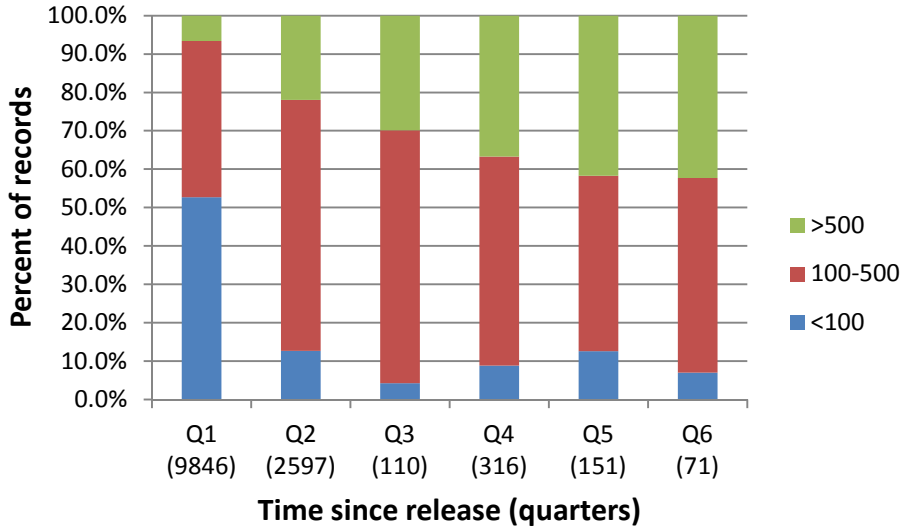
Figure 10. Quality of data provided by different source outside of PNG

Time at liberty & distance travelled

Figure 11 graphs the proportion of releases by successive quarters within 100nm, 100-500 nm and > 500 nm displacement from the release point for skipjack and yellowfin. Movement trends observed are consistent with expectations for mobile species with larger scale displacements positively related to increasing time at liberty. Skipjack appear to show a greater degree of mobility on average than yellowfin, with more than 50% of recoveries after five quarters involving displacements of more than 500 nm, whereas this is not observed in yellowfin after 6 quarters. The displacement also appears more rapid for skipjack, with the majority or returns > 100 nm from the release point after two quarters (6 months) whereas for yellowfin after 6 months, the majority of displacements are reported in the <100 nm with fewer displacements >500 nm. Although yellowfin dispersion is slower than that observed for skipjack the total distances moved are similar with that observed for skipjack (Figure 12).

Tag attrition (the decline in recovery numbers with time, Figure 13) follows the expected declining pattern with the rate of decline in skipjack tag returns indicating their shorter expected lifespan. It is also noted that most of the tagged fish are recovered in the first year of release, particular in the case of skipjack (Figure 13).

Skipjack



Yellowfin

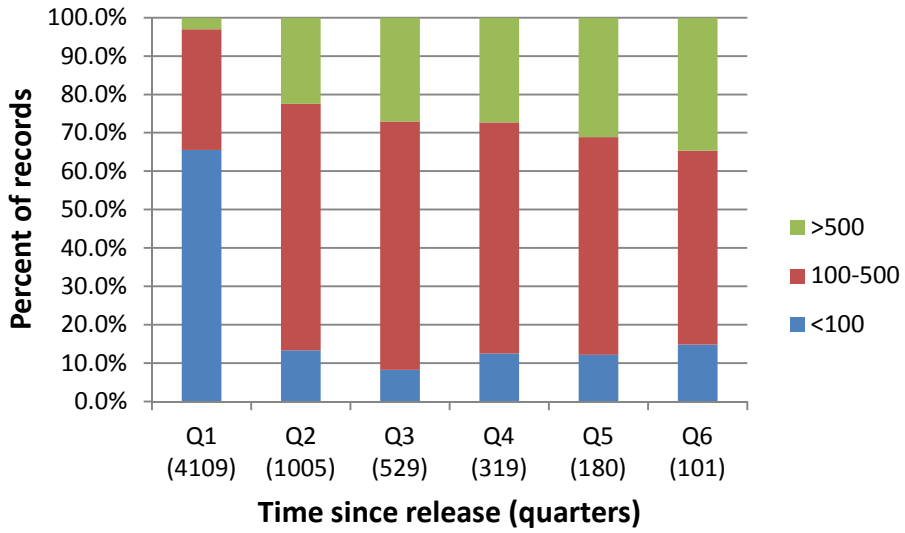


Figure 11: Reported recoveries within 100 nm, 100-500 nm and >500 nm in the first 6 quarters (18 months) since release for skipjack and yellowfin released in PNG waters. The sample size for each quarter is provided in the parentheses below the quarter label on the x-axis.

