New biodegradable FADs developed for the Pacific Islands region: A step towards more sustainable tuna fisheries

By Lauriane Escalle, Gala Moreno and Tracey Holley

Tuna fisheries in the western and central Pacific Ocean (WCPO) are the largest and most productive in the world, accounting for over half of the global tuna catch (Hare et al. 2022). The same work concludes that the four key tuna stocks in this region – bigeye, yellowfin, skipjack and South Pacific albacore – are considered to be sustainably exploited. The use of drifting fish aggregating devices (dFADs) within the purse-seine fishery, however, has raised concerns about the entanglement of non-target marine species, marine pollution and damages to sensitive coastal habitats. With the deployment of 23,000–40,000 dFADs in the region's waters each year (Escalle et al. 2021), the need to reduce the number of environmental impacts is critical.

Why are FADs crucial for fishers?

FADs are important devices for both industrial and artisanal fishers. Fish are naturally attracted to floating objects, which provide shade and shelter. Human-made FADs are typically constructed from a variety of materials, and strategically placed in the sea to aggregate fish. Increasingly, especially since the 1990s, dFADs have had marker buoys with satellite tracking devices and echosounders attached to them so that purse-seine fishers can relocate their dFADs and obtain information on biomass of tuna gathering beneath them. These technologies have no doubt improved the efficiency of purse-seine fishing on dFADs.

Although the use of tracking devices has allowed the purse-seine industry to track and set on their dFADs, abandoned or lost dFADs that drift out of key fishing areas can negatively impact wildlife through entanglement and habitat damage. The floating rafts of dFADs use a variety of materials – basically whatever floats. Nets, ropes and lines are used to hold dFADs together and provide a dangling "tail" in the water column to attract tuna, but this subsurface mesh netting can entangle other species such as sharks and turtles. With the high number of dFAD deployments in the WCPO, there is an urgent need to transition to biodegradable and non-entangling dFADs (Escalle et al. 2023). Fortunately, trials of a biodegradable FAD constructed without netting in the WCPO marks the beginning of a new era towards the use of more environmentally friendly dFADs for tuna fishing.

Jelly-FADs: A sustainable solution

Jelly-FADs (Moreno et al. 2023) have been developed by the International Seafood Sustainability Foundation (ISSF) and oceanographers from the Insitute de Ciències del Mar in Barcelona, Spain, and are currently being tested by the Pacific Community (SPC) and ISSF as part of the Western and Central Pacific Fisheries Commission's Project 110 (non-entangling and biodegradable FAD trial), complemented by the National Oceanic and Atmospheric Administration's BREP project. SPC, ISSF and partner fishing companies, recently deployed the first batch of biodegradable dFADs in the WCPO. The newly-developed "jelly-FADs" – so called because they drift neutrally in the water column like jellyfish – are made with natural materials such as bamboo canes, cotton canvas and ropes, which become saturated with seawater after 20–25 days. Sand or clay blocks are used as bal-

