PACIFIC TUNA TAGGING PROJECT
STEERING COMMITTEE

ELECTRONIC MEETING
15 July 2020 (from 18:00-19:30 hours Pohnpei time (UTC+11 hours))

PROJECT 42: PACIFIC TUNA TAGGING PROJECT REPORT AND WORK-PLAN FOR 2020-2023

WCPFC-SC16-2020/RP-PTTP-01

SPC-OFP

1 INTRODUCTION

This Pacific Tuna Tagging Programme (PTTP) report provides information on the PTTP to date with a focus on the tagging activities undertaken in 2019-20 including research voyages, tag recoveries, and tag recovery and seeding activities. Issues arising in 2020 for consideration by the PTTP Steering Committee are highlighted and the PTTP work planned for 2020-2023 is outlined.

1.1 Programme objectives

The PTTP is a joint research project, implemented by the Oceanic Fisheries Programme (OFP) of the Pacific Community (SPC). The goal of the Pacific Tuna Tagging Programme is to provide data and knowledge for stock assessment and management of skipjack, yellowfin and bigeye tuna in the Pacific Ocean. The objectives of the PTTP, originally specified in WCPFC-SC6-2010/GN-IP-04, and revised in 2016 (PTTP Steering Committee, 2016), are:

1. To obtain data that will contribute to, and reduce uncertainty in, WCPO tuna stock assessments including estimation of overall and local exploitation rates, extent of mixing and appropriate spatial strata for use in assessments.

2. To obtain information to better understand the interactions between tropical tuna species and major fishing gears to support development of mitigation measures (where appropriate) and better interpret fisheries data (e.g., CPUE).

Under these objectives, information collected includes age-specific rates of movement and mixing, movement between assessment regions and other adjacent regions of the Pacific basin, species-specific vertical habitat utilisation by tunas, and the impacts of FADs on their behaviour.

In 2011, SPC and the PNG National Fisheries Authority (NFA) also began a three-year tag release programme in the PNG EEZ, funded by NFA. This project, referred to here as the PNG Tagging Project (PNGTP) is considered under the umbrella of the PTTP and where relevant is reported on in this report.

In 2016 the PTTP steering committee recommended that SC normalise the tagging programme as part of the ongoing work of the SC (WCPFC-SC 2016). Ideally this would include research voyages every year alternating between skipjack via pole and line in one year and bigeye via handline and dangler fishing in the next, starting with skipjack in 2017 (noting that yellowfin would be adequately covered by both surveys).

1.2 Operational structure

The overall operational structure of the PTTP to date is given in Table 1, with the work completed since the last PTTP report highlighted and the scheduled work for 2020 also shown. The spatial distribution of these research voyages in the Western and Central Pacific Ocean is shown in Figure 1.

Table 1: Period, area and vessel used in PTTP tagging research voyages since the inception of the programme. Work completed since the last PTTP report to SC15 in 2019 in **bold** and the scheduled work for 2020 shown in *italics*.

	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	May – Jun 2008	Central Pacific (CP1)	*Double D*
(to date)	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*
	Nov – Dec 2013	Central Pacific (CP9)	*Pacific Sunrise*
	Aug 2014	Central Pacific (CP10)	*Pacific Sunrise*
	Sep - Nov 2015	Central Pacific (CP11)	*Gutsy Lady4*
	Sep-Oct 2016	Central Pacific (CP12)	*Gutsy Lady4*
	Sep-Oct 2017	Western Pacific (WP4)	*Soltai 105*
	Jul-Aug 2018	Central Pacific (CP13)	*Gutsy Lady4*
	Jul-Sep 2019	**Western Pacific (WP5)**	**Soltai 105**
	Aug-Sep 2020	*Central Pacific (CP14)*	*Gutsy Lady4*
PNGTP	Apr – Jul 2011	PNG (PNGTP1)	*Soltai 105*
	Jan – Mar 2012	PNG (PNGTP2)	*Soltai 105*
	Aug 2012	PNG (TAO trial)	*FTV Pokajam*
	Apr – Jun 2013	PNG (PNGTP3)	*Soltai 101*
	July 2016	PNG (TAO trial)	*FTV Pokajam*

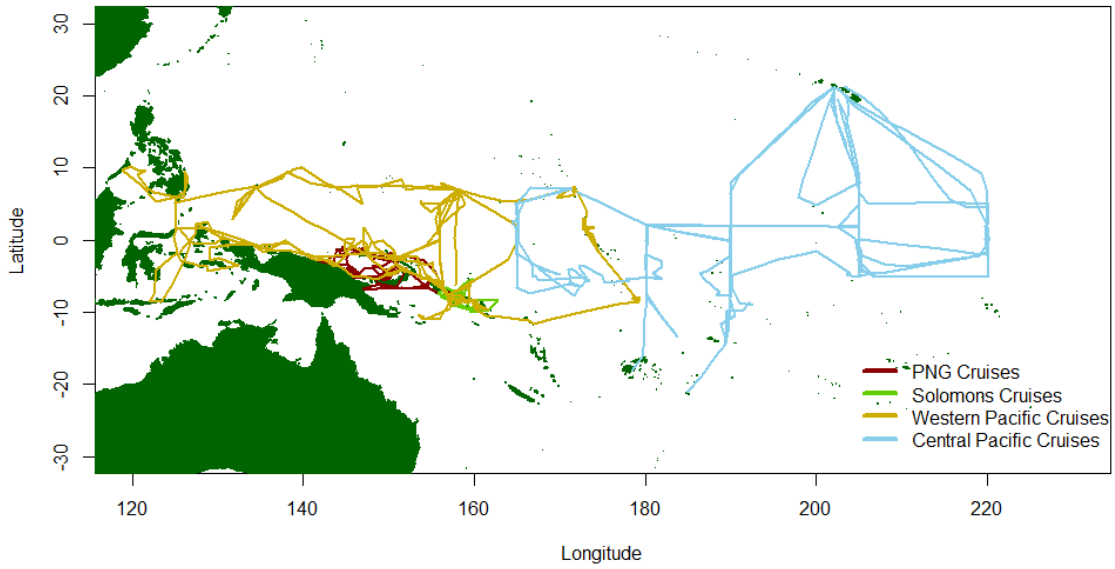

Figure 1: Tagging vessel tracks for all voyages for all PTTP research voyages. Legend relates to the groups of operational areas described in Table 1.