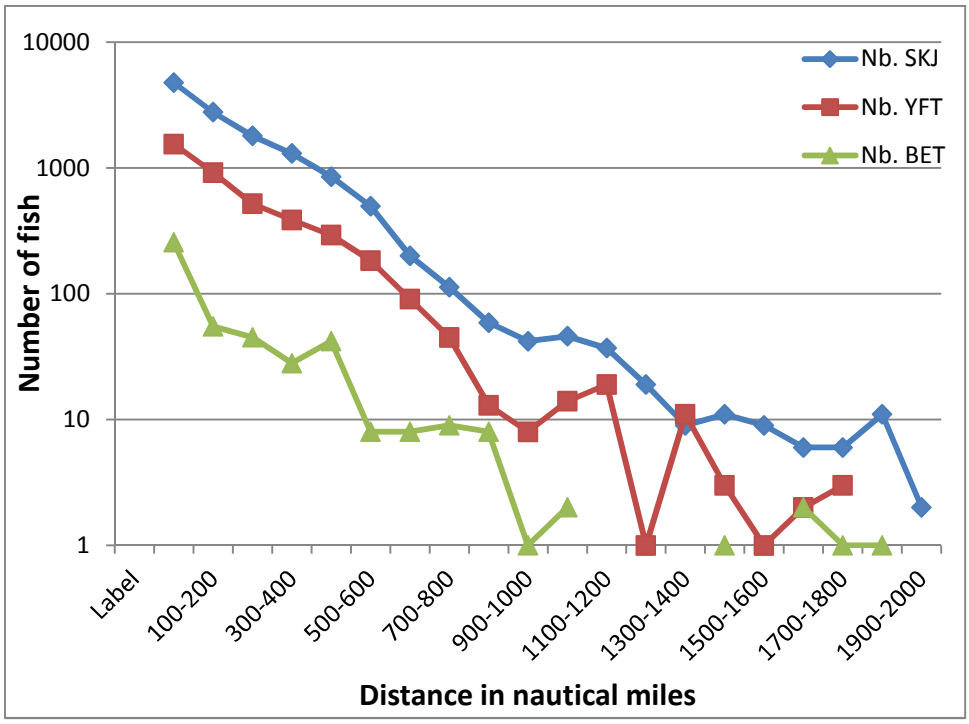


Figure 12: Distance travelled in nm up to 2000 nm

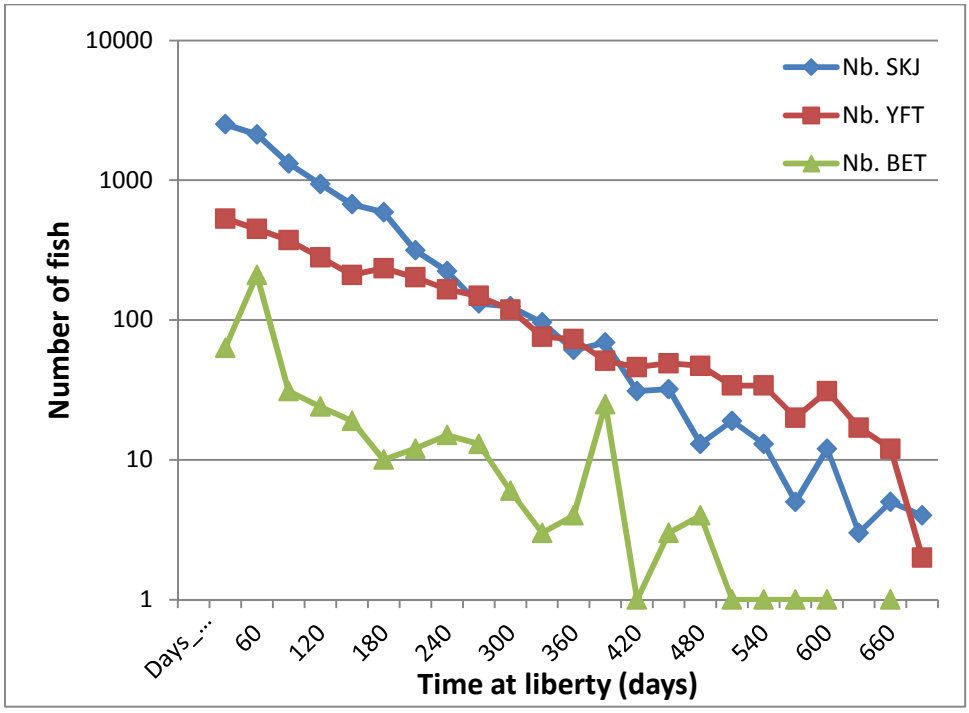


Figure 13: Time at liberty in days up to 2 years

Long range Movements

Arrow maps (Figure 14) depict the reported displacements > 200nm for verified recoveries with area reliability less than 2 degrees for each species. The global displacement pattern is generally

towards the equator and central Pacific for the larger movements. This West to East longitudinal movement is consistent for all species.