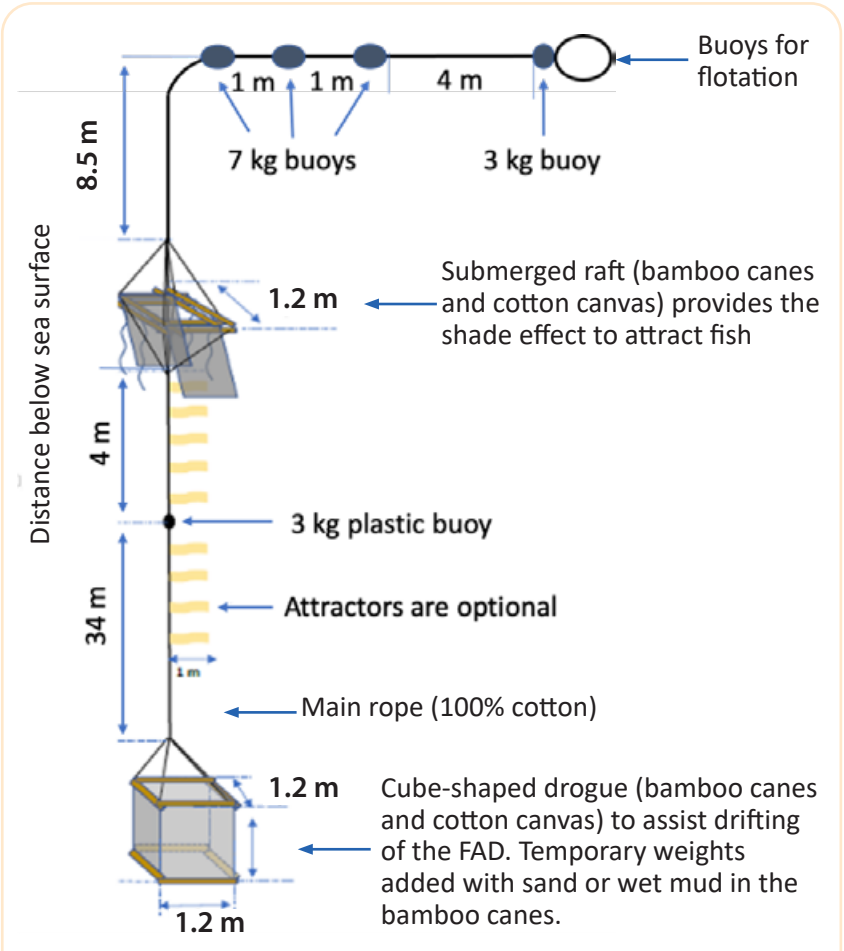

Figure 1. Diagram of a jelly-FAD. Source: ISSF

last, and will dissolve slowly once the bamboo canes become neutrally buoyant. The design has a very limited surface-level floating structure, just four plastic buoys – that are the only non-biodegradable materials present – and a satellite beacon. This neutrally buoyant design reduces structural stress from wind, waves and currents, thus giving the jelly-dFAD a longer lifespan. This is a key design feature because biodegradable materials are not as robust as synthetic materials. The materials will, ideally, degrade slowly after 9–12 months of use, and leave little in the way of an environmental footprint.

These jelly-FADs are the future for environmentally friendly FAD fishing at the industrial level, and will reduce the number of entanglements of non-target species such as turtles and sharks, as well as the impacts caused by lost and abandoned dFADs and their parts.

Trial and evaluation

How well do these new jelly-FADs perform in comparison to conventional FADs? A jelly-FAD can drift for many months (we hope around one year) and be used the same way as traditional dFADs are used. Over the coming months, we will be evaluating how effective jelly-FADs are at aggregating tuna, how well they drift in the open ocean, and how long they last. The satellite buoys with echosounders attached to the jelly-FADs will provide crucial scientific information for the trial. The data for the jelly-FADs will be compared with similar data collected at the same time for traditional synthetic dFADs.

In total, 426 jelly-FADs will be tested in the Pacific over a two-year period (late 2022 to late 2024). Last year, 100 jelly-dFADs were constructed in Ecuador, and deployed in late 2022 and early 2023 by the US purse-seine fleet (American Tunaboat Association and Cape Fisheries). Recently, 100 jelly-dFADs were constructed in the Federated States of Micronesia (FSM), and eight have been successfully deployed by Caroline Fisheries Corporation (FSM), FCF Co., Ltd (Taiwan) and Silla (Korea), and are now drifting in the ocean. The rest of the jelly-dFADs will be constructed over the coming months in FSM, American Samoa and Ecuador. SPC and ISSF scientists will analyse the data collected by skippers, fisheries observers, and through the satellite and echosounder buoys, with the first results expected by the end of 2023.

The future of sustainable dFAD fishing

A report on the scientific analyses will be provided to industry partners, national fisheries agencies, and WCPFC. When the trials are completed, the next steps will involve workshops with industry and national fisheries managers to develop implementation plans at the scale of the WCPO. The use of biodegradable dFADs has the potential to reduce the environmental impacts of dFAD fishing practices and contribute to improving the sustainability of tuna fisheries in the WCPO.

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The constructed jelly-FAD.
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Attaching the cotton ropes to the drogue.
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Building the submerged raft with bamboo and cotton canvas.
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