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Summary of Research Activities and Results of the International Seafood Sustainability Foundation's (ISSF) Second Bycatch Project Cruise WCPO-2 in the Western Central Pacific Ocean (WCPO)

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Abstract

Empirical and observational data were collected from 45 sets made from the Cape Finisterre, a U.S. flagged tuna purse seine vessel during the International Seafood Sustainability Foundation's (ISSF) Western Central Pacific Ocean (WCPO)-2 bycatch mitigation research cruise. Three researchers were hosted on a ride-along style research trip and conducted experiments opportunistically on a 42 day voyage originating from Pago Pago, American Samoa. Sampling was completed on a total of 37 fishing days prior to the July 1st FAD closure and four days of free school fishing. Initially, it was desired that a selective release mechanism similar to the net panel design from the ISSF's WCPO-2012 bycatch cruise be tested, but due to a mechanical failure in the net yard, the net was not modified in time for the cruise. Nevertheless, observations of sharks and other bycatch in the net were made on most sets to determine if the spatial distribution of these animals was consistent. The objective was to determine the most appropriate placement of a release panel in the future. Visual observations using SCUBA and snorkel in the net were made to assess several areas of interest: 1) if sharks and other bycatch were consistently located in one area of the net, and if these animals could be selectively released, 2) natural behavior of bigeye, yellowfin, skipjack and bycatch species in the net to assess if behaviors occurred consistently and for what duration. Overall, there was a lower occurrence of silky sharks observed and caught (average of 2.3 sharks/set) as compared to the WCPO-1 cruise (average of 9.5 sharks/set). Generally, catch rates of bony fish bycatch were also less than the WCPO-1 cruise. Proportion of bigeye catch appeared to be higher than the WCPO-1 cruise, which may be attributed to the location of the 1st 20 days of the cruise in and around the Line Islands, on the far eastern margin of the WCPO. BIA sampling was conducted on skipjack (n=1,057) to assess condition factor of dFAD vs unassociated skipjack, analysis of this work is still in progress. One whale shark was caught and released, but due to logistical challenges we were unable to deploy a pSAT tag in the animal. There were several ancillary projects including assessing skipper satisfaction and collecting comments about ISSF's FADtrack software, net depth data collection, and documentation of unassociated schools once encircled in the net. Finally, we conducted genetic, isotope, and oral bacteria sampling on some or all of the following species: skipjack, yellowfin, bigeye, silky shark, oceanic triggerfish, rainbow runner.

Reporting Period: May 23 – July 7, 2013

Background

Following the success of the ISSF's first Bycatch Project cruise in the WCPO (Itano et al. 2012a), and utilizing the working relationship developed with Trimarine and their Pago Pago, American Samoa based tuna purse seine fleet during the first WCPO Bycatch Project cruise in 2012, the ISSF formulated and executed a second bycatch project cruise. Continuing momentum was desired in bycatch mitigation by ISSF after funding and conducting three bycatch mitigation cruises in the Indian Ocean (IO), equatorial eastern Pacific Ocean (EEPO) and WCPO (Itano and Restrepo 2011, Schaefer and Fuller 2011, Dagorn et al 2012). The Western Central Pacific Ocean (WCPO)-2 cruise was conducted in a ride-along style, and scientific observations and experiments were carried out opportunistically as safety and time allowed, to minimize interference with the fishing operation. This arrangement is highly cost effective and mutually beneficial to ISSF and Trimarine; ISSF can conduct scientific research aboard tuna purse seiners, without the high costs associated with chartering a vessel, and Trimarine can host scientists aboard their vessels and contribute to the cause of making tuna purse seining more sustainable.

During the first Bycatch Project cruise (WCPO-1), observations made while conducting visual surveys on SCUBA in the net after a set had been made on a drifting Fish Aggregation Device (dFAD) elucidated behavior of animals in the net, including target tuna species skipjack (*Katsuwonis pelamis*), yellowfin (*Thunnus albacares*), and bigeye (*T. obesus*) as well as that of other bycatch species, primarily silky sharks (*Carcharhinus falciformis*) (Muir et al 2012). Amongst other important observations of natural behavior in the net, it was quickly realized that silky sharks consistently congregated in the same area of the net during most sets. This behavior was thought to be conducive to selectively releasing sharks and other bycatch through a release panel. Such a panel, pictured in Fig. 1, was installed and tested on the same cruise (Itano et al. 2012a) with modest results (Itano 2012b). As a result of these preliminary tests, further testing was desired and requested by the ISSF Bycatch Mitigation Committee after the completion of this cruise (ISSF 2012). This testing and refinement of the release panel was to be the focus of the second Bycatch Project cruise in the WCPO (WCPO-2). The importance of releasing sharks before they encounter any major handling, interactions with the net or other fish, or other stress to maximize their chances of post release survival, is described in Hutchinson et al 2012.