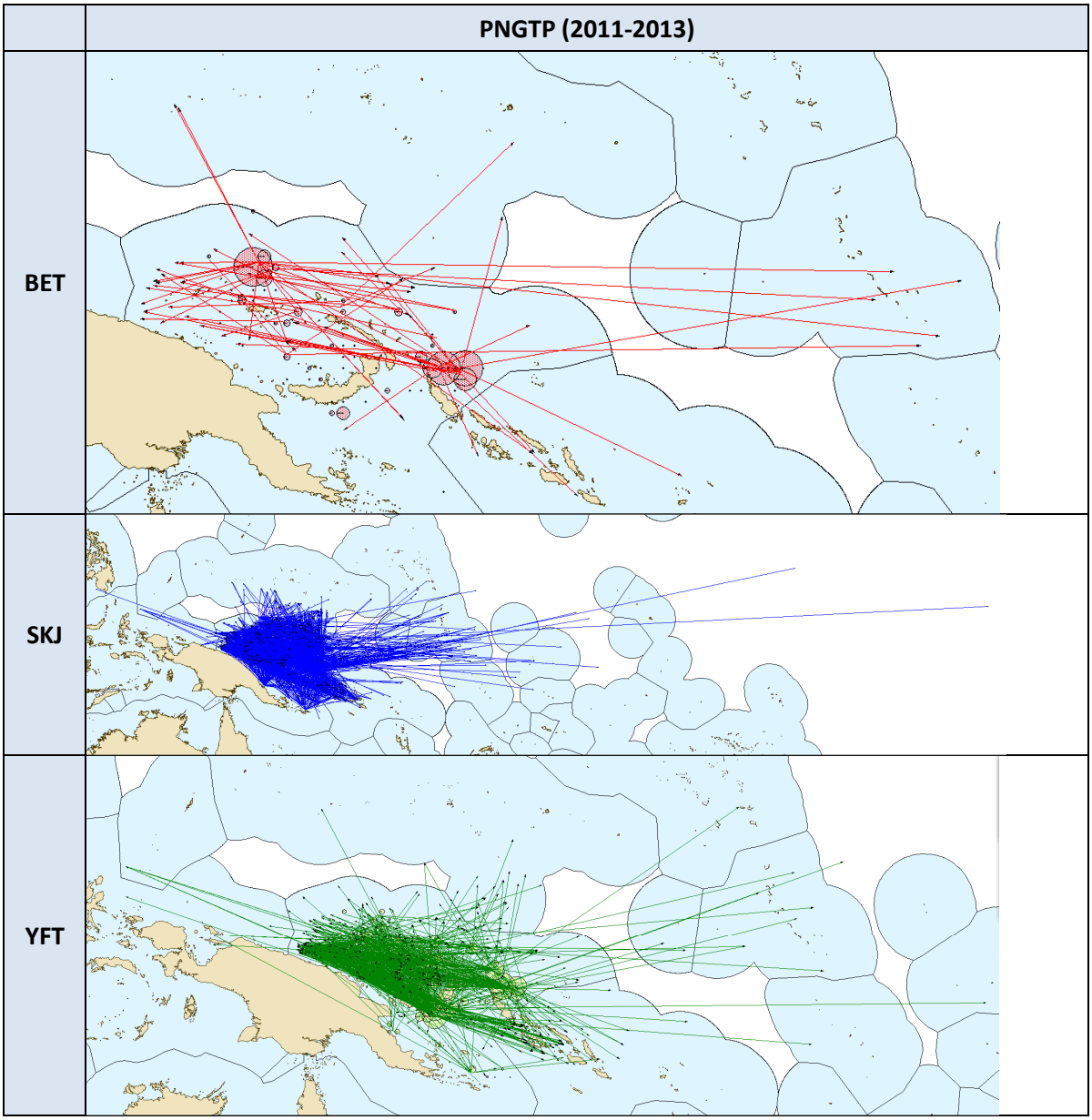


Figure 14: Release/Recovery arrow maps by species. Displacements over 200nm.

The validated recoveries (11692 fish total) from PNGTP releases were observed over a wide area of the western Pacific. Most were recovered in PNG (10332 tags - 88%). However, other recoveries were observed from FSM waters (624 tags-5%), the SB waters (486 tags -4%), Kiribati, Nauru, Indonesia, Palau. Figure 15 shows the relative number of recaptures by external EEZ, represented by different shadings. The pattern of movement