2 SUMMARY OF PTTP ACTIVITIES IN 2019-2020

Since SC15, PTTP activities have included one Western Pacific, WP5, voyage focussed on skipjack tuna in the waters of FSM, Palau, PNG and the nearby International Waters, alongside continued implementation of tag recovery processes and tagging data preparation for use in the 2020 stock assessments of yellowfin and bigeye tuna.

2.1 WP5 pole and line tagging voyage

Following the 2017 WP4 tagging voyage, WP5 was designed to focus on releasing tagged skipjack and yellowfin tuna to provide data in support of their stock assessment. In addition to conventional tag releases, effort was made to deploy archival tags in skipjack tuna, to obtain more detailed information on their horizontal movements, vertical behaviour and associative behaviour with respect to FADs, in light of new, smaller archival tag models now being available.

To achieve this work, SPC chartered the Soltai 105 Pole and Line vessel from the National Fisheries Developments (NFD)/Tri Marine (TMI) fishing fleet based in Noro/Western Province/Solomon Islands. The research cruise departed from Noro on the 22 of July for a total duration of 59 days (see voyage track in Figure 2).

The WCPFC, Korea and the European PEUMP project jointly funded the cruise. Cape Fisheries and the Caroline Fisheries Corporation purse seine companies also supported the cruise by providing positions of drifting FADs in the neighbourhood of the cruise.

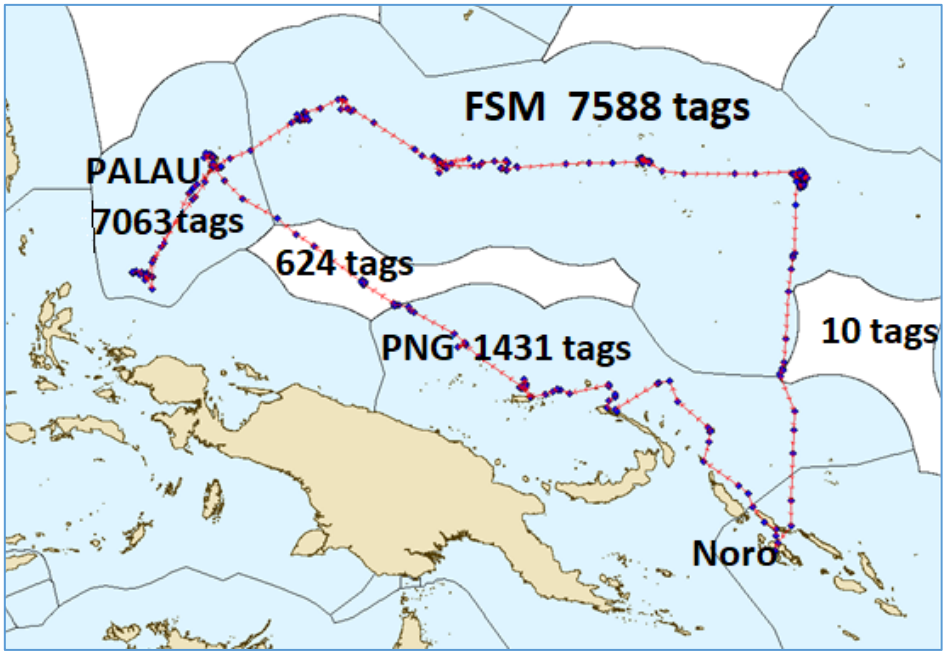

Figure 2: Voyage tracks during WP5 with indication of total release number of tags per area/EEZ

2.1.1 WP5 tag releases

Of the 59 days of charter during WP5, 11 days were spent in PNG waters including 9 fishing days. Two fishing days were spent on the payaos anchored in the High Sea Pocket 1 (HSP 1); 16 days, including 11 fishing days were spent in Palau and 30 days, including 26 fishing days, were spent in FSM EEZ. A small number of fish (10) were also tagged and released in HSP2 (the spatial distribution of tag releases is given in Figure 3). A total of 16,716 fish were tagged and released during the cruise at an average of 348 fish per fishing day. Table 2 summarizes the number of fish tagged per species and tag type. The length frequency of tagged skipjack and yellowfin is shown in Figure 4.

In addition to be tagged, 492 skipjack and 9 yellowfin tuna were injected with Strontium Chloride, depositing a mark in their otolith to aid age validation, thereby supporting improved growth rate estimations. These fish were tagged with a white conventional tag. Electronic, archival tags were implanted in 79 skipjack tuna (also tagged with an orange colour conventional tag).

The absence of small size (<40 cm FL) fish and the larger percentage of skipjack tagged (93% instead of 64% in the same area during WP1 cruise in 2008) may be due to the fact that the majority of fish (70%) were tagged in free schools during WP5. By contrast, free schools constituted only about 45% of tagged fish in 2008.

The deployment of archival tags in skipjack tuna is challenging due to the rapid deficit in oxygen the animal experiences once out of seawater. This induced stress often prevents fish from staying calm enough to safely undertake surgery, which must often be undertaken within 30 seconds. Previous attempts at electronic tagging of skipjack had been made in 2008 and 2009 during previous PTTP cruises with older archival tag models, but were shown to not be reliable, with only very few recaptures of poor data. The newer tag model used during WP5 has been shown to have success during recent Japanese tagging research cruises, and so is expected to produce more skipjack archival recoveries than in previous experiments

Table 2: Numbers of fish tagged during WP5, by tag type and species (including multiple tagged fish)

Tag type	BET	SKJ	YFT	TOTAL
ArcGeo-9TS archival(Lotek)		79		79
MK9 archival tag (Wildlife Computers)	3		4	7
T-Bar tag - (experiment trial)		40	6	46
White conventional - 11cm		1	4	5
White conventional - 13cm		491	5	496
Yellow conventional - 11cm	5	57	74	136
Yellow conventional - 13cm	138	14825	984	15947
Total	146	15493	1077	16716

