SCIENTIFIC COMMITTEE
TWENTY-FIRST REGULAR SESSION

Nuku'alofa, Tonga
13 – 21 August 2025

Stakeholders view and economic and feasibility analysis on options to mitigate dFAD loss and abandonments and their impacts: preliminary results

WCPFC-SC21-2025/EB-WP-04
14th July 2025

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Executive Summary

While there is growing information related to drifting Fish Aggregating Devices (dFADs) and their use in tuna purse seine fisheries, information related to dFAD loss and abandonment, as well as potential environmental impacts remains limited. The current paper summarises work plan and preliminary results of a project entitled "Assessment of the impacts of drifting Fish Aggregating Devices on marine environment in Pacific Island Countries: recommendations for mitigation strategies" from 2024 to 2026. The project aims to gather additional information on dFAD loss, abandonment and stranding, as well as exploring mitigation options. In particular, project tasks include: i) monitoring of dFADs drifts outside fishing grounds; ii) review of the regulatory framework of dFADs in the Pacific, with a focus on loss and abandonment; and iii) evaluate the economic viability and operational feasibility of measures aimed at minimizing dFAD loss and abandonment, including retrieval mechanisms.

At this stage, the review of the regulatory framework of dFAD loss and abandonment is almost complete, with key findings from a Regional Fisheries Management Organisation (RFMO) point out view presented here. Some egulatory and programmatic actions for RFMOs' consideration were prosposed in the draft report. This includes: (i) clarifying legal ownership of dFADs and all their parts; (ii) regulating dFAD ownership transfer; (iii) establishing responsibilities for retrieval and damage compensation; (iv) establishing time-bound targets to increase retrieval rates; (v) introducing or supporting fees or funds to cover cleanup and recovery costs; (vi) establishing robust compliance mechanisms, (vii) banning or controlling satellite buoy deactivation; (viii) enhancing dFAD registry systems; and (ix) removing regulatory disincentives for retrieval.

The monitoring of dFADs outside fishing grounds is underway with 109 dFAD tracking buoys monitored to date. This effort has enabled the identification of stranding events in areas where trajectory data has previously been very limited. Partnerships with other organisations are also being developed, through pitot dFAD recovery projects, with three dFAD tracking buoys, and associated dFAD structures, where present, already recovered. Finally, the economic viability and operational feasibility analyses of options to reduce dFAD loss and abandonment, including dFAD retrieval is currently underway, with 72 responses from a large stakeholder consultation.

Finally, the economic and feasibility analyses of options to decrease dFAD loss and abandonment, including retrieval is currently underway, with 72 responses from a large stakeholder consultation (https://docs.google.com/forms/d/e/1FAIpQLScMhpj158Dku-UmAly3CsZtvSgogOiO8nBrwwrZXZKEZbH0Og/viewform). Respondents generally agreed that the five options considered in this study and listed below would lead to decrease in dFAD loss and abandonment:

1- Modification of the deployment areas to limit dFAD loss from fishing grounds.
2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).
3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.
4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).

5- dFAD retrieval programs from shore (e.g., 'FAD watch' systems) that enable community collection of dFADs prior to stranding events in sensitive areas.

At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea outside the purse seine fishing grounds, along with increased retrieval efforts by purse seine vessels prior to dFAD loss and abandonment were considered both the most feasible and most cost-effective options. However, several limitations and considerations were highlighted by respondents:

i) these options may be limited by logistical challenges; operational costs; limited industry willingness to collaborate; and current lack of coordinated efforts;
ii) the possibility of longliners to retrieve lost and abandoned dFADs remains a point of debate among stakeholders, even if already carried out in the regions;
iii) existing regulations, in some regions, limit the recovery of dFADs by purse seine vessels;
iv) tuna RFMOs should consider implementing some form of guidelines or requirements for dFAD recovery by purse seine vessels;
v) prohibiting or regulating buoy deactivation could contribute to increased dFAD recovery, not limited to purse seiners alone;
vi) dedicated or chartered vessels for dFAD retrieval was proposed as a potential measure to reduce dFAD loss and stranding events.

Additional analyses and stakeholder consultations are planned over the next few months, as well as a regional workshop "*International workshop on mitigation of dFAD loss and abandonment in the Pacific: Insights from fishing industry to communities*" to present results from the whole project and provide opportunities for peer-to-peer exchange and learning.

Key outcomes of the project will include the development of recommendations for mitigation and management of dFADs and their associated impacts in the Pacific Ocean. A final report will be prepared and presented to SC22 in 2026.

SC21 is invited to:

- Provide feedback on the project and planned or ongoing activities presented in the paper.
- Note the preliminary findings of the legal study on the international and regional framework of dFADs loss and abandonment.
- Note the monitoring of dFAD tracking buoys outside fishing grounds and pilot projects to retrieve buoys and dFADs close to shore.
- Encourage members and the fishing industry to complete the stakeholder surveys and to disseminate the link with their national industries and other relevant stakeholders.

https://docs.google.com/forms/d/e/1FAIpQLScMhpj158Dku-UmAly3CsZtvSgogOiO8nBrwwrZXZKEZbH0Og/viewform

- Note the plan for the workshop entitled *"International workshop on mitigation of dFAD loss and abandonment in the Pacific: Insights from fishing industry to communities"* in French Polynesia from February 9th to 12th 2026.

1. Introduction

There is growing information related to drifting Fish Aggregating Devices (dFADs) based on satellite buoy data used to track dFADs, observer and logsheet data (Escalle et al., 2021; Lopez et al., 2024). It is estimated that industrial purse seine vessels deploy 46,000 to 65,000 dFADs annually in the Western and Central Pacific Ocean (WCPO) (Escalle et al., 2021; Lopez et al., 2024) and that dFADs could be a major source of abandoned, lost, or otherwise discarded fishing gear (ALDFG) in the Pacific Island Countries and Territories (PICTs) (Escalle et al., 2023; Mourot et al., 2025). However, the data to study the rate and spatial distribution of dFAD loss and abandonment, as well as potential environmental impacts, remain limited. In particular, abandoned and lost dFADs can cause significant environmental damage when they become stranded in coastal areas, polluting coastlines and damaging fragile habitats like coral reefs while also endangering essential habitats for marine fauna such as marine turtles and sharks (Balderson and Martin, 2015; Mourot et al., 2025). The stranding of dFADs in coastal areas also contributes to an increased public perception that tuna fisheries are polluting the ocean, which will erode the social license of the tuna fisheries that provide vital economic benefits to PICTs. Therefore, quantifying stranding events of dFADs and their impact on fragile ocean habitats (Mourot et al., 2025), as well as reviewing and assessing options for mitigating their impact, will help to inform improved management and mitigation of dFADs environmental risks in the Pacific Ocean.

The Pacific Community (SPC), with funding from the World Bank, is implementing a project entitled "*Assessment of the impacts of drifting Fish Aggregating Devices on marine environment in Pacific Island Countries: recommendations for mitigation strategies"* from 2024 to 2026. The project aims to:

i) enhance data collection programs to investigate the number of dFAD stranding events and type of impacts (Mourot et al., 2025);
ii) gather additional information on dFAD drift patterns and fate;
iii) review of the regulatory framework of dFAD loss and abandonment;
iv) explore potential options for mitigating dFAD loss and abandonment, including their retrieval;
v) implement stakeholders' consultations to inform the development of effective strategies.

The project will provide recommendations that can inform regional dialogue toward an action plan for the prevention, mitigation and management of abandoned and lost dFADs in PICTs. The longer-term outcome of the project is to inform decision makers on policy development at the national and regional level and the investment needs to minimize and remediate impacts of marine debris from dFADs in the Pacific Ocean.

The following sections provide an overview of activities carried out as part of the project, and preliminary results, when available, regarding the objectives mentioned above.

For the purposes of this project and throughout this report, the following definitions have been used:

- "Lost" buoys and dFADs, at the scale of the entire purse seine fishery (not at the scale of an individual fishing company), are defined as dFAD tracking buoys and associated dFAD structures for which signal transmission is lost by the buoy owner, prior to any deliberate deactivation of the buoy. DFADs that are appropriated by another company or sold to another company, may be considered "lost" from the perspective of the original owner, but are not included in this definition, as dFADs continue to be monitored by a different entity.

- "Abandoned" dFAD tracking buoys and associated dFAD structures are buoys that have been deliberately deactivated while still transmitting.
- "Discarded" dFADs or buoys refer to dFADs that have been intentionally placed or left at sea with no intention of further tracking or recovery– as at the end of their operational life or following dFAD appropriation by another vessel who replace the buoy by one of its own.
- "Owner" of a dFAD is the vessel or entity that has last attached a satellite buoy to it and have has last been tracking the position.

2. Project tasks

Task 1: Support the regional stranded FAD data collection programmes

The first subtask is supporting the ongoing regional stranded FAD data collection programmes. More detailed information can be found in the paper on this programs submitted to SC21 (Mourot et al., 2025).

