An Update on Electronic FAD Tracking and Monitoring in PNA Zones

The Pew Charitable Trusts

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INTRODUCTION

In 2015, the Parties to the Nauru Agreement (PNA) adopted a 12-month trial program to electronically track and monitor fish aggregating devices (FADs) in members' Exclusive Economic Zones effective Jan. 1 2016.[1] This decision followed the successful demonstration of FAD tracking via a pilot project conducted with the PNA Office in 2012-14. Given the extensive use of FADs in members' waters, with an estimated 80,000 being deployed by industry in PNA zones each year[2], improving the management of FADs is central to the members' efforts to secure the sustainability of their tuna resources. The program is the latest in the PNA's efforts to promote the region's development of regulatory and management measures for tuna fishing, which have included:

- The development of the Vessel Day Scheme;
- Bans on setting on whale sharks;
- A Marine Stewardship Council certification for free-school purse seine-caught skipjack (and more recently yellowfin); and
- Limit reference points for tuna species and an interim target reference point for skipjack across PNA waters.

Electronic tracking and monitoring of FADs will allow the PNA to improve the management of the resource in members' waters, providing a more accurate picture of the dynamics of FADs in the fishery, and giving members a new tool to track compliance with conservation measures. The Pew Charitable Trusts and the Gordon and Betty Moore Foundation provided financial support to enable the technology provider Quick Access Computing (QAC) to develop the FAD tracking software and train PNA officials to use the system. The Gordon and Betty Moore Foundation fosters path-breaking scientific discovery, environmental conservation, patient care improvements and preservation of the special character of the San Francisco Bay Area. Pew's global tuna conservation program supports the adoption of science-based regulations to manage the use and deployment of FADs and establish systems to accurately quantify and monitor FADs to provide data for compliance and science. This paper presents the rationale for the project, the steps in its development, and the opportunities resulting from its implementation to realize more sustainable tuna fisheries.

RATIONALE

FADs aggregate smaller fish, including juvenile and small Pacific bigeye tuna, a stock that is subject to overfishing and overfished in the Western and Central Pacific Ocean. Smaller fish also have a lower value, which depresses the value of the fishery and the economics of the region's fish processing.

The PNA's national-level legislation, as well as the rules of the Western and Central Pacific Fisheries Commission (WCPFC), defines a FAD as "fishing gear" and "fishing" as applying to a drifting FAD during its entire time at sea, recognizing the process of aggregation as part of the fishing activity, and not just the period when a net is set around the FAD. However, this fishing activity has not been effectively

[1] The Parties to the Nauru Agreement are the eight members of Papua New Guinea, Solomon Islands, Palau, Federated States of Micronesia, the Marshall Islands, Nauru, Tuvalu, Kiribati, and the participating territory of Tokelau. PNA waters encompass the world's largest skipjack fishery.

[2] Report of the WCPFC FAD Working Group, Bali, Indonesia, Nov. 27-28, 2015, Page 10.

monitored to fully integrate the dynamics of FAD movement and "fishing" into overall management regimes, and in fact can be considered IUU as unlicensed and unregulated. Currently, the PNA and the WCPFC manage effort on FADs through FAD set closure periods. FADs, however, continue to drift and aggregate fish during the closure periods – which as noted above, is considered "fishing". In addition, purse seine vessels are deploying greater numbers of FADs during the non-closure periods.[3] The result is a weakening of conservation measures adopted by the PNA (and the WCPFC). FAD tracking and monitoring provides the PNA with an opportunity to take greater control over the most important fishing gear in the region. FAD tracking enables the PNA to:

- Track and monitor all "fishing" in PNA and adjacent waters;
- Share data from drifting FADs with scientists from the Secretariat of the Pacific Community to better understand the dynamics and impacts of FADs on tropical tunas and the broader ecosystem;
- Monitor compliance in PNA waters with FAD measures (set limits and FAD closures);
- Automate verification of "free-school" MSC sets during FAD closures (proximity alerts);
- Incentivize industry accountability for FADs that are abandoned or wash up on reefs; and
- Assist in identifying IUU activity related to FAD fishing.

DEVELOPMENT

PNA Ministers discussed a FAD tracking and monitoring concept in 2009 and endorsed its development in 2011. Building on those discussions, The Pew Charitable Trusts and the PNA Office developed a FAD tracking trial with QAC in 2012.