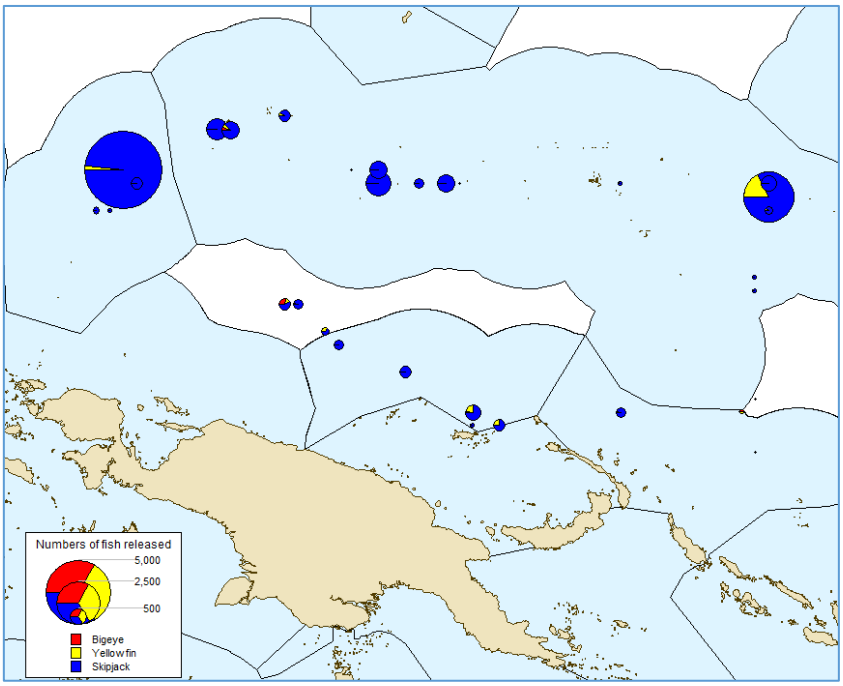

Figure 3. Distribution of tag releases during WP5.

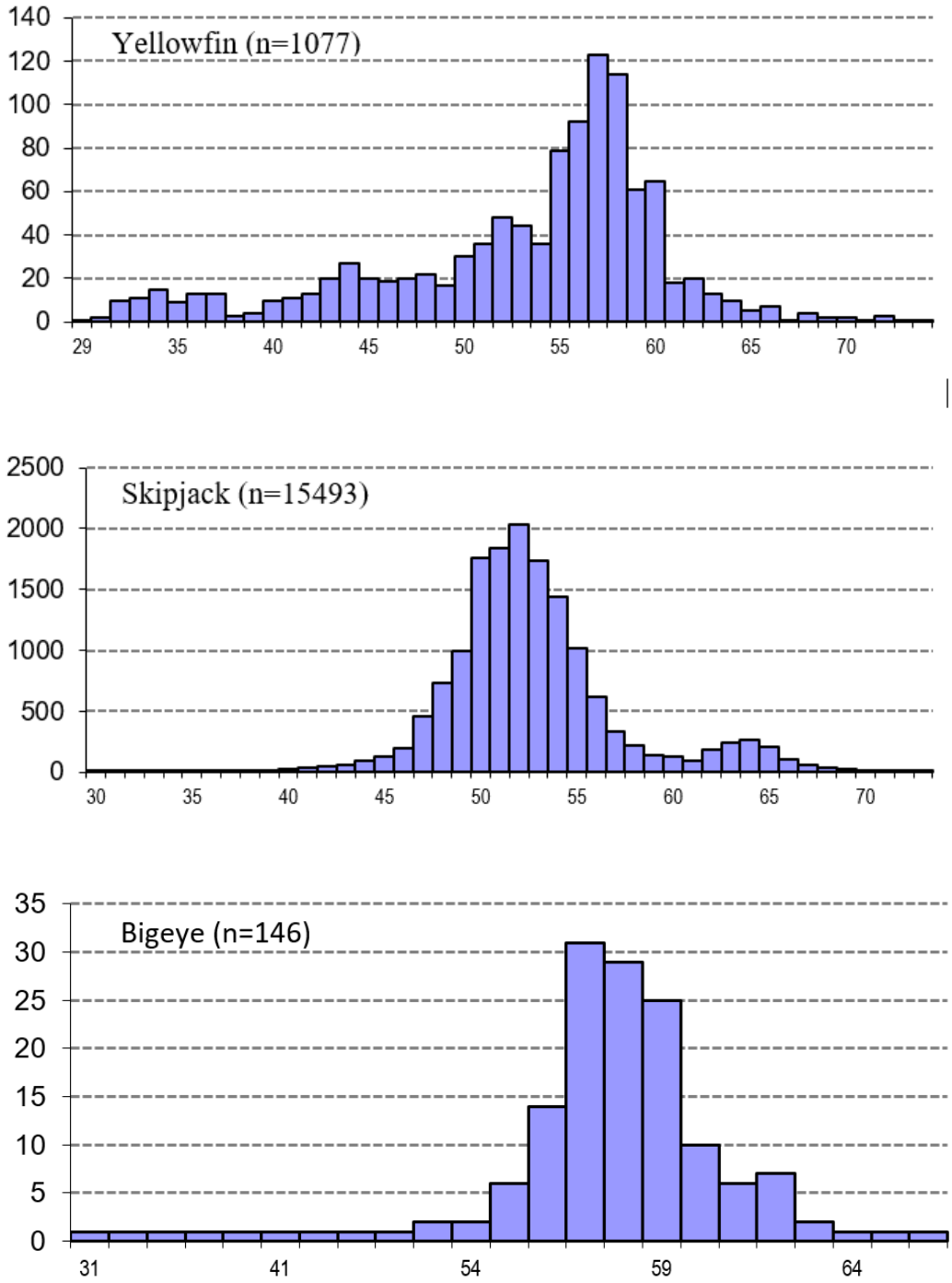

Figure 4: Size distribution (cm) of SKJ, YFT and BET conventionally tagged during WP5

2.1.2 Biological sampling

As part as its planned activities, the WP5 voyage provided a significant number of biological samples and data as identified in Table 3. Biological sampling during tagging cruises complements the work conducted by fisheries observers on board tuna fishing vessels, increasing the number of samples collected in the region during the year. This sampling effort contributes significantly to the WCPFC Tuna Tissue Bank by providing biological information and samples that are available to the scientific community to conduct biological and ecological studies of interest to the region (SC16-RP-P35b-01).