Task 2: Monitoring of dFADs outside fishing grounds

In the purse seine fishing grounds (mostly between 10°N to 10°S), there is a growing source of dFAD tracking data available to scientists and managers, which has allowed for better knowledge regarding dFAD fate, stranding events and areas where positional data is unavailable (Escalle et al., 2023; Lopez et al., 2022). More recently, some management measures also require dFAD buoys to continue to transmit positional data outside the vessel/companies primary fishing grounds (PNA 4th IA: 20°S to 20°N). While this will improve data availability, there remains a lack of information regarding the fate of dFADs over their entire lifetime and the number of dFADs that continue to transmit positional data outside the fishing grounds remains low. In order to gain additional information regarding dFAD fates, this sub-task aims to monitor dFADs outside fishing grounds, by maintaining active buoys that would normally be deactivated by fishers. SPC is therefore collaborating with Satlink and partner fishing companies (the American Tunaboat Association, Tri Marine and Bolton Food and Caroline Fisheries Coorporation) to monitor dFADs outside fishing grounds, in areas where dFAD trajectories are scarce or absent (north of 20°N and south of 20°S). Additionally, this task will include data from echosounder buoys used to track dFADs, providing information related to fish presence and absence around dFADs and their dynamics outside main fishing grounds.

Areas of common signal loss have been defined between SPC and partner fishing companies (see blue area in **Figure 1**). If any buoy is planned to be deactivated by fishers and still drifting (excluding stranded buoys) within these areas, the buoy would be maintained active and the monitoring transferred to SPC (fishing companies and vessels no longer monitoring it). A budget of 50,000 euros was available at SPC for the project, and will aim to monitor as many buoys as possible for a minimum of twelve months (or until communication is lost or the buoy (and dFAD) is stranded). To ensure that both position and echosounder data continues to be transmitted, costs have been shared between the participating fishing companies, SPC and Satlink.

This is the first initiative, at this scale to monitor dFADs outside fishing grounds. Monitoring started in May 1st 2025 and 109 buoys have been monitored by SPC (Table 1 and Figures 1 and 2). A few buoys were also

already stranded at the start of the project. Since the beginning of the project, sixteen buoys have stranded: six in Fiji, four in Tonga, two in French Polynesia, two in Vanuatu, and two in the Cook Islands. Additionally, one buoy stranded in Hawaii but resumed drifting after one week, and a similar event occurred with another buoy in Fiji. There was also two signal loss at-sea, one far from any islands, in Tonga, and one in Hawaii. Satlink was able to investigate the reason and given the tilt movement, and the difficulty to connect with satellite, they likely sunk.

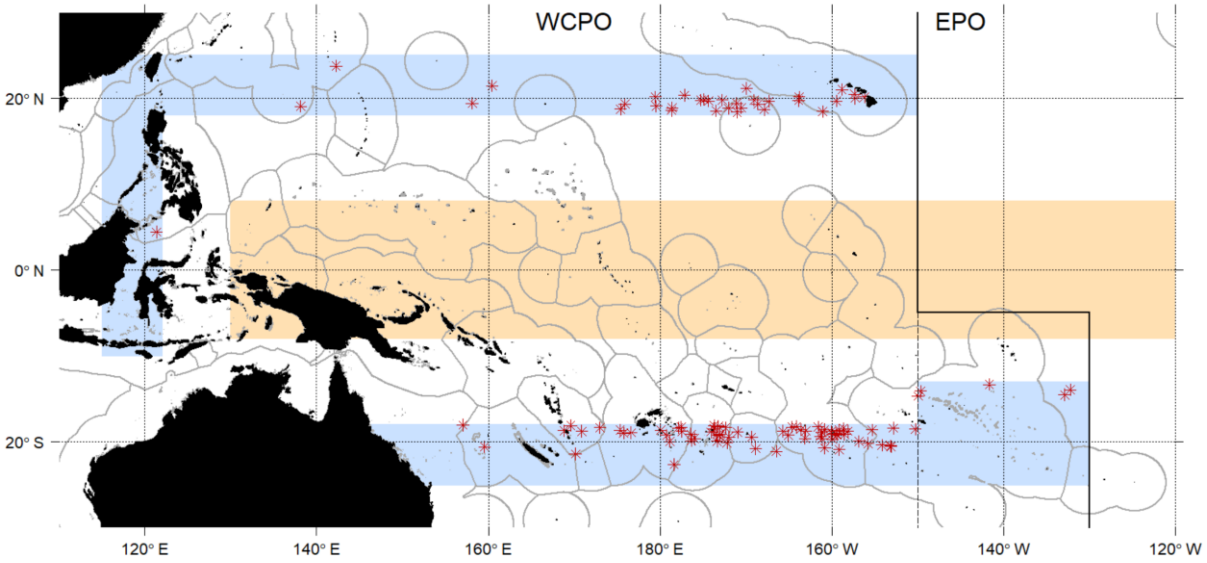

Figure 1. Main purse seine fishing grounds (yellow) and areas of frequent dFAD buoy communication loss in the WCPO (blue), which are the areas where buoys enter the project and start being monitored by SPC. The red stars are the first SPC monitoring positions.

Table 1. Summary of the status of buoys attached to dFADs and monitored by SPC, on July 1st 2025.

	May	June	July	Total
Number of buoys active on 01/07/2025			92	
Number of new buoys	32	57	20	109
Number deactivated	3	14	-	17
Number stranded	10	5	1	16
Stranded CK	2	0	0	2
Stranded FJ	3	3	0	6
Stranded FP	2	0	0	2
Stranded TO	3	1	0	4
Stranded VU	0	1	1	2
Stranding then drift again	0	2	0	2
Number recovered	0	2	1	3
Signal loss at sea	0	2	0	2
Active on 01/07/2025			92	

Finally, SPC contacted their partners in the different PICTs with buoys from the project transiting or stranding in each PICT. This would act as tests for potential dFAD recovery programs from shore in these different locations, with data related to logistics and cost gathered as part of the project. While this part is still under development, three buoys and one dFAD structure have been retrieved, with the collaboration of TNC. One dFAD and buoy, close to Aitutaki was retrieved (8nm from shore) by local fishers on June 12th. While the raft and buoy were brought onboard, the tail (submerged appendage of the FAD) was too heavy to be retrieved by the fishers on their small boats. It was cut and sunk in the open ocean. Two other buoys were retrieved on June 17th and July 3rd in Hawaii, close to Kaho'olawe and Hawaii islands.

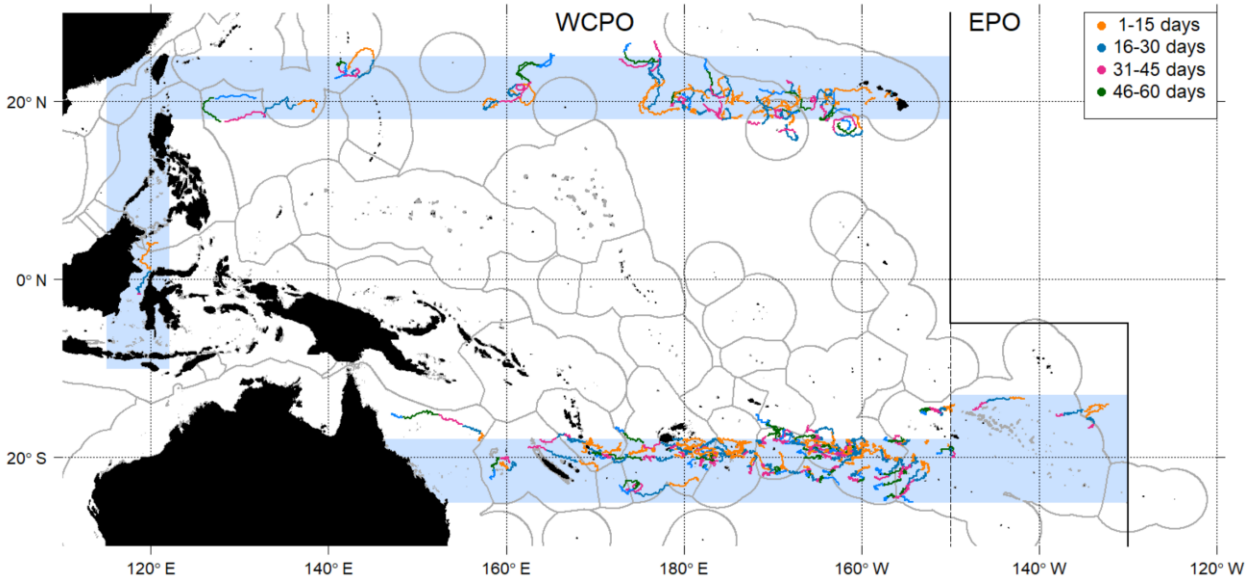

Figure 2. Trajectories of buoys attached to dFADs and monitored by SPC in this project.

Additional outputs beyond the project objectives, include using data from the echosounder buoys as a proof of concept for future efforts aimed at developing abundance indices to support stock assessments. Furthermore, the collected data could contribute to physical oceanographic models focused on ocean current dynamics.