Proof of concept, 2012

The purpose of the trial was to determine if existing technology could be used to track FADs in PNA waters and whether the PNA's Fisheries Information Management System (FIMS) could be enhanced to receive the data as an additional "asset." QAC purchased satellite buoys from the major FAD buoy suppliers (GeoEye, Zunibal, and SatLink) and determined that the buoys operated on systems similar to VMS. Buoys are programed to send regular reports (i.e. generally at sunrise and sunset) with their unique FAD identification and ownership information, location (latitude/longitude), time of transmission, and water temperature. Sonar capable buoys also are programmed to send indications of biomass, species and fish size, the speed at which the buoy is drifting in the ocean current, and its course. The buoys also report this information whenever they are "polled" by the buoy owner.

More importantly, it was discovered this information can be relayed to a second party by the service provider at no additional cost to industry. This provided an assurance that the PNA could have access to the buoy information as long as industry authorized their satellite buoy data providers to essentially forward "copies" of the data to the PNA. QAC worked with the service providers to develop a protocol for forwarding data in the standard internationally-recognized format, to automate transmissions, and allow FIMS to auto register FAD buoys upon receipt of the data. The next phase of the trial determined that the FIMS could receive, manage and track the FAD data as additional "assets." FIMS already was in use to manage the PNA's Vessel Day Scheme, observer program and other fishery information. QAC was able to fully integrate FAD tracking capabilities into the FIMS and the position data could be overlayed onto a Google Earth display to show the movement of FADs throughout the PNA EEZs. FADs could be

[3] The increase in the deployments of FADs per vessel was noted by former WCPFC Executive Director Glenn Hurry in a 2014 circular and re-submitted to the FAD Working Group as WCPFC11-2014-13_Attachment 2.

grouped to a single vessel or client (group of vessels) for ease of sorting and viewing.

Building the system, 2014

Following the successful trial, in 2014 the Pew Charitable Trusts and the Gordon and Betty Moore Foundation provided support to operationalize the FAD tracking concept and enable the FIMS to receive the volume of data that would correspond to the number of FADs deployed in PNA waters. Among the additional capabilities developed for the FIMS were:

- An alert system that notifies managers when FAD buoys are underreporting information, i.e. functioning incorrectly;
- An alert system that records and notifies managers when FAD buoys drift into EEZs, territorial seas, archipelagic waters or areas closed to fishing;
- A proximity alert system that notifies managers when fishing vessels are potentially setting nets on FADs at dawn;
- A system that summarizes how much time each FAD spends in each PNA EEZ, territorial waters, archipelagic waters and high seas;
- A system that automatically registers individual FAD buoys and groups them based on the information forwarded by the standard satellite data providers; and
- A system that supports the PNA MSC free school skipjack fishery through a web portal to allow industry to apply for and receive an MSC trip number, and integration of MSC traceability data requirements into the FIMS.

Training, 2016

With the technological development of the system completed, the Pew Charitable Trusts and the Gordon and Betty Moore Foundation this year are providing support to train PNA fishery officials in using the FAD tracking capabilities of the FIMS, as well as PNA observers, debriefers and port samplers to fulfill their roles in inputting and certifying data. Training videos viewable on the FIMS will be created as an additional resource.

OPPORTUNITIES

The development of the FAD tracking and monitoring system provides the PNA with opportunities to improve the management, compliance and science related to the purse seine fishery.

1. Improving Scientific Understanding

Despite their importance to the tropical tuna fishery, precise estimates of the number of FADs deployed in the Western and Central Pacific Ocean have been lacking and the impact of the mass deployment of FADs on the fishery is not well understood. An agreement with the Secretariat of the Pacific Community enables its scientists to receive the data from the PNA FIMS. A test in April successfully transmitted FAD data to the SPC. An automated pass-through mechanism could be set up to facilitate future transmission of the data.

Provision of FAD identifying information, ownership, locations, and the date and time of those transmissions is mandatory under the PNA program. Such information could provide scientists with indications of the numbers of FADs deployed, the impacts of currents and the fate of FADs (recovered, beached, lost). Analyzing this data with other fishery information received by the SPC, such as observer

data and logsheets, opens up additional opportunities to improve the understanding of FAD effort levels and catch-per-unit-of-effort in the purse seine fishery. Potential research questions include:

- How long are FADs in the water before being fished?
- Are certain areas more productive than others?
- Does the density of FADs in an area affect catches?
- How do fleets behave relative to FADs – density, distance, etc.?
- How do locations of FADs relate to hotspots of bigeye catch?

Future opportunities for scientific research will be created if the PNA program eventually requires industry to transmit FAD sonar data and oceanographic information to the FIMS. With potentially 80,000 FADs reporting sea surface temperatures and other oceanographic data two times each day, the data received through this project could be the largest source of climate data in the Pacific.