Table 3: Number of samples taken during WP5, per species and sample type

Species	Fish sampled	Fin	Gonad	Liver	Muscle	Otolith	Spine	Stomach	Fatmeter	Weight
BET	8	1	8	8	8	9	8	8	3	8
BUM	5	0	2	4	5	0	0	5	0	0
DOL	1	0	0	1	1	1	0	1	0	1
KAW	11	0	0	0	0	0	0	0	0	11
RRU	29	0	19	29	29	0	0	29	0	28
SKJ	355	160	218	229	230	215	220	229	68	229
YFT	76	34	42	44	44	44	43	44	16	42
Total	485	195	289	315	317	269	271	316	87	319

2.1.3 WP5 implementation challenges

The WP5 voyage was undertaken across multiple regions and EEZs, requiring multiple research and fishing permits to be obtained. Unfortunately, receipt of some permits was delayed. This affected the planning of the cruise and led to several days fishing being lost during WP5; an inefficient use of tagging programme funds.

For future cruises, developing an approach that allows the earlier granting of permits and permissions is needed, to ensure sufficient time for arrangements with local authorities to ensure traditional custom and cultural rules are respected, particularly for bait fish collection. Earlier authorisation also means voyage planning can consider permission to conduct activities within conservation areas that may require additional approvals. Recognizing that the administrative environment for permitting is complex and involves multiple agencies within a country, SPC will work with members to identify ways to streamline administration and ensure the benefits of the research are attained as efficiently as possible.

2.2 CP14 tagging voyage planning for the second half of 2020

The current main goals of the Central Pacific tuna tagging experiments are to augment data collection for studies on tuna movements, exploitation rates and FAD association dynamics. Due to the COVID-19 crisis and associated travel restrictions, the 14th Central Pacific research voyage cannot depart from Tuvalu to carry out the tagging experiments with SPC scientists as scheduled. The tagging voyage will be crewed with a scientific team lead by a SPC-contracted, experienced Hawaii-based scientist Jeff Muir, who has already crewed 4 previous CP and 2 WP tuna research cruises as part of the PTTP. The planned acoustic experiments around drifting FADs will be postponed to future cruises to facilitate the work of the restricted team (3-4 scientists) of CP14.

The cruise will target the TAO buoys anchored on the 170W and 155W longitude lines (see cruise track plan Figure 5). Tagging of tuna in other tuna aggregations, e.g. associated with drifting FADs that tuna industry will provide access to, will also be conducted opportunistically. This research voyage is scheduled to run on or shortly after 15 August (depending upon vessel clearance date from Hawaii) and be completed on or before 05 October 2020, using a chartered vessel, *F.V. Gutsy Lady 4.*

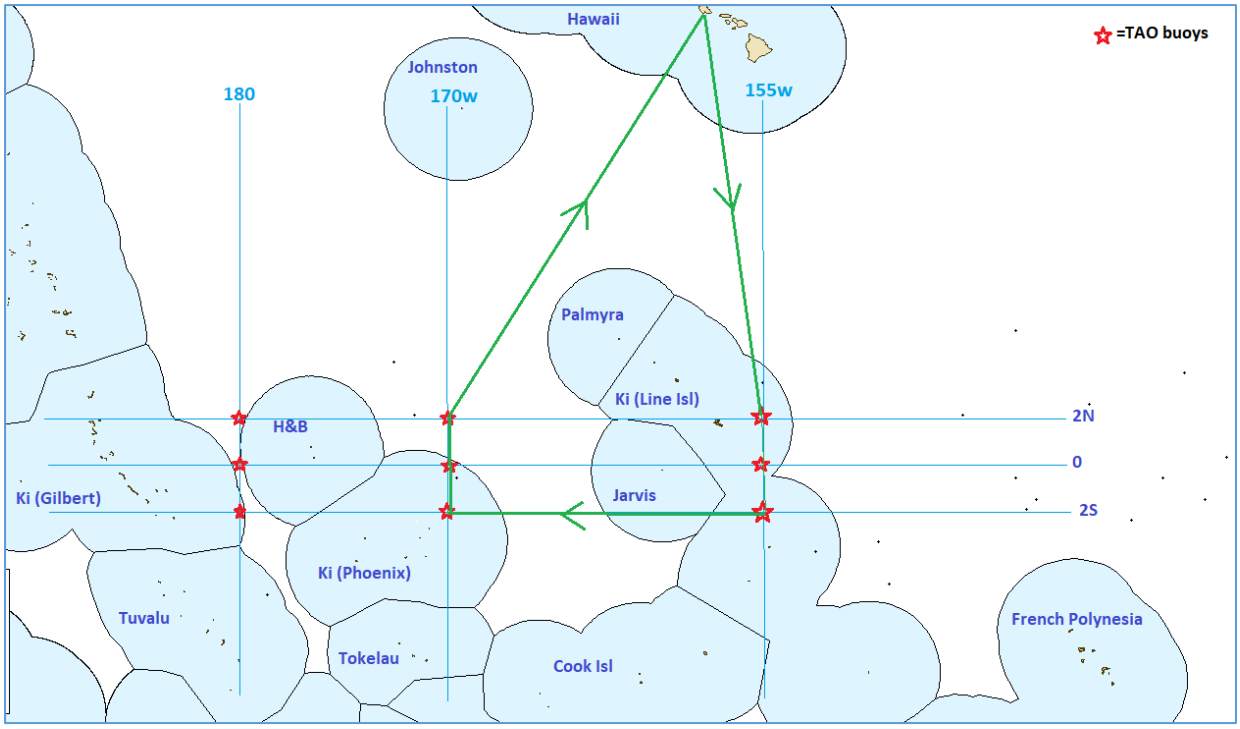

Figure 5. CP14 cruise plan

3 PTTP RESULTS

The Pacific areas covered by the different tagging voyages implemented since 2006 are shown in Figure 1. While there are noticeable gaps in coverage in the extreme east, west and southern latitudes, these are a direct result of the PTTP focus on the tropical tunas, and on undertaking research voyages in areas and with methods allowing maximal catch rates for tagging.

The release numbers and recovery percentages to date of conventional and archival tags made during the 13 Central Pacific (CP) voyages, the PNGTP, and Phase 1 and 2 of the PTTP are detailed in Table 4.

Table 4: CP, PNGTP and total PTTP tag release numbers, and % of recoveries to date (June 2020) of conventional and archival tags.