Task 3: Review of the regulatory framework of dFAD loss and abandonment

This task aims to analyse the regulatory framework of dFADs in Pacific tuna fisheries to improve fisheries sustainability. The preliminary legal findings on the international and regional framework for dFADs are reported below. The final report will refine these findings and further analyse national legislation that is relevant to dFAD use in the Pacific region and beyond.

Although dFADs have increased tuna fishing efficiency and revenue, especially for skipjack, their extensive use now poses some environmental concerns. Up to 65,000 dFADs are deployed annually in the Pacific Ocean, with thousands stranding on coral reefs or beaches, damaging ecosystems and imposing cleanup costs on Pacific Island communities (Mourot et al., 2025; Royer et al., 2023). Most dFADs are constructed with plastics and contribute to marine debris and microplastics. Current regulations by tuna RFMOs in the

Pacific Ocean prohibit the use of netting in the construction of dFAD structures. This conservation measure significantly reduces, if not entirely eliminates, the risk of entanglement of marine fauna in the dFAD structure. In the Western and Eastern Pacific, this regulation entered into force in January 2024 and 2025, respectively. Therefore, newly deployed dFADs are not expected to cause entanglement issues. However, dFADs deployed prior to these dates—particularly those constructed with netting—may still be adrift and pose a risk of entangling marine species. Additionally, dFADs can represent navigation hazards.

The United Nations Convention on the Law of the Sea (UNCLOS) and the 1995 UN Fish Stocks Agreement require States to cooperate in managing straddling and highly migratory species and to minimise fishing-related pollution and waste. Within this framework, several RFMOs have adopted dFAD management measures for tuna stock sustainability. However, only recently have RFMOs begun addressing coastal damage and marine pollution caused by dFADs more directly.

In the Pacific, the Western and Central Pacific Fisheries Commission (WCPFC) has adopted several conservation and management measures relevant to dFADs, including seasonal dFAD closure periods and mandatory use of non-entangling designs (CMM 2023-01). Additionally, the Parties to the Nauru Agreement (PNA) have implemented region-specific rules for purse-seine fishing and dFAD use under their Vessel Day Scheme. Their Fourth Implementing Arrangement mandates dFAD tracking, keeping buoys active (20°S to 20°N) and buoy registration to increase accountability and enable retrieval. The Inter-American Tropical Tuna Commission (IATTC) regulates dFAD use through a series of resolutions that set rules for their design, deployment, tracking and impact mitigation. They have a unique identification code (the identification code of the tracking buoy used by fishers). A progressive phase-out of synthetic non-biodegradable dFADs is required between 2026 and 2030. Plastic floats will remain permitted until 2030, after which the Commission will review the requirement for fully biodegradable dFADs to be implemented in 2031 (IATTC, C- 23-04).

Under UNCLOS Part XII, States have specific obligations to protect and preserve the marine environment and to prevent, reduce and control pollution of the marine environment. Legal scholars argue that, except in case of *force majeure*, the intentional abandonment of dFADs may trigger application of specific treaties on marine pollution, such as Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) or the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Convention) and its 1996 Protocol.

These treaties reinforce that dFAD-related pollution is subject to international rules, despite the need for specific guidance on certain aspects of dFAD use, such as the status of dFADs that have drifted outside their authorised fishing grounds, or whether deactivating the satellite buoy effectively constitutes illegal dumping or waste discharge under international law. New treaties, such as the Agreement under UNCLOS on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ), and future ones, such as the planned Plastics Pollution Treaty, may bring further clarity as to State obligations.

RFMOs have both the authority and responsibility to act. Strengthening dFAD rules will better align fisheries governance with international environmental law, reduce transboundary harm and build

resilience in vulnerable coastal ecosystems. To strengthen legal accountability and environmental protection for sustainable dFAD use, the draft report suggests regulatory and programmatic actions for RFMOs' consideration. Proposed recommendations include: (i) clarifying legal ownership of dFADs and all their parts; (ii) regulating dFAD ownership transfer; (iii) establishing responsibilities for retrieval and damage compensation; (iv) establishing time-bound targets to increase retrieval rates; (v) introducing or supporting fees or funds to cover cleanup and recovery costs; (vi) establishing robust compliance mechanisms, (vii) banning or controlling satellite buoy deactivation; (viii) enhancing dFAD registry systems; and (ix) removing regulatory disincentives for retrieval (e.g., such as discussing retrieval-only during dFAD closure period; whether retrieval accounts as a fishing day or other licensing requirements; which vessel are authorized to retrieve dFADs; keeping buoy active and implication with active buoy limits, etc.).

Tasks 4 and 5: Economic viability and operational feasibility of options to decrease dFAD loss and abandonment, including retrieval; and stakeholder consultation

These tasks include an economic and feasibility analysis of options to decrease dFAD loss and abandonment, including increased recovery by purse seiners and other dFAD retrieval options; but also a stakeholder consultation, which will feed critical information and data into the economic and feasibility analysis. Given the inter-connection between both sub-tasks, they are presented conjointly in this report. The main objective of the economic and feasibility analysis is to identify the most cost-effective mitigation option(s) that could be implemented to reduce the environmental and economic damage associated with lost and abandoned dFADs and buoys. Different scenarios and possibilities for their retrievals likely exist depending on where dFADs are lost or end up stranded; therefore, mitigation options should be tailored to each context to ensure both operational feasibility and cost-effectiveness. This will include the assessment of financial costs that would be incurred by industries and other participants, the identification of administrative requirements and the exploration of potential unintended consequences for each identified option. The options considered to decrease dFAD loss and abandonment and increase dFAD recovery in the Pacific Ocean are the following:

1- Modification of the deployment areas to limit dFAD loss from fishing grounds.
2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).
3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds. This would correspond to specific vessel(s), potentially chartered for specific period(s), that only goes in specific identified area and retrieve dFADs.
4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds). This would be dFAD recovery programmes offshore, using larger vessels, such as longliners, and could cover an entire EEZ.
5- dFAD retrieval programs from shore (e.g., 'FAD watch' systems) that enable community collection of dFADs prior to stranding events in sensitive areas. Although similar to the previous option, this would be closer to shore and likely from smaller vessels.

In order to gather the adequate data and views on these options, SPC, with the support of consultants from MarFishEco and the International Seafood Sustainability Foundation (ISSF), have started to gather

the cost data, operational feasibility and acceptability, as well other logistical components that should be considered through a large stakeholder consultation at the national and regional level (e.g., country fisheries agencies, local communities, country environmental management agencies, fishing companies, RFMOs, FFA, SPREP, PNA, NGOs).

The workplan for the consultation includes surveys and interviews for the following stakeholder groups:

- A general survey, sent to all relevant stakeholders, and open since *May 15th 2025.*

If you have not already filled out the survey, you can do it using the following link: https://docs.google.com/forms/d/e/1FAIpQLScMhpj158Dku-UmAly3CsZtvSgogOiO8nBrwwrZXZKEZbH0Og/viewform

- Dedicated surveys, in-person or remote interviews are also being implemented, to gather more specific details, in particular with purse seine fishing company managers; purse seine skippers; longline fishing company managers; longline skippers; other relevant experts; local partners and communities that are part of, or could be part of, retrieval programmes; and artisanal fishers.

Interested parties can contact the authors via email at laurianee@spc.int

Preliminary results from the stakeholder consultation

Results presented in this paper are from the general stakeholder survey, with results received online no later than Sunday 6th of July 2025. Considering that this is the start of the study and that views from the largest number of stakeholders would be beneficial, the survey is still open and results below are to be considered preliminary.

A total of 72 stakeholders have filled out the general survey, from a wide range of stakeholders: government/RFMO representatives (n = 28); purse seine industry (n = 15); scientists (n = 11); NGOs (n = 10); and others (n = 8; buoy companies, fisheries resource commercialization and retailers, other fishing industry, etc.) (Figure 3). Most stakeholders had expertise in the tropical WCPO (Figure S1).