Figure 1. Net release panel installed and tested during WCPO-2

Observations of natural behavior displayed by target tuna species (Fig. 2) in the net (Muir et al 2012) were also thought to be quite important and were prioritized by the ISSF Bycatch Mitigation Committee (ISSF 2012), with specific emphasis on juvenile bigeye tuna's positioning inside of the net and how this distribution could be exploited to selectively release or exclude them from catch in purse seine gear. The suggestion for further research of this potential release strategy was also noted recently in Schaefer and Fuller 2013. Additionally, it was desired that WCPO-2 researchers conduct more acoustic tagging to refine understanding of vertical behavior of bigeye tuna around dFADs. These data would document vertical behavior before and during dawn to see if this method could empirically determine the best time to set purse seine gear to maximize catch of target species while reducing juvenile bigeye catch. Although this concept of selectively avoiding juvenile bigeye was tested using this method in the EEPO on an ISSF sponsored Bycatch Project cruise (Schaefer and Fuller 2011, Schaefer and Fuller 2013), differences in oceanographic conditions including thermocline depth and sea surface mixing layer depth in the WCPO may yield different results.

Figure 2. Natural behavior of target tuna species encircled in a purse seine net

Figure 3. Panel A) Research platform F/V Cape Finisterre, with net deployed and Panel B) F/V Cape Elizabeth III, transport for scientists back to Pago Pago, American Samoa after the beginning of the WCPFC FAD closure.

The main research objectives of this cruise were as follows:

1. Testing the effectiveness of an escape window to remove sharks and other non-tuna bycatch.
2. Observing the behavior of tuna at FADs and during net setting
3. Observing the behavior and condition of fish inside the net.
4. Opportunistic tagging of large bycatch (whale sharks and manta rays)

Cruise Synopsis: The cruise began when the F/V Cape Finisterre, a U.S. flagged, Pago Pago based tuna purse seine vessel (characterized in Itano et al 2012), cast off from the main container dock in Pago Pago Harbor on 23 May 2013. Forty-five days later, on 4 July 2013, the scientific crew boarded the F/V Cape Elizabeth III, which was inbound for American Samoa. At the time of this vessel change, the Cape Finisterre had made 46 sets for 788 metric tons comprised of the target tuna species; skipjack, yellowfin and bigeye. Of these sets, 28 were made on drifting FADs (commonly referred to as “rafts”) for 433mt, and 17 were made on unassociated free schools for 355mt. Fishing and sampling occurred in two distinct geographical areas (Fig. 4); Area A) that of the US Line Islands, Eastern Kiribati group, and Cook Islands EEZs, and that of Tokelau, Phoenix Islands (Central Kiribati group), and Howland and Baker. The scientific crew departed and offloaded their cargo from the Cape Elizabeth III on July 7th, 2013.

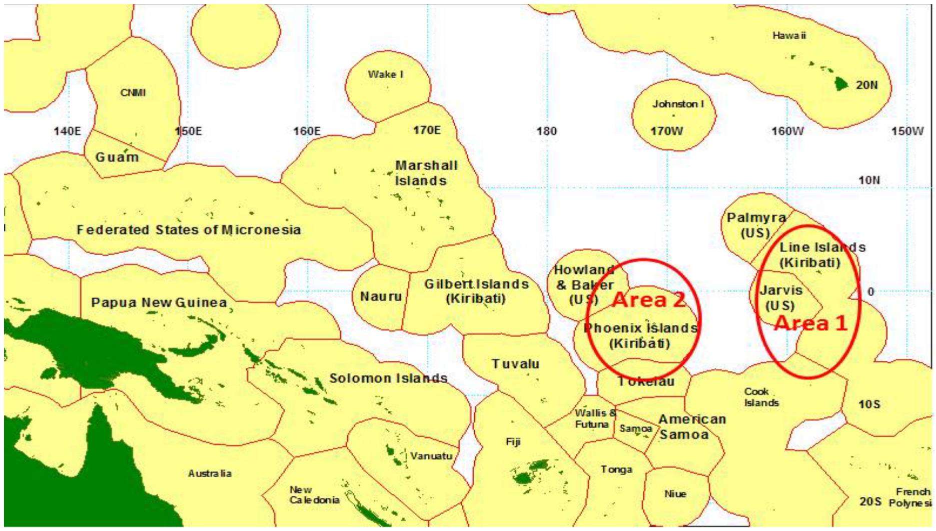

Figure 4. Research area of the WCPO-2 cruise, with sub-areas highlighted in red ovals.