2. Improving Management of Fishing in PNA Waters

Tracking and monitoring FADs provides valuable data that can inform management and is consistent with a Forum Fisheries Agency paper submitted to the WCPFC (WCPFC-TCC9_DP08-Special Requirements of Small Island Development States). The paper describes the interests of Small Island Developing States, such as PNA members, who are seeking to develop arrangements to support rights-based approaches to manage the resources in their waters. FAD closures were created as the purse seine fishery's contribution to ending bigeye overfishing. However, the closures are seen as a blunt tool that is ineffective and inefficient, partly because of changes in technology, and they are viewed as detrimental to the economic welfare of the smaller States, which have zones with greater seasonality of fishing. Despite the FAD closures extending from two months to four, more bigeye is being caught in the purse seine fishery than before. Generating new data on the deployment and use of FADs is crucial to developing effective management arrangements to improve the status of bigeye.

3. Confirming Free School and FAD Sets

FAD tracking can act as a primary or secondary verification of sets for compliance with management measures and trade requirements. The proximity alert notification could be matched against e-reporting logs to confirm catches as "FAD free" for the PNA MSC certification. In this case, the absence of an alert would be used to bolster the observer data. A proximity alert could also be matched with the date and location to be useful for compliance with WCPFC and PNA measures on FAD closures or support the verification of accurate counts of FAD sets.

4. Detecting and Deterring IUU FAD Activities

FAD tracking could enable PNA members to more accurately assess alleged cases of IUU fishing related to FADs. Given that drifting FADs are actively "fishing" under national legislation, FADs that drift into closed areas or territorial waters could be considered IUU. FAD tracking would allow PNA members to answer important questions regarding potential IUU activities, such as:

- Was a FAD placed illegally in a closed area?
- Was a FAD placed immediately adjacent to a closed area, where prevailing currents would carry it through?

- Was a FAD stolen or tampered with in violation of national legislation?

5. Promoting Accountability for Lost and Abandoned FADs

Should the PNA choose in the future, FAD tracking and monitoring could be used to incentivize industry to recover FADs they deploy in PNA zones. Thousands are lost or abandoned each year. The average productive life of a FAD is considered to be approximately 10 months. The raft component of the FAD is inexpensive, and industry generally writes off the $800 to $1,400 cost of the tracking buoy. The cost of the fuel and opportunity cost to recover the FAD is greater than the price of replacing the FAD. Vessels are not penalized for abandoning FADs that have drifted away from the fishing ground. Unrecovered FADs wash up on shores or reefs, or drift Pacific-wide until they break up and sink. They can impose significant costs in damages to the ecosystem and impact on coastal communities.

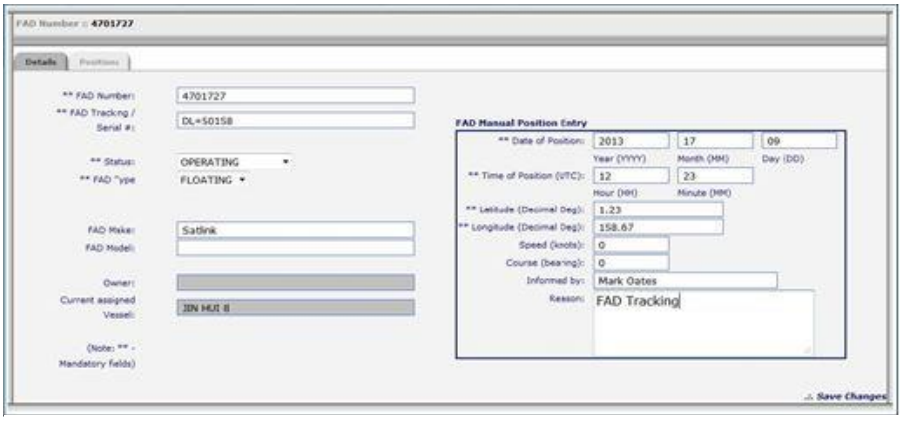
If FADs wash up on shore, the buoy may still function and send reports. Repeated reports from the same location would indicate a beaching event. From the unique electronic signature of the buoy, the deploying vessel could be identified and a clean-up fee could be assessed. If FADs are too far away to recover or not productive, the PNA could limit losses by instituting a limit on the number of FADs permitted on each vessel for a given year. Making each FAD a more valuable asset would prompt vessels to act more strategically to ensure a maximum number remain active and accessible to recover.