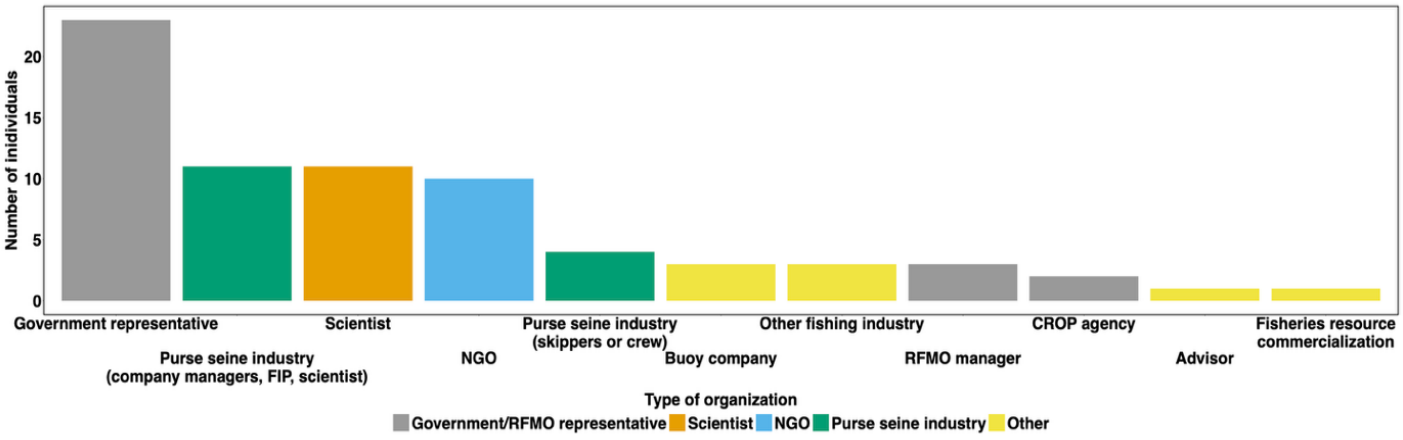

Figure 3. Types of organizations represented by survey respondents.

To gather respondents' expertise and knowledge on the use of dFADs in the Pacific, several questions were asked. First, regarding estimates of dFAD deployments, most respondents indicated 20,000 to 60,000 deployments per year, although this could be WCPO only, whole Pacific or the region they have

the most expertise (Figure 4). This corresponds to the latest known estimates of dFAD deployments in the Pacific Ocean (Escalle et al., 2021; Lopez et al., 2024). In terms of the percentage of dFADs that are lost or abandoned by fishers, the range of responses is more widespread (Figure 5). This may be an indication of; i) the uncertain definition of what a dFAD lost or abandoned is; and ii) the lack of knowledge on this area. Finally, in terms of estimates of the percentage of dFADs stranding each year, most respondents indicated between 0 and 20% (Figure 5). These are in agreements with previous scientific findings, using trajectory data only, of 11% in the WCPO; 15–20% in the Indian Ocean and 19–22% in the Atlantic Ocean (Escalle et al., 2023; Imzilen et al., 2021; Maufroy et al., 2018). Although around 35% of respondents appear to underestimate the number of dFAD stranding, with less than 5% mentioned.

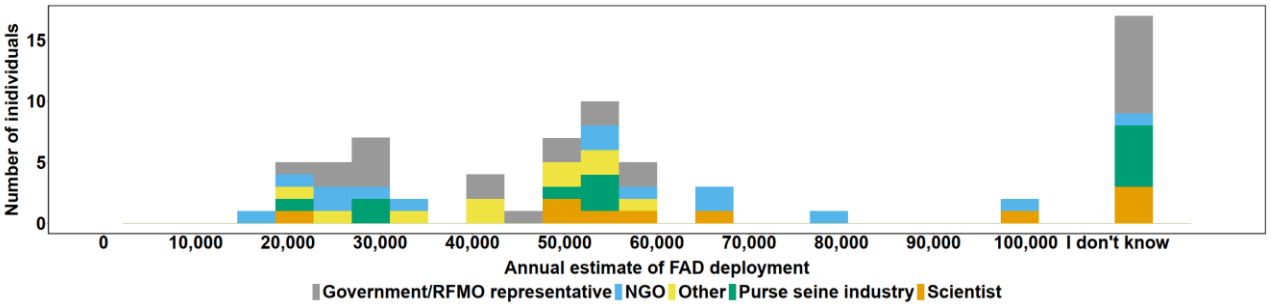

Figure 4. Survey respondents' estimates on number of dFAD deployments in the Pacific or their area of expertise.

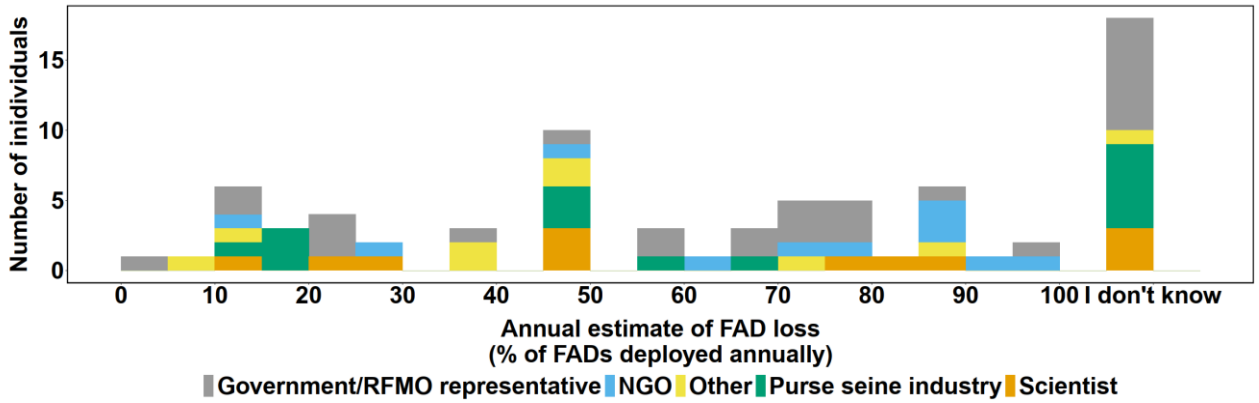

Figure 5. Survey respondents' estimates on the percentage of dFADs that are lost or abandoned by fishers each year.

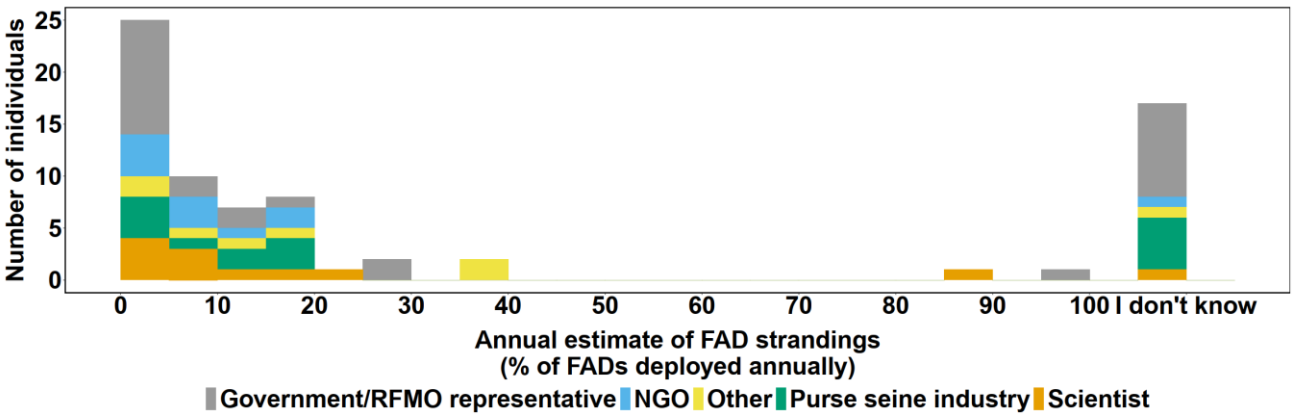

Figure 6. Survey respondents' estimates on the percentage of dFAD that strand each year.

Respondents were asked to rank the different options considered to decrease dFAD loss and abandonment and increase dFAD recovery in the Pacific Ocean from most feasible to least feasible (Figure 7 and Figure S2; top). It was found that, across all the stakeholders (Figure S2, top), the ranking of the options to reduce dFAD loss and abandonment, from most feasible to least feasible, were the following:

4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).
2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).
3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.
5- 'FAD watch' systems that enable community collection of dFADs prior to stranding events in sensitive areas.
1- Modification of the deployment areas to limit dFAD loss from fishing grounds.

When considering all stakeholders together, the ranking was not very different, with all options receiving high feasibility scores, meaning that respondents had various views on the subject. However, options that involved purse seiners and vessels already present in the area where dFADs are lost or abandoned (i.e., in EEZ outside fishing grounds), and dedicated "cleaning" vessels(s) were considered the most feasible, while modifying deployment areas, the least feasible.

Differences were, however, detected depending on the stakeholders considered, for the government and RFMO representatives (Figure 7, top), the ranking were as follows:

4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).
3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.
5- 'FAD watch' systems that enable community collection of dFADs prior to stranding events in sensitive areas.
2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).

1- Modification of the deployment areas to limit dFAD loss from fishing grounds.

Interestingly, the options that involved purse seiners were ranked the least feasible, while using vessels already in EEZ; having dedicated "cleaning" vessels or relying on project from countries (FAD watch) were ranked the most feasible.