Project	Tag Type	Release numbers				Recapture rate (%)			
		SKJ	YFT	BET	Total	SKJ	YFT	BET	Total
CP	Archival	32	323	808	1,163	0	7.1	19.1	15.2
	Conventional	841	2,913	39,086	42,840	4.3	13.3	28.6	27.1
PNGTP	Archival	0	68	12	80	NA	27.9	58.3	32.5
	Conventional	80,444	27,065	2,915	110,424	20.3	18.7	21.3	20
Total PTTP	Archival	208	742	999	1,949	1.9	11.3	18.9	14.2
	Conventional	287,925	110,624	48,581	447,130	17.2	16.7	27.1	18.1

3.2 Tag recoveries for the PTTP

As at 10 June 2020, a total of 81,318 tagged tuna had been recaptured and the data reported to SPC. The numbers of conventional tag recoveries by species and by main tagging voyage are given in Table 5. Tag attrition (the number of tags recovered over time following release) follows the expected declining pattern (Figure 6) with the rate of decline in skipjack tag returns indicating their shorter expected lifespan and higher natural mortality compared to yellowfin and bigeye tuna. The recovery rates of yellowfin and bigeye tagged with archival tags and conventional tags vary depending on voyage (Table 6), with some suggestion of increased tag rejection/fish mortality for archival-tagged fish on some voyages.

The reduction in bigeye conventional tag recovery rate from CP9 onwards continues. Recovery rate changes from ~30+% up to voyage CP8, fall to 14% for CP9, between 3 to 16% for CP10 to CP12, and currently rests at 4.6% for the CP13 cruise carried out two years ago (Table 5).

The current return rate for skipjack tuna targeted during WP5 is low at present, relative to 9-months following the previous WP4. Such comparisons cannot be easily made however, as WP5 was mainly focussed in the oceanic waters north of the area tagged during WP4, where fish are likely to experience very different drivers of movement and fishing-induced probability of recapture. It is worth noting the current spatial distribution of recaptures from WP5, as well as the generally reduced probability of capture, mirrors that predicted under Ikamoana simulations undertaken prior to this cruise (SC15-RP-PTTP-02), suggesting that the continued interrogation of movement models for directing tag recovery effort may be useful.

Twelve 'white tag' skipjack tuna injected with strontium chloride have been recaptured and reported since WP5. Otoliths were extracted from seven fish, one pair of otoliths was lost and four fish are still in country and waiting to be sampled.

A description of albacore tagging activities was outlined previously in WCPFC-SC5-2009/GN IP-16 and WCPFC-SC6-2010/GN IP-06. Since SC14, two tags have been reported after being washed ashore in New Zealand. This increases the total reported tags, but not the number of informative recoveries, which remain at 31 (1%) for the project. Following a recovery in New Caledonia during 2017, the reward for white tags from albacore tuna tagged with oxytetracycline was increased to US$250, and conventional tags to $US20.These new rewards apply to all fish, and the change was particularly promoted in the key expected areas of recovery, i.e. New Caledonia, French Polynesia and Fiji.

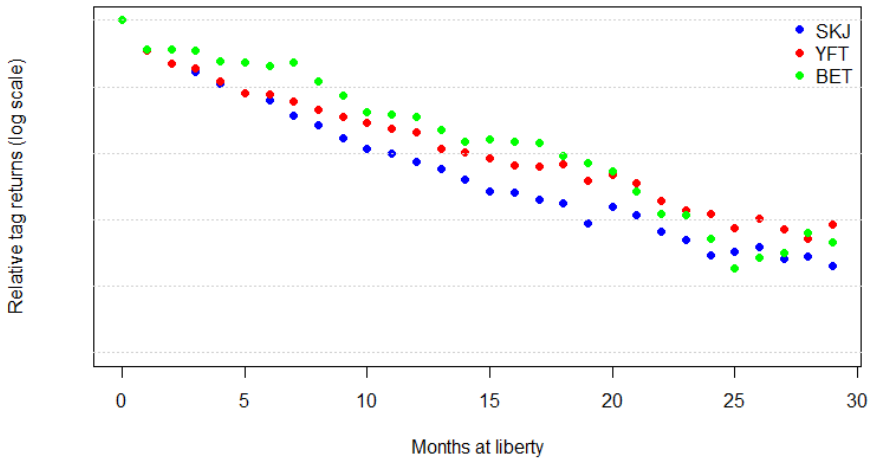

Figure 6: Tag recoveries by time at liberty for skipjack, yellowfin and bigeye tuna. Note that the values on the y-axis are uninformative and thus omitted. At the top-left the points (overlaid so as only BET shows) are the (species) specific maximum logarithm of recoveries, standardised so that the attrition curves all start at the same value. The gradient is a proxy for total mortality.

Table 5: Tag releases and recaptures for the PTTP to date (as at 10/06/2020).