indicates little evidence for large advected movement with diffusion the more dominant movement process.

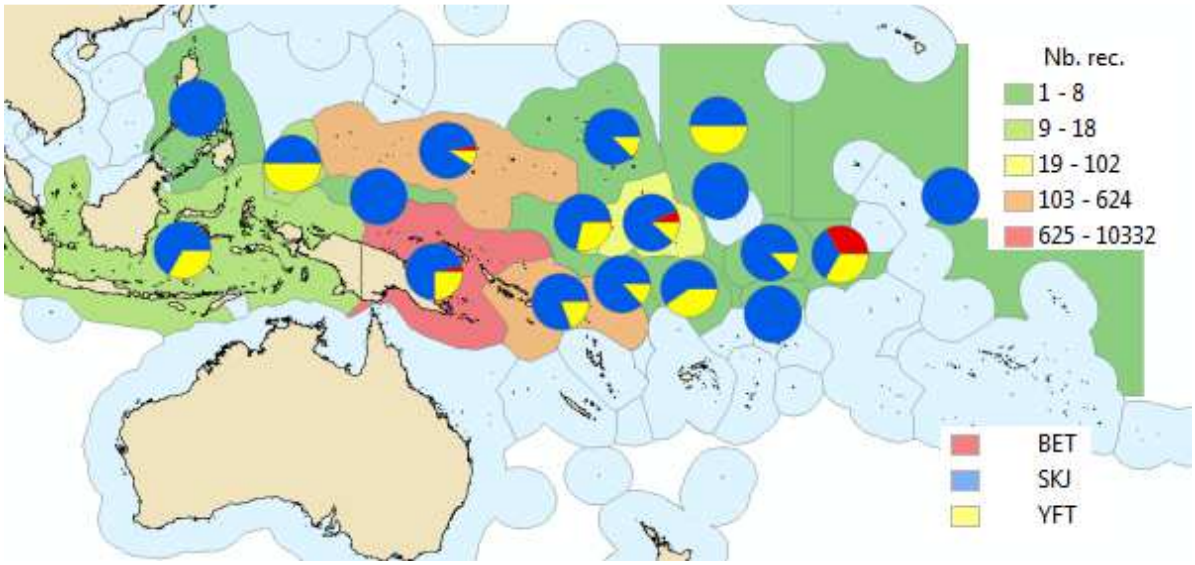


Figure 15: Catch by EEZ for validated recoveries released in PNG waters

Table 11 and Figure 16 summarize the interactions amongst the PNG sub-areas. The interaction between the Bismarck Sea and Solomon Sea appears from these raw statistics to be stronger than the interaction with the other regions

Table 11: Release/Recovery table by PNG Seas. The recoveries from releases in the same sea area are shaded.