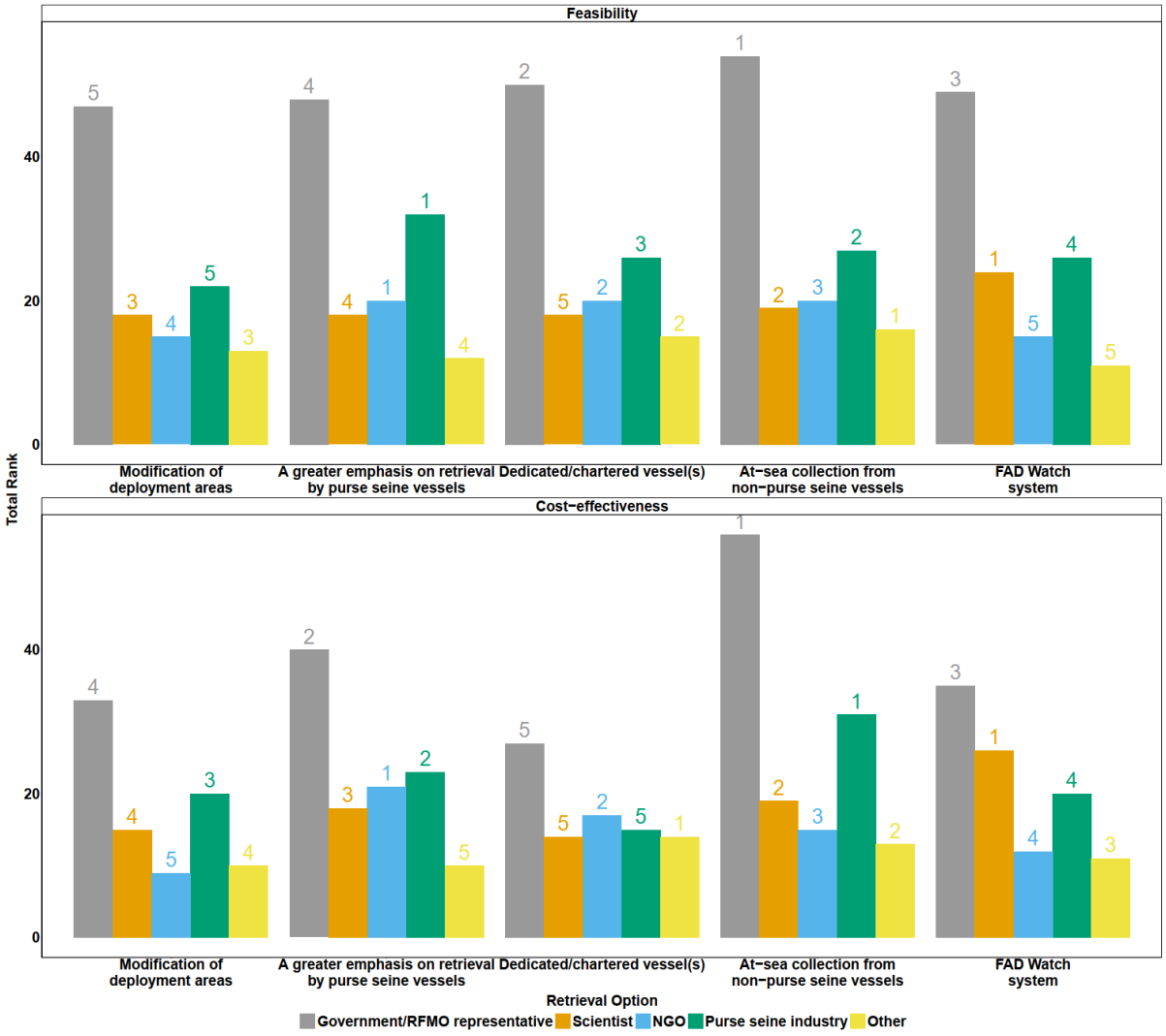

Figure 7. Ranking by survey respondents the different options considered to decrease dFAD loss and abandonment and increase dFAD recovery in the Pacific Ocean from most feasible to least feasible (top) and from most cost-effective to least cost-effective (bottom). Each option was given a note from 1 (least feasible or cost-effective) to 5 (most-feasible or cost-effective), these scores were then added to gather view across all responses.

To the contrary, the ranking from the purse seine industry (Figure 7, top) was the following:

2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).

4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).

3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.
5- 'FAD watch' systems that enable community collection of dFADs prior to stranding events in sensitive areas.
1- Modification of the deployment areas to limit dFAD loss from fishing grounds.

This ranking is more similar to that of all stakeholders combined and includes retrieval from purse seine vessels ranked the highest, while modification of deployment areas the lowest.
Scientists considered that dFAD watch initiatives were the most feasible (Figure 7, top), while NGOs and other stakeholders considered it the least feasible. To the contrary, NGOs considered that retrieval "cleaning" vessels and by purse seiners were the most feasible options, while scientists ranked them the lowest.

Respondents were also asked to rank the different options considered to decrease dFAD loss and abandonment and increase dFAD recovery in the Pacific Ocean from most cost-effective to least cost-effective (Figure 7 and Figure S2; bottom). It was found that, across all the stakeholders (Figure S2, bottom), the ranking of the options to reduce dFAD loss and abandonment, from most feasible to least feasible, were the following:

4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).
2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).
5- 'FAD watch' systems that enable community collection of dFADs prior to stranding events in sensitive areas.
3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.
1- Modification of the deployment areas to limit dFAD loss from fishing grounds.

The top options considered the most feasible were also ranked the most cost effective. However, dedicated "cleaning" vessel(s) and modification of deployment areas were considered the least cost-effective ones.

When comparing stakeholder groups, differences were detected again (Figure 7, bottom). At-sea collection by non-purse vessels outside fishing grounds were considered the 1st or 2nd most cost-effective, while dedicated "cleaning" vessel(s) the least cost-effective by government representatives, purse seine industry and scientists, but 1st or 2nd most cost effective by other stakeholders and NGOs. After the use of other vessels, stakeholders from the purse seine industry considered that higher recoveries by purse seiners and modifying deployment areas were the second and third most cost-effective options. Interestingly FAD watch initiatives were ranked quite low for purse seine representatives and NGOs, but the most cost-effective for scientists.

While ranked by all stakeholders, including representatives of the purse seine industry, as potentially the most feasible and most cost-effective, the implementation of dedicated offshore recovery programmes

(by vessels, purse seiners or non-purse seiners, already in the area; or dedicated "retrieval" vessels) were considered to be limited by theirs cost, current lack of coordination, logistical issues and lack of willingness from the industry to collaborate (Figure 8 and S3, top). The lack of willingness from the purse seine industry was not considered as a main limitation by the industry stakeholders themselves, however logistical issues and cost were mentioned a lot (Figure 5). While the implementation of dedicated recovery programmes from shore (e.g., "FAD watch" type initiatives) were considered to be limited by firstly logistical issues, then lack of coordination and cost (Figure 8 and S3, bottom).

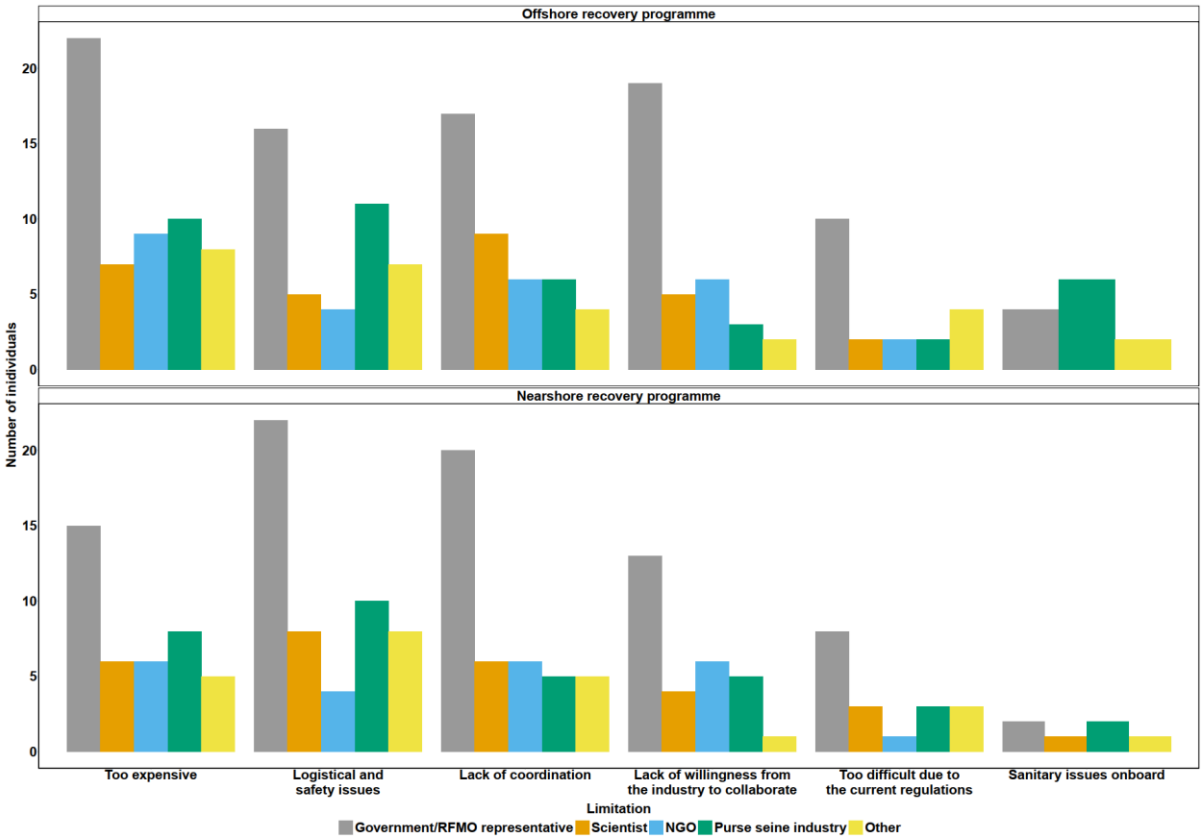

Figure 8. Main limitations considered by survey respondents for dedicated dFAD recovery programmes i) offshore (top) and ii) from shore.