Research Objectives

1. Testing the effectiveness of an escape window to remove sharks and other non-tuna bycatch

Objective: To continue the testing of the escape window to remove sharks and bycatch species out of the net during the hauling process.

Materials: Modified net with escape panel, snorkelers, speedboat, sight box, still cameras and underwater housings, video cameras and underwater housings (GoPro and Sony DV cam), hand held VHF radios, chum bucket and chum . Option: scuba divers (instead of snorkelers)

Originally, two release panels were to be installed while in port in Pago Pago into the Cape Finisterre's net prior to commencing the cruise; one panel at half net, and one between ¼ net and the edge of the sack to test the efficacy of the two designs during normal fishing conditions. Unfortunately, this did not occur due to a mechanical failure in the net rolling crane at the net yard. At the point at which the breakdown occurred, the crew had half of the net off the boat in the yard, with good intentions to carry out the job. The installation of the release panels was aborted after it was determined that the crane could not be repaired in a timely fashion, and the net was hand stacked back onto the Cape Finisterre. Although this was the main focus of the cruise, the trip was not aborted because of the importance of completing the other objectives of the trip, as well as the effort and funds already expended to place scientists aboard the vessel. Furthermore, it was felt that even though no panel was installed to be tested, it would still be useful to make observations of sharks and other bycatch in the net and their relative positions and behavior around the proposed area for release panels for future work with release panels.

Observations of sharks in the net

During sets on made on dFADs, underwater observations were conducted using SCUBA or snorkeling equipment (Fig. 5) to assess the number, behavior and locations of sharks in the net after half of the net was rolled on board. In lieu of testing a release panel, the position of the sharks was noted and for each set the hypothetical utility of a panel was evaluated.

Figure 5. Panel A) silky shark near purse seine net, panel B) scientist conducting survey in net

Results

Date	Time	Set No.	Tons (m)	Obs?	No. Divers	No. Snorkel	No. sharks obs.	No. sharks caught	Sharks in bend?	Deploy Panel?
23/05	5:30	1	22	N		0	0	3	NA	NA
26/05	5:00	2	5	Y	2	1	0	1	N	N
26/05	8:20	3	35	Y	2	1	0	0	NA	NA
28/05	5:20	4	14	N		0	0	3	N	N
29/05	5:20	5	18	Y		2	3	3	Y	Y
30/05	5:05	6	27	Y		2	1	1	Y	N
30/05	8:52	7	8	Y	2	1	0	0	N	N
31/05	7:37	8	5	Y		2	0	0	N	N
01/06	6:00	9	2	Y		2	2	2	Y	N
02/06	5:10	10	17	Y		2	1	1	N	N
02/06	8:55	11	22	Y	2	1	0	0	N	N
05/06	4:55	12	18	Y		3	1	2	Y	N
07/06	5:05	14	40	Y		3	0	1	N	N
08/06	5:20	15	10	Y		2	0	0	N	N
09/06	5:18	16	8	Y		2	0	1	N	N
10/06	5:26	17	7	Y		2	0	0	N	N
11/06	5:35	18	15	Y		2	3	3	Y	Y
12/06	5:28	19	33	Y		3	7	7	Y	Y
13/06	5:47	20	16	Y		2	2	2	N	N
20/06	4:44	28	39	Y		2	3	5	Y	N

21/06	4:46	29	5	Y		2	0	4	N	N
24/06	5:44	30	11	Y		3	1	2	N	N
25/06	5:26	31	9	Y		2	4	4	N	N
25/06	11:41	32	3	Y		3	3	3	Y	Y
26/06	5:33	33	10	Y		3	2	6	N	N
27/06	5:34	34	18	N		0	0	6	NA	NA
29/06	-	36	14	Y		3	1	4	N	N
29/06	-	37	12	Y		3	0	0	N	NA
Total		**28**	**443**	**25**			**34**	**64**		

Table 1. Summarization of number and location of sharks observed in net during WCPO-2 dFAD sets

Sharks were observed in half of all FAD sets. Only silky sharks were observed during the duration of the cruise, with the exception of one (1) whale shark (*Rhincodon typus*) in an unassociated school; this encounter is documented in part (4) of this document. When sharks were present in the net they were generally observed by divers/snorkelers. Only on four occasions were no sharks observed in the water but found on deck with the catch. Although observation rates were high, the behavior of the sharks in the net was not consistent. Typically sharks were seen in the surface waters, separate from the tuna but they were seldom observed in the bend of the net near where the proposed release panel would be located for prolonged periods of time. Often sharks would come and go from the net bend and rarely appeared 'trapped' in this area (Fig. 6) as had been observed during the first WCPO cruise (Itano et al 2012b), which was the criteria for deploying (opening) the release panel. As a result, the release panel would only have been hypothetically deployed five times during the cruise.