6. FAD marking alternative

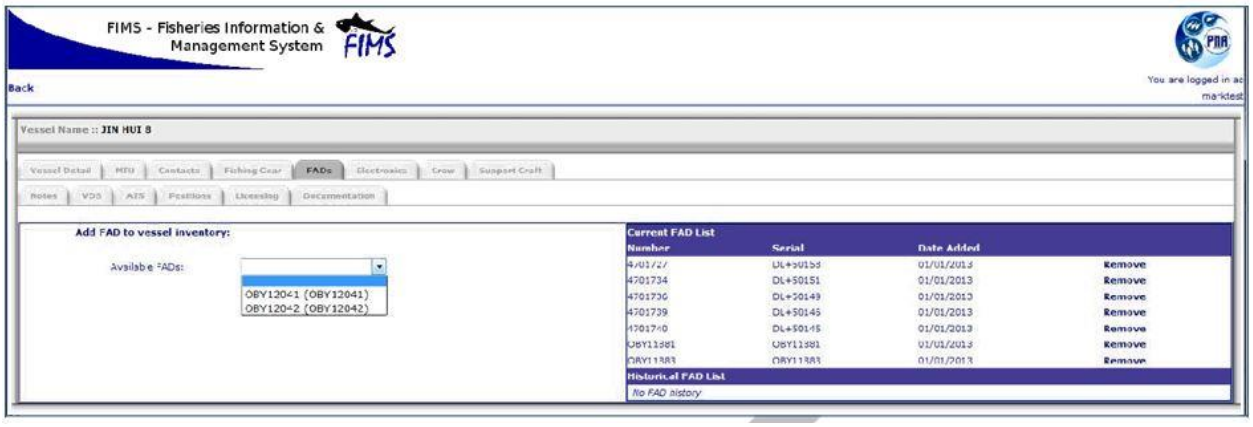
The WCPFC is discussing the development of protocols to physically mark FADs with identifying information, as has been the practice in other oceans. One challenge for fisheries observers is to visually read the identifying information on the marking for a variety of reasons. However, each buoy used on a FAD already has a unique identifier. This is the identifier that is used electronically in the PNA FIMS tracking system. Rather than have a fisheries observer read a physical marking on the side of a FAD, the vessel captain could provide the observer with the unique identifier of the buoy attached to the FAD. Most artificial FADs are deployed with tracking buoys. The PNA is requiring any vessel that investigates a FAD – whether a log or a man-made FAD – to attach a tracking buoy to the object if it does not have one. This does not place an additional burden on industry as productive FADs are too valuable not to track.

CONCLUSION

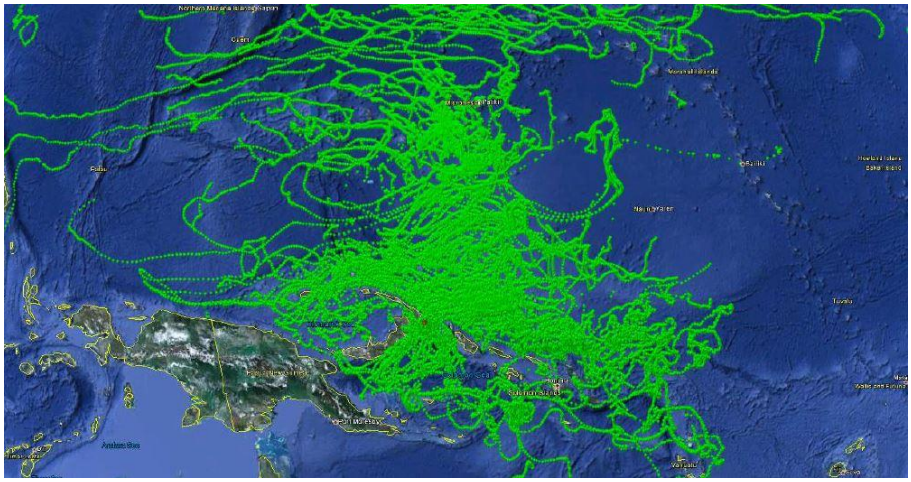
Electronic tracking and monitoring is an important step toward more strategic management of FADs. The PNA is leading the way in the Western and Central Pacific as a consensus has emerged among scientists, fishery managers, fishermen and conservationists that FADs must be better managed. The PNA project is the world's first comprehensive system to use existing industry technology to improve management and scientific understanding of a gear that is so critical to tropical tuna fishing. Additionally, as the market continues to demand responsible fishing practices, electronic tracking and monitoring of FADs offers yet another level of transparency to the tuna supply chain. Finally, improving the understanding of FADs may offer insights that lead to more effective conservation measures for bigeye and other species.



FIMS screenshot 1 - FAD data entry can be viewed and updated as needed.



FIMS screenshot 2 - FADs can be assigned to a vessel or group of vessels for ease of viewing and display on Google Earth.



A Google Earth display generated by the pilot project showing FADs associated with three vessels drifting in PNA zones.