Release PNG sub-areas	Total releases	Total recoveries validated position	Recov. in Bismarck	Recov. in Eastern	Recov. in Northern	Recov. in Solomon	Recov. in Outside
Solomon	28501	1540	782	126	147	184	301
Eastern	28711	1832	464	468	173	55	672
Bismarck	37854	6184	5141	123	644	115	161
Northern	15437	2136	282	145	1491	7	211

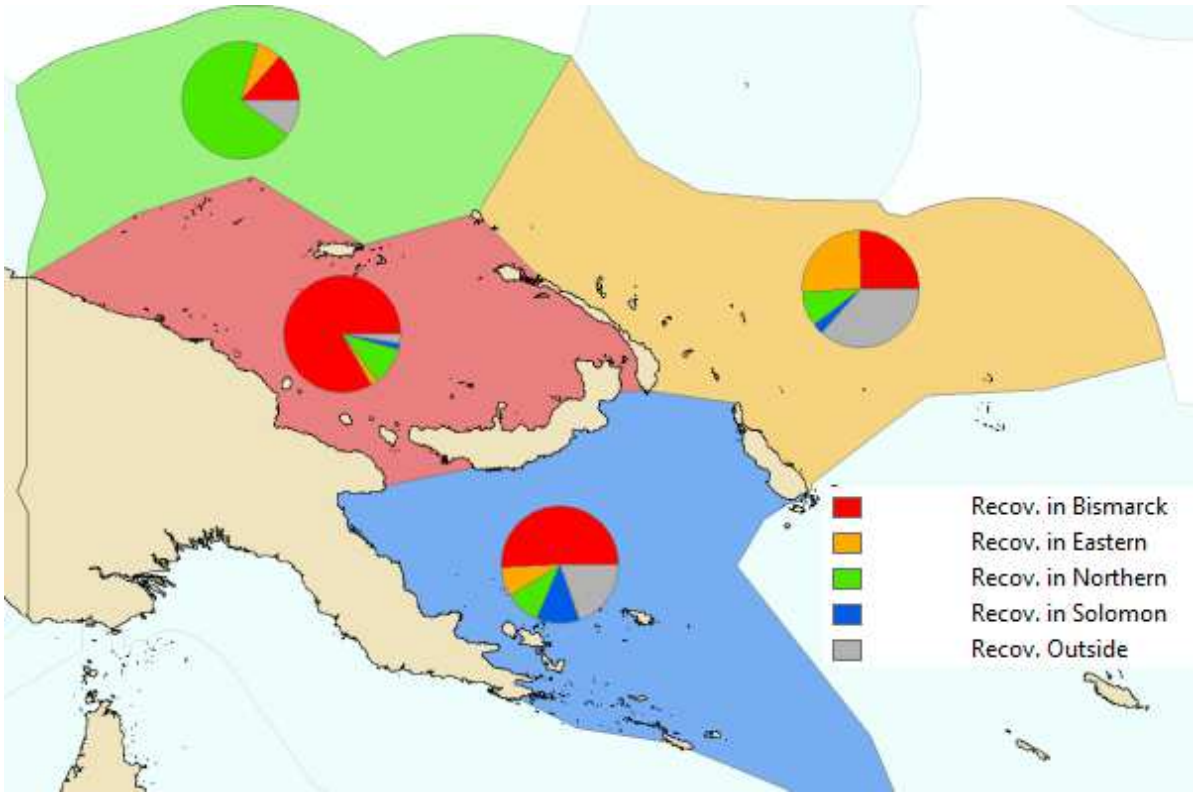


Figure 16: Proportion of recoveries in each PNG Sea per PNG Sea at release.