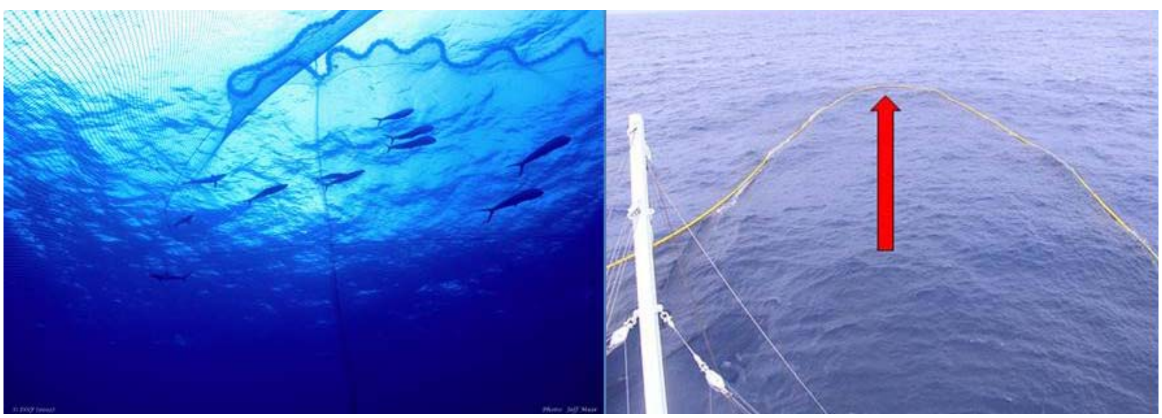

Figure 6. Panel A) Bycatch species, including silky sharks, in the "bend", as seen in Panel B) bend area in net as seen from speed boat deck of vessel (photo D. Itano)

On three occasions sharks were observed outside of the net, swimming very close, and often near to conspecifics located on the inside. These individuals typically remained close to the net right until the end of the set, and on occasion were observed scavenging on tunas protruding through the sac. Nonetheless, the regular segregation of sharks from the tunas suggests that further work on stimuli could be beneficial for improving the duration of their presence in the area of the panel. Furthermore, testing of the release panel in areas where sharks are more abundant and under situations where set size is larger is still recommended, as these factors likely contribute to their behavior during the set.

There was a discrepancy in the number of sharks observed during surveys in the net (above) and counts of sharks by the FFA observer (Fig. 7) during 11 sets. Many of the sharks caught were small (<70cm) and, unless close attention was paid to contents in the hopper as brailing commenced, would be easily missed by an observer, preoccupied with their many other duties. This discrepancy is far less than that observed in 2012 by Hutchinson et al on the WCPO-1 cruise, where the science party's count of sharks against the vessel's (Captain), found that the vessel was severely underestimating the number of sharks per set, in the same region and same vessel as WCPO-2. Unfortunately the counts of sharks were only taken for a few sets by the vessel during WCPO-2, and therefore not included in this analysis. Additionally, the number of sharks caught during WCPO-1 (295) was nearly five times as large as that of WCPO-2 (67) for a similar number of dFAD sets (30 and 28 respectively).