In terms of stakeholders that should be involved in dFAD recovery programmes, survey respondents considered that purse seine fishing companies, followed by buoy companies, RFMOs and NGOs should be the main stakeholders involved in dFAD recovery programmes (Figure 9 and S4; top). Similar groups, also including seafood processors, were considered necessary to be involved in financing such programmes, with fishing companies being most important (Figure 9 and S4; bottom). Interestingly government representatives were the only stakeholders, mentioning their own involvement in implementing recovery programmes (Figure S4).

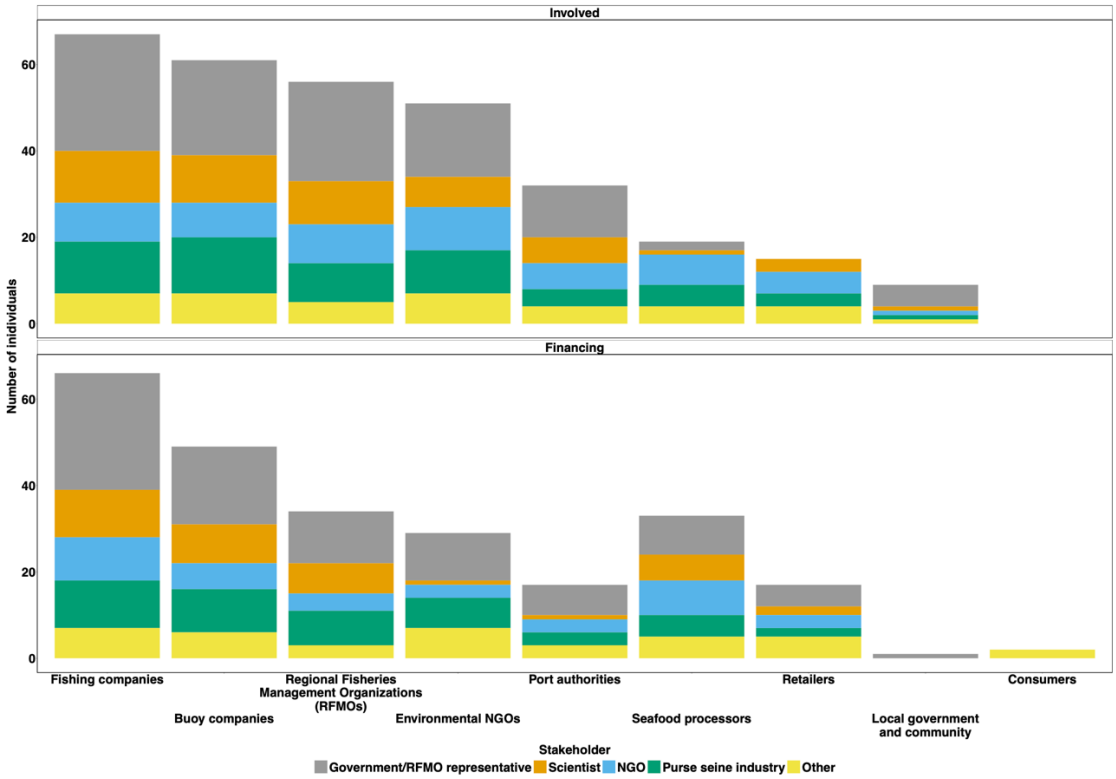

Figure 9. Survey respondents' views on main stakeholders that should be involved in implementing (top) and financing (bottom) dFAD recovery programmes.

Specific questions were asked for each of the options considered to decrease dFAD loss and abandonment.

1- Modification of the deployment areas to limit dFAD loss from fishing grounds.

Most respondents considered that modifying purse seiners dFAD deployment areas could limit dFAD and buoy losses from fishing grounds and stranding events (Figure 10). This will be further analyzed, in the next few months, in terms of which areas and/or periods could be potentially considered to limit deployments in order to reduce dFAD loss and strandings, using responses from respondents to the general surveys and the dedicated ones (in particular purse seine skippers), as well as using dFAD trajectory data.

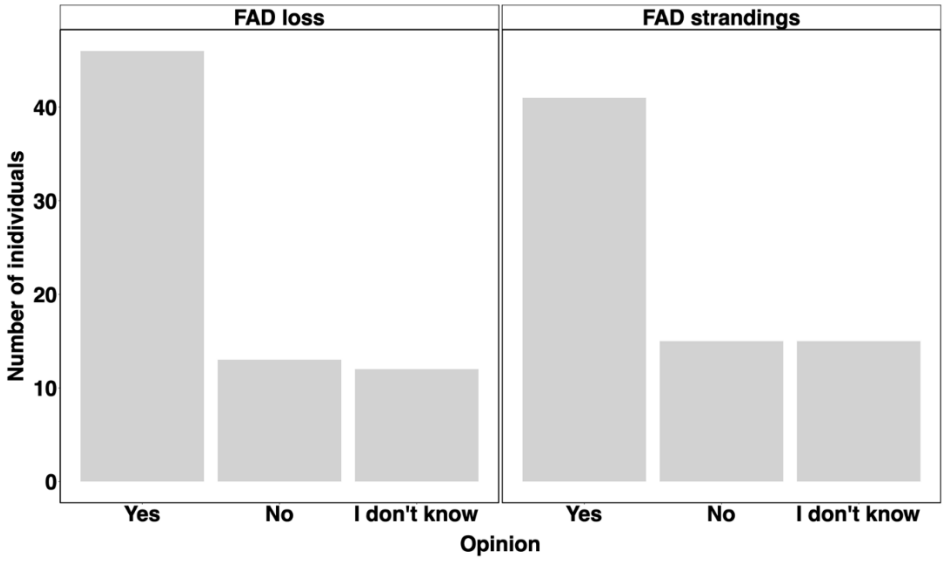

Figure 10. Survey respondents' views on whether limiting dFAD deployment in certain areas or periods could reduce dFAD and buoy loss (top) and stranding (bottom).

Suggestions regarding the modification of purse seine operations to limit dFAD loss and stranding events were also made and included:

- continuing the transition to non-entangling and biodegradable dFADs;
- developing dFADs with movement capabilities;
- gaining better scientific information on dFAD drift patterns, including dFAD loss;
- reducing the total number of dFADs deployed;
- ensuring continued tracking of buoys attached to dFADs;
- enhancing skipper/crew training, including for free school fishing;
- having higher recoveries by purse seiners;
- promoting repairs of old dFADs.

Views from stakeholders on dFAD recovery programmes and other options to decrease dFAD loss and abandonment are similar to findings discussed during previous international workshops (e.g., Moreno et al., 2024).

2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).

Stakeholders were asked to estimate the percentage of dFADs currently recovered by purse seiners, and most responded that less than 10% of all dFADs deployed were recovered, with some responding between 10 and 30% (Figure 11). This is similar to previous work finding that ~6% of dFADs are recovered (Escalle et al., 2023). It is worth noting that more than 25% of respondents stated that they did not know how many dFADs are recovered by fishers, including from the purse seine industry.

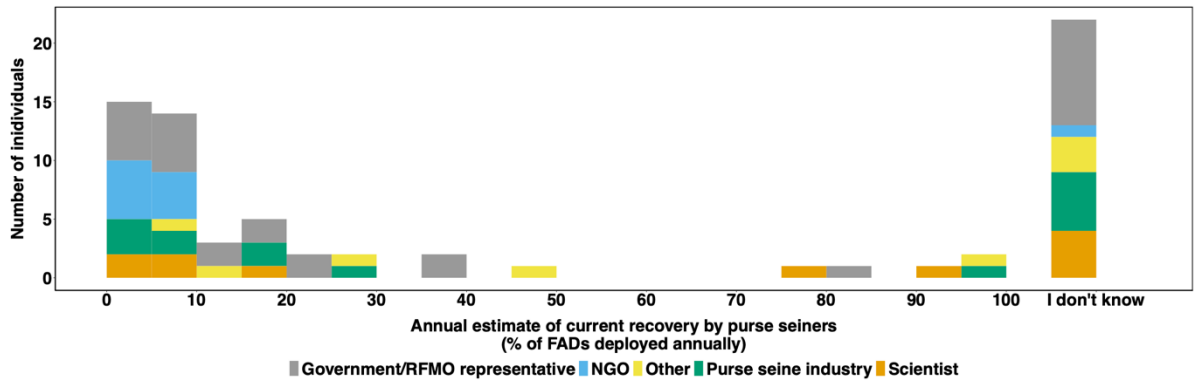

Figure 11. Survey respondents' estimates on the percentage of dFADs that get recovered by purse seiners each year.