Cruises	Release numbers				Recapture rate (%)			
	SKJ	YFT	BET	Total	SKJ	YFT	BET	Total
PG1 Aug-Nov 2006	13,948	7,806	562	22,316	2,646 (19%)	1,806 (23.1%)	229 (40.7%)	4,681 (21%)
PG2 Feb-May 2007	26,493	12,845	129	39,467	2,510 (9.5%)	1,720 (13.4%)	8 (6.2%)	4,238 (10.7%)
SB1 Oct-Nov 2007	7,479	3,565	139	11,183	1,976 (26.4%)	784 (22%)	18 (12.9%)	2,778 (24.8%)
SB2 Feb-Apr 2008	15,327	14,405	414	30,146	1,765 (11.5%)	2,422 (16.8%)	62 (15%)	4,249 (14.1%)
CP1 May-Jun 2008	57	116	1,736	1,909	4 (7%)	25 (21.6%)	575 (33.1%)	604 (31.6%)
WP1 Jun-Nov 2008	37,691	17,647	1,467	56,805	6,378 (16.9%)	2,061 (11.7%)	363 (24.7%)	8,802 (15.5%)
WP2 Mar-Jun 2009	34,207	13,919	3,145	51,271	4,612 (13.5%)	2,356 (16.9%)	490 (15.6%)	7,458 (14.5%)
CP2 May-Jun 2009	169	205	2,309	2,683	5 (3%)	27 (13.2%)	573 (24.8%)	605 (22.5%)
WP3 Jul-Oct 2009	30,722	7,340	735	38,797	6,699 (21.8%)	1,431 (19.5%)	197 (26.8%)	8,327 (21.5%)
CP3 Oct-Nov 2009	66	237	4,802	5,105	2 (3%)	64 (27%)	1,772 (36.9%)	1,838 (36%)
CP4 May-Jun 2010	7	120	2,284	2,411	1 (14.3%)	13 (10.8%)	514 (22.5%)	528 (21.9%)
CP5 Nov-Dec 2010	40	228	6,090	6,358	7 (17.5%)	46 (20.2%)	1,963 (32.2%)	2,016 (31.7%)
PNGTP1 Apr-Jul 2011	28,730	11,571	355	40,656	5,775 (20.1%)	2,483 (21.5%)	60 (16.9%)	8,318 (20.5%)
CP6 Oct-Oct 2011	2	123	3,804	3,929	0 (0%)	29 (23.6%)	1,036 (27.2%)	1,065 (27.1%)
CP7 Nov-Dec 2011	52	245	4,212	4,509	1 (1.9%)	21 (8.6%)	1,455 (34.5%)	1,477 (32.8%)
PNGTP2 Jan-Mar 2012	28,312	9,607	2,008	39,927	7,260 (25.6%)	1,709 (17.8%)	523 (26%)	9,492 (23.8%)
CP8 Sep-Oct 2012	20	140	6,014	6,174	2 (10%)	32 (22.9%)	2,311 (38.4%)	2,345 (38%)
PNGTP3 Apr-Jun 2013	23,402	5,955	564	29,921	3,317 (14.2%)	889 (14.9%)	45 (8%)	4,251 (14.2%)
CP9 Nov-Dec 2013	29	135	4,296	4,460	2 (6.9%)	11 (8.1%)	631 (14.7%)	644 (14.4%)
CP10 Aug-Aug 2014	12	98	195	305	0 (0%)	6 (6.1%)	4 (2.1%)	10 (3.3%)
CP11 Sep-Nov 2015	231	775	1,966	2,972	6 (2.6%)	31 (4%)	208 (10.6%)	245 (8.2%)
PG6 Jul-Jul 2016	0	17	2	19	0 (NA%)	2 (11.8%)	0 (0%)	2 (10.5%)
CP12 Sep-Oct 2016	109	371	1,575	2,055	3 (2.8%)	84 (22.6%)	263 (16.7%)	350 (17%)
WP4 Sep-Nov 2017	25,456	2,376	20	27,852	5,832 (22.9%)	426 (17.9%)	0 (0%)	6,258 (22.5%)
CP13 Jul-Aug 2018	79	443	611	1,133	3 (3.8%)	20 (4.5%)	30 (4.9%)	53 (4.7%)
WP5 Jul-Sep 2019	15,493	1,077	146	16,716	663 (4.3%)	17 (1.6%)	4 (2.7%)	684 (4.1%)
Totals	**288,133**	**111,366**	**49,580**	**449,079**	**49,469 (17.2%)**	**18,515 (16.6%)**	**13,334 (26.9%)**	**81,318 (18.1%)**

Table 6: Comparison of archival and conventional tag recovery rates by species and voyage for the PTTP, 2006-2019. Release numbers are given in parentheses.

Cruises	Archival Recoveries (Numbers Tagged)				Conventional Recoveries (Numbers Tagged)			
	SKJ	YFT	BET	Total	SKJ	YFT	BET	Total
PG1 Aug-Nov 2006	100% (1)	37% (46)	44% (25)	40.3% (72)	19% (13,947)	23.1% (7,760)	40.6% (537)	20.9% (22,244)
PG2 Feb-May 2007	0% (1)	9.1% (187)	0% (23)	8.1% (211)	9.5% (26,492)	13.5% (12,658)	7.5% (106)	10.8% (39,256)
SB1 Oct-Nov 2007		0% (5)	0% (7)	0% (12)	26.4% (7,479)	22% (3,560)	13.6% (132)	24.9% (11,171)
SB2 Feb-Apr 2008		22.7% (22)	0% (1)	21.7% (23)	11.5% (15,327)	16.8% (14,383)	15% (413)	14.1% (30,123)
CP1 May-Jun 2008		40% (5)	24.4% (45)	26% (50)	7% (57)	20.7% (111)	33.4% (1,691)	31.8% (1,859)
WP1 Jun-Nov 2008		0% (13)	38.9% (36)	28.6% (49)	16.9% (37,691)	11.7% (17,634)	24.4% (1,431)	15.5% (56,756)
WP2 Mar-Jun 2009	0% (39)	3.6% (56)	3.7% (81)	2.8% (176)	13.5% (34,168)	17% (13,863)	15.9% (3,064)	14.6% (51,095)
CP2 May-Jun 2009		11.1% (9)	17.3% (81)	16.7% (90)	3% (169)	13.3% (196)	25.1% (2,228)	22.8% (2,593)
WP3 Jul-Oct 2009	5.4% (56)	7.7% (13)	0% (1)	5.7% (70)	21.8% (30,666)	19.5% (7,327)	26.8% (734)	21.5% (38,727)
CP3 Oct-Nov 2009		21.4% (28)	34.6% (107)	31.9% (135)	3% (66)	27.8% (209)	37% (4,695)	36.1% (4,970)
CP4 May-Jun 2010		10% (20)	12.8% (39)	11.9% (59)	14.3% (7)	11% (100)	22.7% (2,245)	22.2% (2,352)
CP5 Nov-Dec 2010			22.4% (58)	22.4% (58)	17.5% (40)	20.2% (228)	32.3% (6,032)	31.8% (6,300)
PNGTP1 Apr-Jul 2011		15.8% (19)	0% (3)	13.6% (22)	20.1% (28,730)	21.5% (11,552)	17% (352)	20.5% (40,634)
CP6 Oct-Oct 2011		50% (2)	15.7% (51)	17% (53)	0% (2)	23.1% (121)	27.4% (3,753)	27.2% (3,876)
CP7 Nov-Dec 2011	0% (30)	1.2% (85)	16.3% (92)	7.7% (207)	4.5% (22)	12.5% (160)	35% (4,120)	34% (4,302)
PNGTP2 Jan-Mar 2012		42.1% (19)	87.5% (8)	55.6% (27)	25.6% (28,312)	17.7% (9,588)	25.8% (2,000)	23.8% (39,900)
CP8 Sep-Oct 2012			44.4% (18)	44.4% (18)	10% (20)	22.9% (140)	38.4% (5,996)	38% (6,156)
PNGTP3 Apr-Jun 2013		26.7% (30)	0% (1)	25.8% (31)	14.2% (23,402)	14.9% (5,925)	8% (563)	14.2% (29,890)
CP9 Nov-Dec 2013		0% (1)	19.5% (41)	19% (42)	6.9% (29)	8.2% (134)	14.6% (4,255)	14.4% (4,418)
CP10 Aug-Aug 2014		12.5% (8)	4.2% (24)	6.2% (32)	0% (12)	5.6% (90)	1.8% (171)	2.9% (273)
CP11 Sep-Nov 2015		4.2% (71)	13.7% (95)	9.6% (166)	2.6% (231)	4% (704)	10.4% (1,871)	8.2% (2,806)
PG6 Jul-Jul 2016					NA% (0)	11.8% (17)	0% (2)	10.5% (19)
CP12 Sep-Oct 2016	0% (2)	14.3% (28)	17.2% (93)	16.3% (123)	2.8% (107)	23.3% (343)	16.7% (1,482)	17.1% (1,932)
WP4 Sep-Nov 2017		0% (5)	0% (2)	0% (7)	22.9% (25,456)	18% (2,371)	0% (18)	22.5% (27,845)
CP13 Jul-Aug 2018		3% (66)	7.8% (64)	5.4% (130)	3.8% (79)	4.8% (377)	4.6% (547)	4.6% (1,003)
WP5 Jul-Sep 2019	0% (79)	0% (4)	0% (3)	0% (86)	4.3% (15,414)	1.6% (1,073)	2.8% (143)	4.1% (16,630)
Total	**1.9% (208)**	**11.3% (742)**	**18.9% (999)**	**14.2% (1,949)**	**17.2% (287,925)**	**16.7% (110,624)**	**27.1% (48,581)**	**18.1% (447,130)**