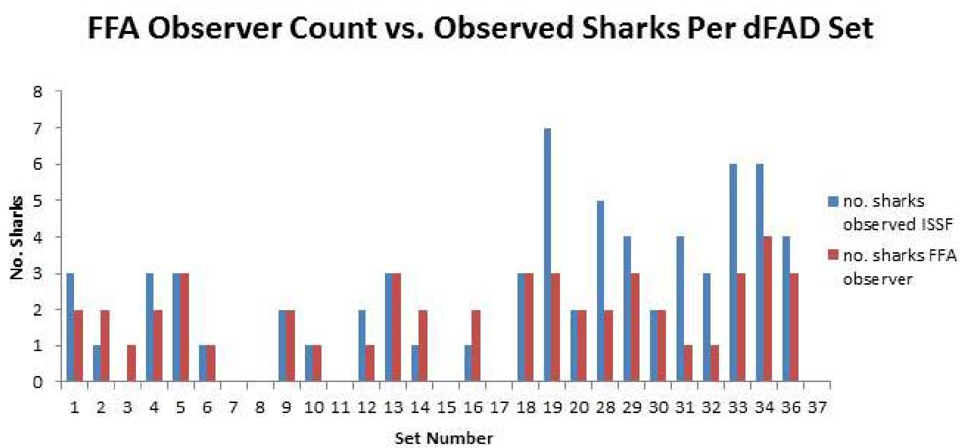

Figure 7. FFA Observer Count vs. Observed Sharks Per dFAD Set

2. Observing the behavior of tuna at FADs and during net setting

Objective: To investigate the behavior of bigeye and yellowfin tuna at FADs under natural conditions and during setting of the purse seine net. These experiments will address whether bigeye tuna move away from the FAD during crepuscular periods and thereby determine if there is a window of opportunity for avoiding capture of bigeye tuna. Also, if there are changes in vertical behavior during setting (e.g., an 'escape response' in which the tuna dive deep), there is the possibility of reducing bigeye bycatch by adjusting net depth. This might also help explain why not all tuna are captured during a set and would improve estimates of purse seine efficiency.

Materials: (1) VEMCO VR2W acoustic receivers, (2) VEMCO acoustic transmitter tags V13P coded transmitter tags, (3) fishing and tagging material

This objective was not completed. Fishing was slow during the 36 days of non FAD-closure fishing days, and there were not adequate opportunities to deploy acoustic tags in bigeye on a desirably sized aggregation of fish above 15 tons when it would not interfere with fishing operations. The materials and equipment procured for this objective will be stored and used in future ISSF endeavors.

3. Observing the behavior and condition of fish inside the net.

Objective: (1) To determine how regularly, to what degree, and at what stage, species and size segregation occurs in the net during the hauling process, with a particular focus on bigeye tuna versus other tuna species. A particular focus will be made to determine what makes the mixed schools of small bigeye and yellowfin tuna split into monospecific schools and merge in multispecific schools.

(2) To measure the body condition of bigeye, yellowfin and skipjack tuna using morphometric analysis and Bioelectrical Impedance Analysis (BIA) of tuna caught under FADs and in free-swimming schools.

Materials: (1) Three sets of SCUBA equipment (optional), sight box used from workboat/speedboat, video cameras and underwater housings (GoPro and Sony DV cam), workboat or speedboat. (2) Measurement tape and BIA box.

Species and size separation in the net

Underwater visibility during this voyage severely limited completion of this objective. Many of the sets during which UVCs were conducted had severely restricted visibility due to early set time, near dawn, and also from plankton and other matter in the water column. Despite this, UVCs were conducted using SCUBA during 4 sets, and UVCs were conducted on snorkel 23 times during net hauling on the remaining dFAD sets of the cruise. During the 4 SCUBA surveys on dFAD sets, and the 23 surveys conducted on snorkel, even with the limited visibility it was quite clear that species and size segregation was occurring as described in Muir et al 2012.

Condition of FAD associated and free swimming skipjack tuna

Bioelectrical Impedance Analysis was conducted on skipjack, during the cruise. The sampling utilizes a Quantum II Bioelectrical Body Composition Analyzer from RJL Systems. Pairs of electrodes are inserted into the dorsal musculature of the fish and a high frequency, low amplitude current is passed through the tissue that measures resistance and reactance between two electrodes (Fig. 8). These measurements provide an estimate of body composition and metabolic condition by measuring the electrical impedance of the musculature. Studies have previously been conducted on Bluefin tuna (Willis and Hobday 2008) to test the reliability of this method. Skipjack tuna associated with dFADs provide an excellent opportunity to test the FAD 'ecological trap hypothesis' (Marsac et al 2000) when compared to unassociated schools within the same region. BIA analysis was conducted on skipjack caught in association with dFADs and caught in unassociated schools (Table 2).

Figure 8. BIA electrodes inserted to large, unassociated skipjack (photo F. Forget)

A total of 1057 BIA measurements were made on skipjack, fork length 32-85cm (Fig. 9) to investigate the ecology of FAD associated and free school of skipjack tuna (Table 2). Phase angle (Fig. 10) and composition index (Fig. 10) are two complementary condition indices that reflect on the metabolic condition and the non-skeletal tissue condition respectively. These results (Figs. 10) are preliminary, and statistical analyses will be performed at a later stage to determine whether there are differences in the condition of skipjack tuna that are associated to FADs and in free swimming schools. However, based on these preliminary data, it appears that both composition index and phase angle indices are not different for dFAD and unassociated skipjack. If confirmed this would indicate that associating with a floating object does not necessarily mean a fish will have a lessened condition factor.

