

SPC participates in purse-seine bycatch mitigation cruise



David Itano, ©ISSF 2012

A key ecological concern about purse-seine fishing around fish aggregation devices (FADs) is the wasteful catch of unwanted species. In the search for better fishing practices to avoid these wastes, the International Seafood Sustainability Foundation (ISSF) has, since 2011, implemented a global research programme — the ISSF Purse-Seine Bycatch Mitigation Project — to develop and test technical options to reduce bycatch resulting from large-scale purse-seine fishing on FADs. At the core of the project is the chartering of purse-seine vessels to serve as experimental platforms to conduct these tests under different oceanographic and fishery-specific conditions.

The first cruise to the western and central Pacific Ocean (WCPO) left Pago Pago, American Samoa in May 2012. The Pelagic Fisheries Program (PFP) of the University of Hawaii was the lead institute responsible for conducting experiments during the cruise, and was represented by David Itano, cruise leader, and Jeff Muir. As a key partner and science provider to the Western and Central Pacific Fisheries Commission, the Secretariat of the Pacific Community (SPC) was invited by ISSF to send scientific staff to participate in the cruise. Feral Lasi and Bruno Leroy from SPC's Oceanic Fisheries Programme joined the cruise. The Hawaii Institute of Marine Biology (HIMB), represented by Melanie Hutchinson, was also part of the scientific investigation. Finally, two senior Fisheries Observers from the Pacific Islands region — Kevin Kisekup from the Papua New Guinea National Fisheries Authority and Elton Clodumar from the Marshall Islands Marine Resources Authority — were invited to join the cruise as part of a capacity building programme.

Key tasks undertaken by SPC staff during the cruise included: 1) monitoring and logging monitoring, control and surveillance (MCS)-related data produced by the Archipelago Electronic Monitoring System; 2) conducting paired spill-and-grab sampling on catches; and 3) testing the viability of GoPro cameras for their potential for supporting the electronic monitoring of tuna catch and size estimates. The two senior Fisheries Observers assisted SPC staff with spill sampling, and provided technical support to the PFP and HIMB scientists.

The cruise

The cruise took place on the *Cape Finisterre*, a US-flagged, 72.6 m purse-seine vessel powered by a 1,000 hp Caterpillar engine. The vessel has 18 storage wells that can hold 1,242 t of fish when full. The vessel is skippered by John Crisci (an American), and has a crew of 21 made up of a wide range of nationalities including

Americans, Ecuadorian, Panamanians, Philipinos, Solomon Islanders, Samoans, Tongans, Tuvaluans, Mexicans, Croatians, Chinese and Indonesians.

The cruise was divided into two parts. The first leg began on 22 May when the vessel departed Pago Pago, and ended on 10 June, when it returned. The second leg departed Pago Pago on 14 June and returned on 1 July. The cruise path ran through the exclusive economic zones of Tuvalu, Tokelau and “pockets” of international waters between them. During the cruise, fishing was mostly done around FADs but, when transiting between FADs, free schools that were encountered were also targeted.

Summary of cruise research activities

The research activities undertaken by the three organisations taking part in the cruise are summarised in the tables below.

What is the Archipelago Electronic Monitoring System?

The system, which uses video-based electronic monitoring, has been developed by the Canadian company Archipelago Marine Research Ltd. to “augment observer programmes, increase the accuracy of data collected by observers, and provide monitoring on the unobservable component of the fleet “.*

For the ISSF Purse-Seine Bycatch Mitigation Cruise, the system comprised an array of cameras mounted in strategic locations on the vessel, which are connected to the main winch hydraulic system, a central computer and a monitor that is located on the vessel’s bridge. The system switches on as soon as the main winch hydraulic system is used, as it is a signal that fishing is occurring, even in the middle of the night. The system attempts to automatically log vessel fishing activities and store data in a computer for later perusal by law enforcement officers to ensure that fishing regulations are not violated. If the system works well, there should be no need for Fisheries Observers to collect MCS information.

* Use of a video electronic monitoring system to estimate catch on ground-fish fixed gear vessels in California: A pilot study. By Maria Jose Pried et al. [[http://www.edf.org/sites/default/files/California Fixed Gear EM Study 2008.pdf](http://www.edf.org/sites/default/files/California%20Fixed%20Gear%20EM%20Study%202008.pdf)]

Table 1. Summary of activities undertaken by the SPC team, and their outcomes.

Experiments or activities	Outcomes
Trial of the Archipelago Electronic Monitoring System	<ul style="list-style-type: none"> · System works fine and is suitable as additional support for MCS reporting but cannot replace observers. · Cannot replace Fisheries Observer work because scientific data still needs to be collected by observers.
Paired spill and grab sampling	<ul style="list-style-type: none"> · Large sample size of data obtained from FAD fishing in the central Pacific Ocean region, and can be used for comparison with other regions in WCPO. · Data from average lengths of tunas to fill sampling bins are used to determine optimal bin size for spill sampling.
Trial of GoPro cameras	<ul style="list-style-type: none"> · GoPro cameras can be used to monitor performance of grab and spill observers on board. · GoPro cameras are not suitable for capturing species composition during brailing or loading of wells at the wet deck. · Ice slurry mixed with fish blood obscures fish sliding down the chute into wells. GoPro cameras are of little use in such situation.

Table 2. Summary of activities undertaken by the PFP team¹

Experiments or activities
Underwater visual census at FADs
Natural behaviour of tuna and bycatch in the net
Initial release of fish from the net by towing FADs
Pre-set estimation of catch and bycatch
Vertical and horizontal behaviour of tuna and bycatch species on FAD aggregations
Targeting skipjack after dawn while avoiding bigeye and bycatch
Shark escape panel experiment
Bigeye tuna tagging (sonic/conventional)

¹ The outcomes of the work carried out by the Pelagic Fisheries Program and Hawaii Institute of Marine Biology teams will be released later as internal documents of the International Seafood Sustainability Foundation.

Table 3. Summary of activities undertaken by the HIMB team.

Experiments or activities
Condition and post-release survival of sharks
Best practice for the live release and handling of whale sharks and manta rays
Shark tagging

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What are spill and grab samplings?

Grab sampling is a standard method used by SPC for determining tuna species composition of purse-seine activities in the WCPO, and involves the Fisheries Observer selecting five fish at random from each brail as fish are poured on deck from the net. Each of the five fish is then identified and its fork length measurement taken. However, it has been found through statistical analyses that the use of this sampling method for estimating species composition was biased because five fish are too few a sample size to represent less common species, such as bigeye tuna, and because five fish are taken at the top of the brail, where the bigger fish tend to be.

Spill sampling is a new method being recommended to all Fisheries Observers, and consists of “spilling” part of the fish contained in a brail, as it is winched in, into a bin. All of the fish spilled into the bin are then identified and measured. A spill sample is taken for every tenth brail during a fishing trip. Overall, the number of fish sampled using the spill sampling method is greater (± 200 –300 fish/10 brails) than with grab sampling (50 fish/10 brails), and takes into account the stratification (bigger fish at the top) or layering (weaker fish — usually smaller specimens and bigeye — dying first and dropping to the bottom of the net) of the fish that may occur during brailing. It therefore enables better estimates than grab sampling.



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