3.3 Tag Recovery Network

New Tag Recovery Officers (TROs) have now been appointed under contract in Philippines, and are employees of the SOCSKSARGEN Federation of Fishing and Allied Industries. From July 2019 to July 2020, 188 tags were recovered by SFFAI and rewards were paid. Five contracts for other TROs were renewed, while negotiations with Kiribati MFMRD to re-establish a full time TRO position in Tarawa, and negotiations with Solomon Islands MFMR to sign a new Grant agreement for the Noro office, Solomon Islands are still in progress.

Regular emails, visits in countries, as well as meetings held at SPC allow maintenance of constant contact with the existing network. Emails to raise awareness on the tagging program prior to, and at the end of research voyages are still part of the ongoing awareness program. The PIRFO website is also used as a portal for awareness among observers. The messaging application "Slack" is actively used to enhance the TRO network, allowing rapid exchanges of information between the officers, feedback on tag recovery information, and any issues encountered with the TROtag Database.

SPC receives recovery information from TROs on a semester basis. The establishment of new TRO 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, as well as transhipping vessels in port, have been visited by TROs over the last 12 months, except for Tarawa and Solomon Islands, where TRO positions have not yet been re-established. SPC staff continue to enter tag recovery information into TagDager and undertaking the necessary validation processes.

In order to retrieve whole tagged fish released with strontium chloride or with an archival tag, a new reward system is now in place. On board purse seine vessels, observers are rewarded USD 50 to place the fish aside, to keep the fish frozen at all times, to coordinate the collection of biological samples onshore and to collect associated data. On-board longline vessels, recaptured tagged fish are now purchased whole at a rate of USD 10 /kg. New Posters were translated into eight languages and were circulated across the tag recovery network.

3.4 Tag Seeding

Without accurate information on reporting rates, estimated from tag seeding, it is impossible to disentangle potentially low fishing mortality from low reporting. To date nearly 55% of seeded tags 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 (Peatman 2020). From February 2007 to July 2020, a total of 575 tag seeding kits (consisting of seeding tags, applicators, guide books and data forms) for a total of 14,635 tags have been given to observer coordinators and TROs in Tonga, Ecuador, PNG, Solomon Islands, Fiji, FSM, Marshall Islands, Kiribati, New Zealand and American Samoa for deployment on purse seine vessels by senior observers. When a kit is not completely deployed during a trip, the kit is either kept aside or used in another kit for deployment. Table 7 details the number of seeded tags deployed per EEZ to date.

To aid in the implementation of tag seeding experiments, training is provided as part of the PIRFO observer upgrade training courses. Deployment instruction and training material have been updated to include only conventional tag deployment, following the discontinuation of steel-head tag seeding last year. Tag Recovery Officers in the ports of, Honiara, Rabaul, Madang, Lae, Pago Pago, Port Moresby and Majuro continue to 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 materials are used by both TROs and local debriefers. Of the 575 kits distributed to observer coordinators, 431 have been given to observers for deployment, of which 364 tag seeding datasheets have been received for observer trips.

Since June 2019, tag seeding kits have only been deployed and distributed by NFA; six kits, using a total of 180 tags over this period. Peatman et al. (2019, WCPFC-SC15-2019/SA-IP-06) recommended that

across the region, 32 tag seeding experiments per year were needed to capture any temporal changes in reporting rate. This highlights the need to further increase the focus on regional tag seeding experiments in 2020/2021.

As at 10th June 2020, there have been 7,498 reported tags that have been seeded and 4,151 (55%) of these have been returned to SPC. Table 8 details the reporting of vessel name by location. 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 810 tags, was absent from the recovery information for 172 tags, and was correct for 3150 tags.

Table 7: Number of seeded tags deployed per EEZ since the beginning of the project.

EEZ	Releases
Not known yet	492
American Samoa	4
Cook Islands	67
Federated states of Micronesia	503
Fiji	7
Gilbert Islands	841
Howland & Baker	8
Indonesia	7
International waters H4	103
International waters H5	145
International waters I2	119
International waters I3	10
International waters I4	35
International waters I5	99
International waters I6	106
International waters I7	1
International waters I9	5
Jarvis	5
Marshall Islands	131
Nauru	297
Northern Line Islands	25
Palau	5
Papua New Guinea	2,560
Phoenix Islands	488
Samoa	24
Solomon Islands	722
Tokelau	200
Tuvalu	529
Total	**7,538**

Table 8: Accuracy of recapture vessel reported for seeded tag recoveries, by TRO location.