School Type	**No. sets**	**Sampled Fish**	**Girth measurements**	**Stomach sampled**
FAD	11	562	299	50
Free School	11	495	495	111

Table 2. Summary of BIA data collected

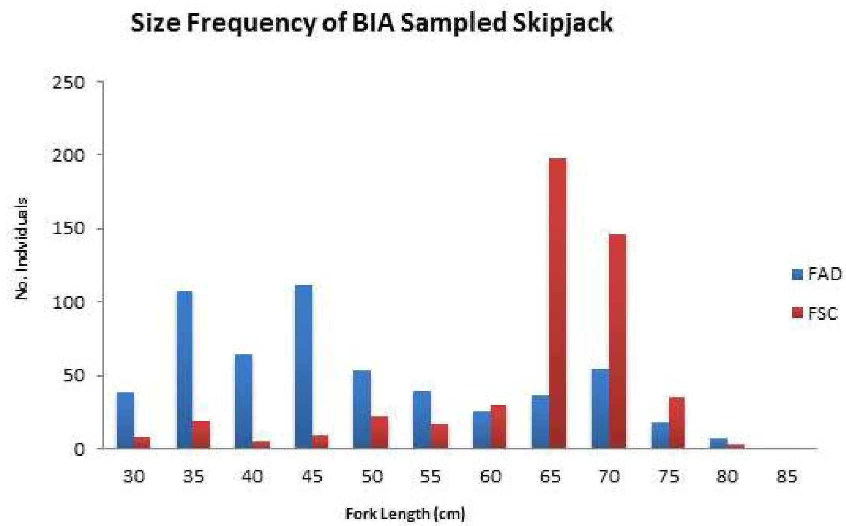

Figure 9. Size frequency of BIA sampled skipjack

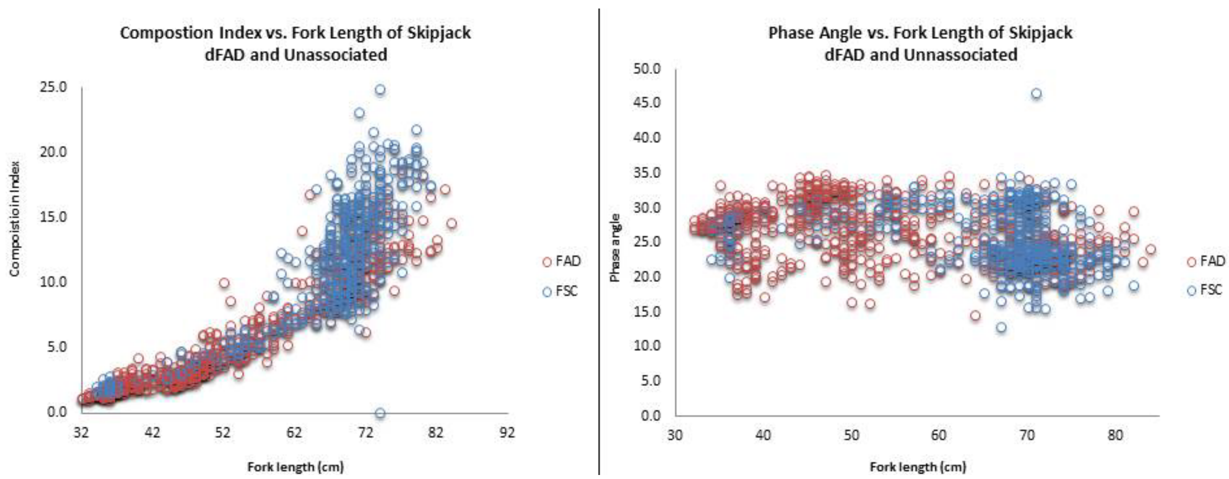

Figure 10. Panel A) Composition index and Panel B) phase angle vs fork length of skipjack in dFAD (red circles) and unnassociated (blue circles) schools

4. Opportunistic tagging of large bycatch (whale sharks and manta rays)

Objective: To determine the post-release survival of large elasmobranchs after release using the best handling practices.

Materials: miniPATs, regular PATs, spear gun, snorkeling gear

During the course of the WCPO-2 cruise, one whale shark was encountered. This occurred on set 27 on an unassociated foaming skipjack aggregation. The aggregation was spotted with the helicopter, and then traced with large spotting binoculars on the crow's nest, half mast, and bridge. At no point in this pre-set evaluation of the aggregation was the whale shark visually detected. The set was made, and the snorkel UVC was conducted from ½ net to sack up. The whale shark was spotted only during the sacking-up point of the set, and was located well below the surface, out of sight of the captain and fishing master. The capture of this animal seemed to be completely inadvertent and unintentional.