Growth estimates

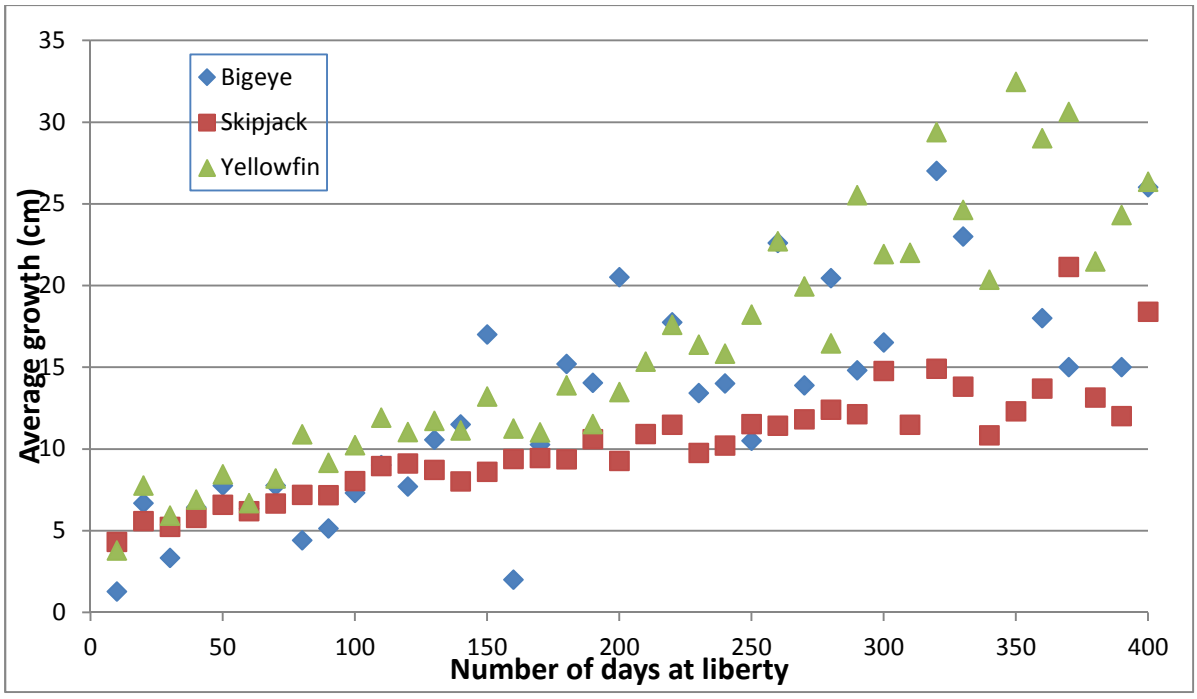


Figure 17: Growth estimates per species

In Figure 17, an indicative growth curve for each species can be established based on average lengths from fish caught less than 400 days after their release and for which the length quality index indicates a positive growth. At the fish sizes involved (mostly 35-45 cm), growth increments

for the three species seem broadly similar, though with more variability in the case of the smaller number of bigeye returns, and with yellowfin growing faster after around 200 days at liberty.

Tag seeding experiments

890 tuna have been tagged in the PNG during 59 distinct seeding cruises (Table 12). The first occurred in February 2007 and the last one in February 2013. More recent cruises have occurred in the last 6 months but the logsheet data from the observer have not been received or entered yet. 551 of the seeded tags have been recovered to date, with a recovery rate of 62%.

Table 12: Result of tag seeding experiments

Start cruise	Cruise	Vessel name	Flag	Nb. Releases	Nb. Recoveries
16-Feb-07	SED-02	Dolores 837	PG	5	5 (100%)
12-Mar-07	SED-04	Hsiang Fa 8	PG	2	1 (50%)
19-Mar-07	SED-01	DOLORES 834	PG	25	25 (100%)
08-Apr-07	SED-05	Golden Sapphire	PH	15	14 (93.3%)
28-Jul-07	SED-06	Yu Wen 301	TW	9	3 (33.3%)
05-Aug-07	SED-07	Dolores 829	PG	25	16 (64%)
29-Sep-07	SED-47	Fair Pesca 707	TW	17	11 (64.7%)
23-Oct-07	SED-15	Sea Encounter	US	2	1 (50%)
27-Oct-07	SED-46	Tuna Queen	PG	2	2 (100%)
26-Dec-07	SED-14	Dolores 828	PG	20	12 (60%)
10-Feb-08	SED-18	Koos 108	MH	10	4 (40%)
11-Feb-08	SED-16	Koos 107	MH	14	2 (14.3%)
16-Feb-08	SED-11	Eastern Star	PG	15	6 (40%)
18-Feb-08	SED-12	Shun Fa 8	PG	16	13 (81.3%)
06-Mar-08	SED-17	Marshalls 201	MH	23	17 (73.9%)
19-Mar-08	SED-13	Shun Fa 8	PG	6	1 (16.7%)
01-Apr-08	SED-10	Silver Queen	PH	24	24 (100%)
04-Apr-08	SED-09	Fair Pioneer 707	PG	20	7 (35%)
09-Jun-08	SED-19	Resty BT	PH	19	6 (31.6%)
29-Nov-08	SED-23	Jin Hui 2	CN	18	1 (5.6%)
21-Dec-08	SED-24	Alpine Rose/Sunflower 888	PH	20	17 (85%)
12-Feb-09	SED-26	Dolores 828	PG	25	11 (44%)
25-Feb-09	SED-27	Cape Finisterre	US	8	6 (75%)
01-May-09	SED-33	Dolores 829	PG	25	25 (100%)
02-Jun-09	SED-32	Hannah 88	PG	24	22 (91.7%)
17-Oct-09	SED-42	Queen Evelyn	PH	50	49 (98%)
08-Nov-09	SED-41	Dolores 827	PG	25	25 (100%)
18-Mar-10	SED-143	Koo's 101	MH	2	0 (0%)
18-Mar-10	SED-53	FONG SEONG 666	VU	25	20 (80%)
20-Mar-10	SED-55	Sea defender	US	11	3 (27.3%)
14-Sep-10	SED-50	Sajo Accordia	KR	20	1 (5%)
18-Sep-10	SED-57	Eastern Marine	US	5	4 (80%)