In terms of recovery from purse seiners, around half the respondents considered that purse seiners could retrieve lost and abandoned dFADs if they were aware of their positions (Figure 12). However, the following question in the survey was related to the reason for being able or unable to retrieve, and the main answer was the distance and related cost. From a single vessel or fishing company point of view, this would not be feasible, but through cooperation, this could potentially be considered, if positions of lost and abandoned dFADs, or dFADs outside a fishing company fishing grounds, were known. Survey respondents viewed that the main factors limiting higher dFAD recoveries by purse seiners were logistical issues; cost; lack of willingness from the industry to collaborate; and current lack of coordination (Figure 13). The difficulty due to some current regulations was also mentioned by 25% of respondents and highlighted by some respondents in a specific question (Figure 14). Such limitations included i) the fact that dFAD recovery in EEZs requires licensing, including under the PNA VDS, under which dFAD recovery would be consider as a fishing activity and hence lead to a vessel being charged a fishing day; ii) recovery of old or entangled dFADs may violate safety regulations or compromise onboard hygiene/food safety standards; iii) the need to keep buoys active longer to monitor them throughout the whole lifetime and hence being limited by active buoy limits; and iv) restrictions on support vessels.

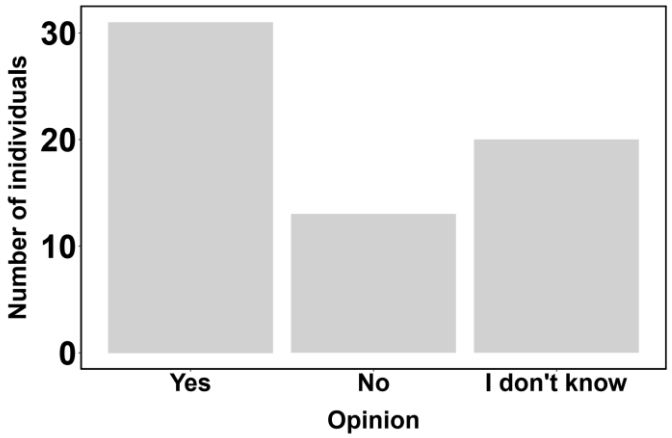

Figure 12. Survey respondents' views on whether purse seiners could recover lost FADs, if they knew their positions.

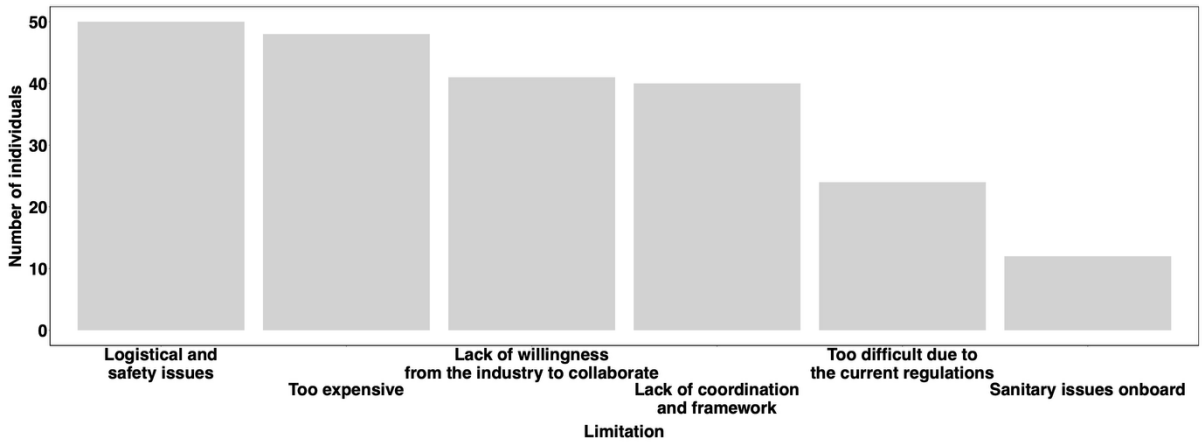

Figure 13. Survey respondents' views on the main limitations for higher dFAD recoveries by purse seiners.

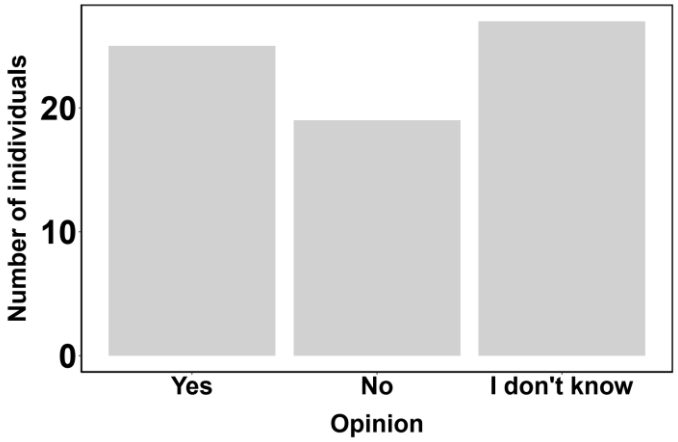

Figure 14. Survey respondents' views on whether there were current regulations that limited recoveries of dFADs by purse seiners.

Most stakeholders surveyed considered that some form of dFAD recovery requirements should be considered by RFMOs (Figure 15). From answers to the surveys, these could be to mandate a specific target recovery rate or recovery incentives. DFAD design standards and obligations to transmit dFAD tracking data were also mentioned as other measures that would support higher recoveries. Currently IATTC is the only RFMO to have some form of dFAD recovery requirements, in relation to the closure period: "all its Class-6 purse-seine vessels recover within 15 days prior to the start of the closure period a number of FADs equal to the number of FADs set upon during that same period" (IATTC Resolution C-24-01).

Most stakeholders surveyed also considered that prohibiting buoy deactivation could increase dFAD recoveries (Figure 16). However, the fact that these buoys, even outside fishing grounds, would count in the vessel active dFAD limit was mentioned as one of the main issues with this approach currently. In addition, stakeholders mentioned that this would not necessarily increase recoveries by purse seiners, for instance when dFADs have exited the fishing grounds. Hence, the need for dFAD or buoy registry platforms (with access needing to be defined: government when within EEZs, other purse seiners, other

stakeholders, etc.), in particular for lost and abandoned dFADs, with survey respondents predominantly highlighting the fact that this would promote more recoveries (Figure S5).

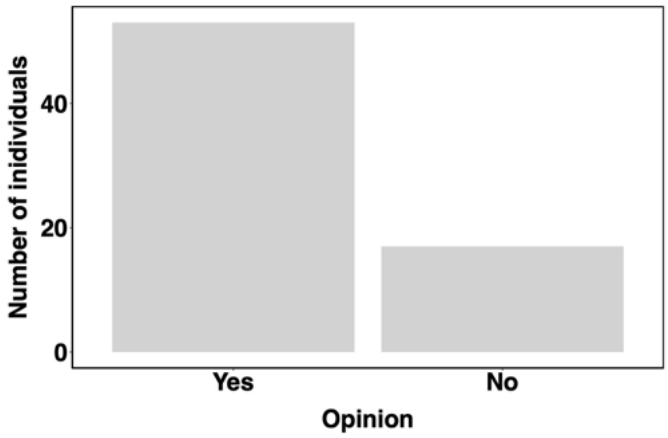

Figure 15. Survey respondents' views on whether some form of requirements for dFAD recovery by purse seiners should be considered by RFMOs.

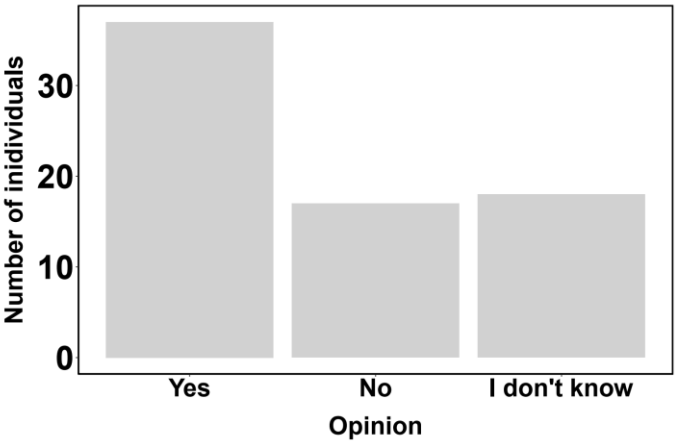

Figure 16. Survey respondents' views on whether prohibiting buoy deactivation could increase dFAD recoveries.