The scientific team attempted to deploy a regular PAT tag into the dorsal musculature of the animal, while it was being removed by swimmers over the cork line (Fig. 11). Total length of the animal was 3m. There was no opportunity to create a pilot incision through the skin of the animal, and the tag was not successfully set into the dorsal musculature, due to the applicator bending from the force exerted on it. The animal was subsequently pulled over the corks by the tail and swam away in good condition. This release technique was highly effective and believed to have maximized the chances of survival of the animal.

Figure 11. Panel A) tagging attempt and Panel B) subsequent release of small whale shark out of the sack (Photo credit M. Lamprides and J. Joseph)

Future tagging efforts on whale sharks in purse seine gear can benefit from this experience:

1. A pilot hole or incision must be made before attempting to deploy any tag anchor through the skin of the animal
2. As conditions allow, swimming in the sack or mounting the animal (similar to horseback riding) to deploy the tag should be considered, although this technique must be used with extreme caution
3. One (1) piece tag applicators constructed of titanium will prevent application failure
4. Powered application with use of a speargun or other device should be considered for deploying tags in whale sharks

ISSF scientists were present during all stages of this encounter, and can say with certainty that the whale shark was not detected visually or otherwise during any point in the fishing operation until approximately half of the sack up process was reached. The captain and navigator aboard the vessel insisted whale sharks are most often discovered in the catch during late stages of retrieving the net.

Future management measures concerning whale sharks in purse seine fisheries should strongly consider this to evaluate its potential unintended consequences of levying a citation to the fishing operation, as noted in SCP-OFP 2012.

5. Collaborative research and ancillary projects

FADtrack Data Retrieval and Software Suggestions from Fishing Master

ISSF's FADtrack software (Fig. 12) was tested by the Cape Finisterre for several months. The iPad was collected at the end of the cruise and swapped with another unit so that data could be collected from the current unit.

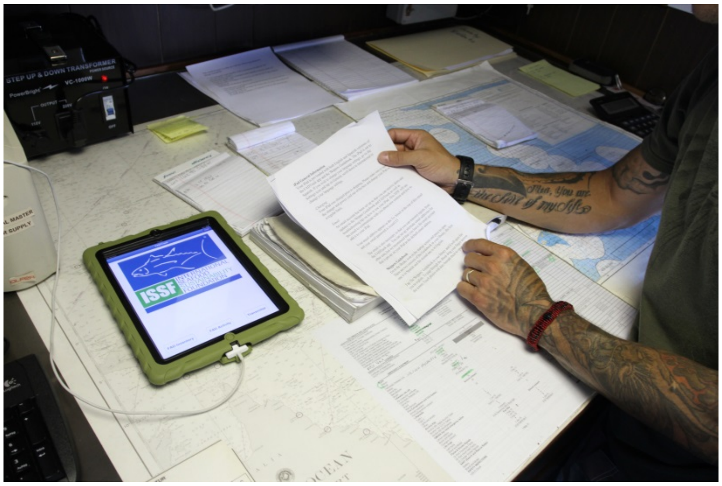

Figure 12. Use of ISSF's FADtrack FAD accounting system with iPad supplied to vessel by ISSF

The chief scientist recorded suggestions and notes regarding problems and issues with the software from the fishing master, who was responsible for recording information into the unit. These notes and suggestions were transcribed and transmitted to ISSF at the end of the cruise. Hopefully these suggestions can be incorporated into any new versions of the software to make the software more user friendly, which in turn will output a higher quality dataset.

Observations and Specimen Collection During Unassociated Sets

During WCPO-2, 16 sets were made on small to medium size "foamer" surface feeding aggregations (Fig. 13) of skipjack, 10 of which were successful in capturing target tuna species. Although there were no research objectives specifically directed at collecting information on non-FAD schools and fishing, the ISSF scientific team took the opportunity to collect as much data as possible.

Figure 13. Approximately 60mt school of skipjack "foaming", feeding on pelagic baitfish

Snorkel surveys of the net were conducted in a similar fashion to those in dFAD sets. Using snorkel gear scientists photo and video documented surface feeding behavior commonly known as foaming (Fig. 13 and 14) on ten occasions. Such in-situ observations may be unprecedented and previously undocumented. Blue marlin (*Makaira nigricans*) (Fig. 14) were encountered three times during these surveys, providing scientists excellent opportunities to photo and video document the behavior of these animals while encircled by purse seine gear. Given their surface oriented behavior, usually near the corkline, it is likely that billfish can be easily released over the corkline during the final stages of net retrieval if desired.