Location of TRO reporting tag recovery	All tag recoveries	Tag seeding recoveries (TSR)	Wrong vessel reported (TSR)	No vessel reported (TSR)	Correct vessel reported (TSR)	% correct vessel
GENERAL SANTOS, Philippines	9,340	246	61	24	161	65
HONIARA, Solomon Islands	1,672	474	74	2	398	84
IATTC, Manta/San Diego (Ecuador/USA)	9,878	292	72	104	116	40
LAE, PNG	5,554	199	29	5	165	82.9
LONDON, Kiribati	162	2	0	0	2	100
MADANG, PNG	2,882	300	42	0	258	86
MAJURO, Marshalls	1,251	285	84	0	201	70.5
NORO, Solomon Islands	11,745	52	20	1	31	59.6
PAGO PAGO, A. Samoa	2,249	595	58	22	515	86.6
POHNPEI, FSM	1,031	159	13	0	146	91.8
PORT MORESBY, PNG	545	94	1	0	93	98.9
RABAUL, PNG	508	166	13	0	153	92.2
SAMUTSAKOM, Thailand	10,913	613	244	6	363	59.2
SHIMIZU, Japan	3,205	7	1	1	5	71.4
TARAWA, Kiribati	1,047	176	6	4	166	94.3
VIDAR, PNG	7,149	192	13	1	178	92.7
WEWAK, PNG	7,048	280	79	2	199	71.1

4 ISSUES ARISING

The PTTP continues to be a highly successful programme. The significant commitment from the Commission to ongoing funding recognises tagging as a high priority and a strong component of WCPFC's science for the medium term.

However, significant issues remain that undermine the effectiveness of both implementation of tagging experiments, and the use of tagging data for stock assessment and other analyses under the objectives of the PTTP.

1. An insufficient number of tag seeding kits were deployed in the 12 months since SC15. This has impacted the precision of estimated tag reporting rates. The recent low tag recoveries, particularly in the case of bigeye tuna, can have a considerable effect on estimated levels of fishing mortality within stock assessments. However, without accurate information on reporting rates, it is impossible to disentangle potentially low fishing mortality from low reporting. Deployment of tag seeding kits, by members and their agencies, must be significantly increased through national and regional observer programmes across both fleets and regions in order to ascertain this information.

2. The late granting of necessary rights and permits to undertake tagging voyages in WCPFC member state EEZs is resulting in difficulties with voyage planning. This has occasionally led to expensive losses in fishing days for the programme. Ways in which obtaining permits can be finalised earlier and streamlined should be explored to maximise efficient use of programme funding.

3. A strong case for identifying a long-term multi-purpose tagging platform in the WCPO remains. The safety and functionality of the few available pole and line vessels in the region, combined

with a need to capture more data over increasingly limited cruise schedules further exacerbates the problems of using commercial fishing boat charters for scientific purposes. Increased collaboration between in-country scientists, observers and industry provide new opportunities for applied research, but the logistics of housing such scientific teams and their required equipment is severely limited on such vessels. Examining the feasibility of a multi-purpose scientific vessel to undertake a variety of research in the region should be continued.

5 PTTP 2020-2023 work-plan

The work-plan identified in 2019 (SPC-OFP, 2019) has been completed. The proposed work-plan for the PTTP for 2020-2023 is highlighted in Table 15 below. The work-plan recognises the decisions of SC in 2016 to normalise the tagging programme (WCPFC SC, 2017), and the decisions of SC in 2017 where this rolling medium-term research work-plan was endorsed (WCPFC-SC 2017).

6 RECOMENDATIONS

SC16 is invited to note the report of ongoing progress in implementation of the PTTP. In particular we recommend that SC:

- Note the successful 2019 WP5 tagging voyage
- Note the critical importance of effective tag seeding to informing stock assessment, and support an urgent increase in deployment and fleet coverage of tag seeding experiments
- Note the need for continued member participation and support in tag reporting;
- Support the 2021 tagging programme, and associated budget;
- Support the 2022-2023 tagging programme, and associated indicative budget; and
- Consider and support the PTTP work-plan for 2020-2023;

Table 15: Proposed PTTP work-plan for the period 2020-2023.

ACTIVITIES		2020	2021	2022	2023
TAGGING					
1.	**Pole and line tagging research voyage** Target is skipjack, with secondary target of yellowfin. Skipjack-focused, pole and line tagging research voyage scheduled for 2021 and biennially thereafter. Note also critical component of biological sampling in support of Project 35b.		Plans to be refined after assessing viable available options		Plans to be refined after assessing viable available options
2.	**Dangler/troll tagging research voyage** Target is bigeye, with secondary target of yellowfin. Bigeye-focused, dangler/troll tagging research voyage scheduled for 2020 and biennially thereafter. Note also critical component of biological sampling in support of Project 35b.	Contingency CP14 cruise will depart Hawaii mid-august, in light of COVID travel restrictions	In light of the contingency CP14 2020 tagging, it may be appropriate to undertake a second consecutive year of BET-focused dangler/troll research	Focus in the Central Pacific to continue view of bigeye across the WCPO	
TAG RECOVERY					
3.	Establish new TRO positions where required.				
4.	Ongoing support of TROs in PNG, Philippines, Thailand and key Pacific Island locations.				
5.	Review and revise tag rewards scheme.	New rewards implemented for white or orange tags			
DATA MANAGEMENT					
6.	PTTP data verification with VMS and Logbook, and cannery data.				
7.	Consolidation of the web-tagging database, recapture information and tagging database frameworks.	Consolidation of TRO data with a Tuna Tagging App			
DATA ANALYSES					
8.	Tag reporting and seeding.	Purpose: Maintained tagging and tag-seeding for direct inclusion in MF-CL stock assessments to estimate natural mortality, fishing mortality, and movement rates Tasks: Routine update of analyses, reporting to SC.			
11.	Fishing and natural mortality.	Purpose: Provide validation to estimates from within MFCL and identify fishing mortality changes in response to expansion of the WCPO fisheries. Tasks: Routine update of analyses, reporting to SC.			
12.	Tagging mortality	Tagging effect analyses undertaken for YFT and BET assessment	Develop more robust tagging effect analyses prior to next SKJ assessment		
12.	Movement.	Purpose: Provide validation to estimates from within MFCL and SEAPODYM. Tasks: Routine update of analyses, reporting to SC.			
13.	Tag-simulation analyses.	Tag mixing simulations undertaken to inform use of skipjack tags in MF-CL	Optimal design for 2021 skipjack-focused research voyage	Explore inclusion of simulated tag data within MSE framework	
PLANNING					
14.	Review and update research plan	Ongoing annual task for rolling plan.			

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This report was provided by J. Scutt Phillips, B. Leroy, F. Roupsard, and C. Sanchez

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