Start cruise	Cruise	Vessel name	Flag	Nb. Releases	Nb. Recoveries
15-Jun-11	SED-104	YAP SEAGUL	FM	4	0 (0%)
04-Jul-11	SED-73	Sajo Olympia	KR	25	0 (0%)
06-Jul-11	SED-87	Alpine Pink	PH	12	12 (100%)
16-Jul-11	SED-80	Sajo Accordia	KR	12	1 (8.3%)
30-Jul-11	SED-77	Sajo Potentia	KR	4	4 (100%)
26-Aug-11	SED-105	Kaiho Maru 118	JP	16	2 (12.5%)
07-Sep-11	SED-107	Dolores 827	PH	17	17 (100%)
09-Sep-11	SED-106	Dolly 14	PH	16	15 (93.8%)
21-Sep-11	SED-83	Lojet	MH	56	24 (42.9%)
29-Sep-11	SED-117	Pacific Breeze	US	10	10 (100%)
29-Oct-11	SED-138	Sajo Potentia	KR	8	7 (87.5%)
14-Nov-11	SED-116	Lady Marion	KR	20	12 (60%)
15-Nov-11	SED-101	Ching Feng 787	TW	5	4 (80%)
16-Nov-11	SED-114	Ocean Ace	KR	10	6 (60%)
23-Nov-11	SED-118	Shilla Pioneer	KR	10	5 (50%)
01-Dec-11	SED-151	Blue Ocean	KR	4	0 (0%)
17-Dec-11	SED-134	Dolores 24	PH	15	15 (100%)
23-Dec-11	SED-152	Blue Ocean	KR	16	11 (68.8%)
03-Mar-12	SED-202	Mathawmarfach	FM	6	1 (16.7%)
14-Mar-12	SED-193	Ocean Encounter	US	5	0 (0%)
20-Mar-12	SED-145	FU FA 88	VU	22	17 (77.3%)
20-Mar-12	SED-144	FU FA 88	VU	5	0 (0%)
07-Jun-12	SED-161	Dolores 834	PH	20	3 (15%)
08-Jul-12	SED-155	YU WEN 101	TW	15	10 (66.7%)
21-Jul-12	SED-261	JASMIN 88	PH	10	9 (90%)
29-Dec-12	SED-226	Mariraoi	KI	5	0 (0%)
12-Feb-13	SED-259	Lavender 888	PG	15	12 (80%)

The tag seeding data has been important for identifying sources of recovery data error (Table 13). The data collected by tag finders can be different from those provided by observers at release to a significant degree for important fields such as recovery location (34%) and date (56%). Although a large error (51%) is reported for length at recapture this should be viewed with the perspective that these fish could be slightly shorter due to their measurement in a frozen state, or that the length was not correctly estimated at release.

Table 13: Result of tag seeding data quality

Nb. recoveries	Negative growth	Date difference over 1 week	Position difference over 1 degree	Wrong vessel	Wrong species	Wrong gear
551	284 (51.5%)	311 (56.4%)	187 (33.9%)	190 (34.5%)	111 (20.1%)	9 (1.6%)