Figure 14. Panel A) Foaming aggregation of large skipjack (70-85cm FL) as seen from underwater, Panel B) Blue marlin encircled in purse seine gear

Pelagic baitfish species were also encountered, documented and collected. Two species dominated baitfish aggregations observed on these surveys: 1) ocean anchovy, (*Encrasicholina punctifer*), and 2) yet to be identified, but likely a halfbeak from the subfamily Hemiramphinae (Fig. 15). Specimens of each species were preserved in ethanol for identification, stable isotope analysis, and stomach content analysis. The undisputable importance of the bait resource in this short but important food chain should receive future research interest if possible.

Figure 15. Pelagic baitfish encountered during surveys of unassociated skipjack sets. Top Panel is ocean anchovy (*E. punctifer)*, bottom panel unidentified but likely halfbeak, subfamily Hemiramphinae (photo credit F. Forget).

Presence of Cetaceans in Unassociated Skipjack Schools

Several cetaceans, primarily Sei whales (*Balaenoptera borealis*) were encountered during the course of the WCPO-2 cruise, mostly while associated with unassociated skipjack schools and feeding on baitfish (Fig. 15). Although this occurrence and behavior is not uncommon, the ISSF scientific team noted that the captains and navigators of the Cape Finisterre and Cape Elizabeth III did not have a clear understanding of the regulatory measures aimed at protecting cetaceans from interactions with purse seine gear. As SPC-OFP 2012 highlights, the distinction between “interaction” and “sighting” are often confused, even by trained regional observers. These highly experienced, veteran fishermen all recognized that setting on a school of tuna associated with a whale (whale associated school) was illegal, but all failed to come up with a clear answer on whether setting near a cetacean “sighting” was actually forbidden or not, and complained about the lack of clarity for regulations on fishing while near cetaceans.

It would be highly valuable for an outreach initiative to be developed and carried out in WCPO ports, targeting skippers, to clarify regulations pertaining to cetaceans. This will be particularly relevant in light of the increased school fishing that will be occurring as a result of the FAD closure in WCPO convention area.

Net depth measurements

Three time/depth recorders were affixed to the net at the location where the chainline selvedge is laced to the first (deepest) net strip at 1/3, ½ and 2/3 net corresponding to the purse rings #31, 62 and 93. The sensors were collected after the completion of the last set, compiled in tabular form, and data are available for use.

Skipjack, Bigeye and Yellowfin tuna biological sampling

Muscle tissue for the three target tuna species was collected for colleagues at UNIBO for stock structure analysis and genetic connectivity in each of the world's ocean. Samples for this project were collected in the Line Islands and Phoenix Islands Kiribati EEZ.

Silky Shark, Rainbow Runner, and Triggerfish Biological sampling

Muscle tissue from silky sharks was collected for colleagues at the Hawaii Institute of Marine Biology for stock structure and genetic connectivity analysis, as well as oral bacteria composition analysis. Muscle tissue from silky sharks, rainbow runner, and triggerfish was collected for Mr. Fabien Forget's use for later analysis.

Photo and Video Documentation

Digital photographs and high definition video recording occurred throughout the cruise. Digital photos and video were transferred to computer, edited and backed up daily.

6. Outreach and dissemination of information

The Chief Scientist provided a radio interview prior to the cruise to Radio Australia, which summarized the research goals of the cruise.

One blog was written and published on the ISSF website regarding the cruise.

The research objectives and outcomes of the cruise will be presented to the ***Eight Meeting of the Scientific Committee of the WCPFC*** to be held in Pohnpei, Federated States of Micronesia, 7 – 15 August 2013. The work will be described in a working paper to be presented in the Ecosystems and Bycatch Theme of the meeting.

7. Recommendations for future work aboard tuna purse seine vessels

1. Prioritize future work in the Pacific by ISSF in regions west of the International Date Line, to provide geographical separation of previous cruises and to highlight differences in bycatch occurrence and behavior by region.
2. Conduct UVCs on FADs before set to quantify bycatch present, sharks entangled in FAD material (if any), and other relevant information
3. Conduct an active tracking experiment around a drifting FAD at night to test the effects of introducing artificial light and its effect on YFT, BET and SKJ aggregation habits utilizing acoustic tagging equipment.
4. Conduct more acoustic tagging experiments on bigeye tuna to further develop concepts for release and/or avoidance with purse seine gear
5. Characterization, description, and biological sampling on pelagic baitfish species should occur any time these species are encountered. ISSF should consider funding work specifically aimed at this objective.

Permitting

Permits for this research were obtained prior to the cruise. Permits were granted to conduct research in the EEZs of the following countries:

Kiribati*
Solomon Islands
Nauru
Western Samoa
Tuvalu
Tokelau*
Tonga
Cook Islands*
Marshall Islands

*Research activities were carried out in these waters as well as international waters

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