3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.

Most respondents also considered that having dedicated /chartered dFAD retrieval vessel(s) could be considered to reduce dFAD loss and stranding (Figure 17).

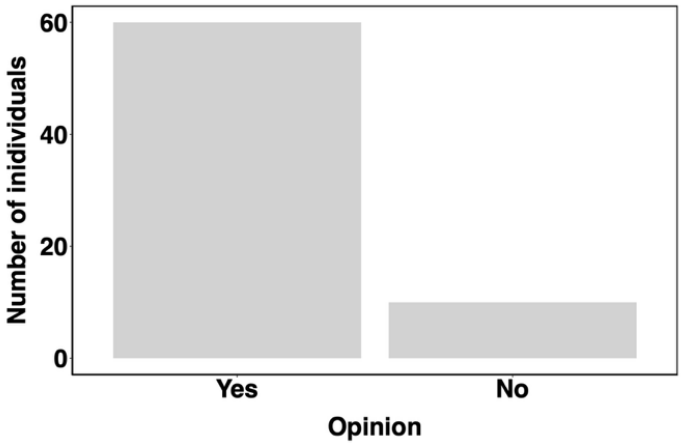

Figure 17. Survey respondents' views on whether dedicated/chartered dFAD retrieval vessel(s) could be considered to reduce dFAD loss and stranding.

4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).

Stakeholder views regarding the possibility for longliners to retrieve lost and abandoned dFADs was more contrasted (Figure 18). Almost 40% of respondents indicated that longliners could retrieve lost dFADs if they knew their position, ~40% that they did not know and 20% that longliners could not retrieve lost dFADs. Most reasons mentioned were the lack of appropriate deck and storage space to store dFADs; the lack of incentives; inappropriate equipment; as well as operational, logistical, regulatory, and economic barriers. It was also mentioned that this would only happen if some forms of financial incentives were in place. A specific example of successfully involving longliner in dFAD recoveries is the Hawaiian Center for Marine Debris Research's Derelict Fishing Gear Bounty program, that has been involving the Hawaii Longline Association in recovering derelict fishing gear, including dFADs (without known position) since 2022.

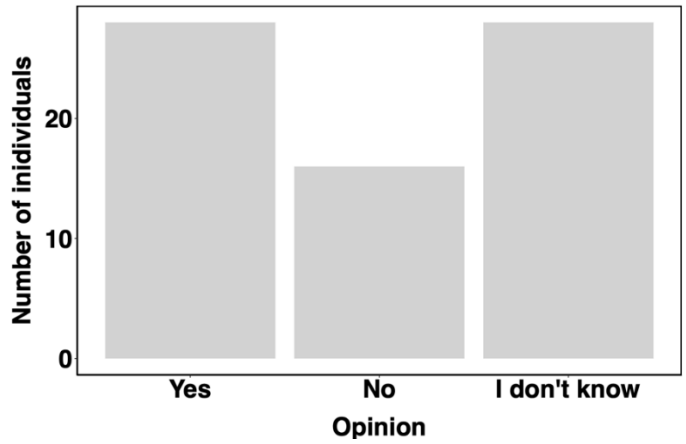

Figure 18. Survey respondents' views on whether longliners could retrieve lost dFADs if they knew their position.

5- 'FAD watch' systems that enable community collection of dFADs prior to stranding events in sensitive areas.

Regarding recovery from shore, or initiatives such as “FAD watch”, where local organizations could access dFAD positions when inside a certain area close to shore, and recover the dFAD and buoy, if possible, before it strands and cause any damage. More than 40% of the survey respondents indicated that they were aware of recovery programs already in place (Figure 17). In the Pacific Ocean, the following programmes were mentioned:

- TNC FAD watch in Palmyra, American Samoa (Pollock, 2024)
- TUNACONS FAD recovery programme in Galapagos (Moran et al., 2025) – could be offshore, so corresponding to option 4.
- The Hawaii discarded fishing gear bounty programme (Jenn Lynch, Pers. Comm) – more offshore, so corresponding to option 4.

Others were mentioned but are still under development (Moreno et al., 2024). And in the Indian Ocean, the initiatives in Seychelles, including the first FAD watch programme were mentioned (Zudaire et al., 2018).

While these programmes are currently being developed, it is clear that many stakeholders in the Pacific Ocean are yet to be aware of them or participating.

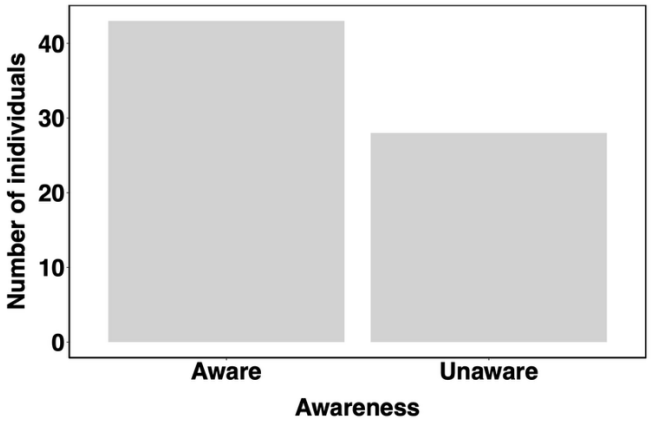

Figure 17. Responses from survey respondents on their knowledge regarding dFAD recovery programmes currently implemented.

When buoys attached to dFADs are recovered, they are often still in a functioning stage and could be re-used to limit the cost of buying new ones, reduce loss and hence marine pollution and burden to local communities. Stakeholders responding to the survey clearly indicated that this type of circular economy could be promoted more widely (Figure 18). These initiatives exist already, for both purse seiners and local communities to re-use buoys, but are not widely implemented (Figure 19). For instance, many of the survey respondents were not aware of initiatives by buoy companies to re-use buoys locally for local communities (Figure 16). However, all three main buoy companies now have projects to reuse their buoys to support local communities, such as Satlink ReCon project, Marine Instruments Blue recovery and Zunibal Searcle.

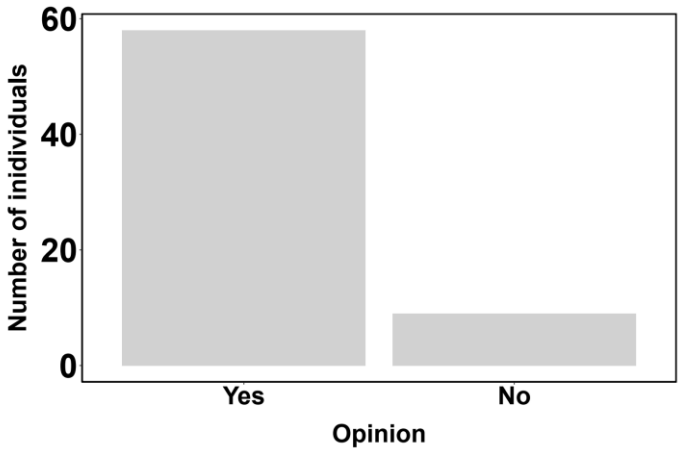

Figure 18. Stakeholder's opinion on whether the circular economy could be promoted more widely for purse seiners to re-use buoys recovered by purse seiners or through recovery programs).

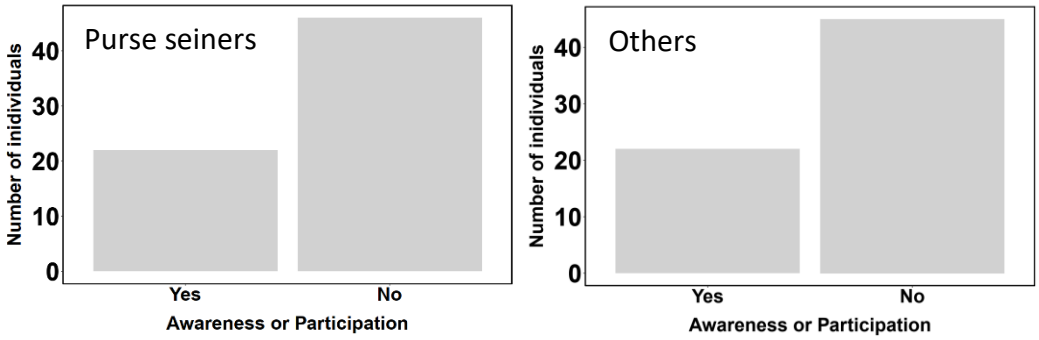

Figure 19. Stakeholders' awareness or participation in any of the initiatives for purse seiners to re-use buoys retrieved by another fishing company or other stakeholders (left) or by buoy companies to re-use buoys locally (non-purse seine activities) (right).

Next steps

Results presented here are preliminary and may change as additional responses are received, since the survey remains open. In addition, complementary and more detailed surveys targeted at stakeholders that could be directly involved in each of the specific options are currently being implemented. In addition, the whole study will also use fishery data available at SPC, such as dFAD trajectory data, *in-situ* stranding data, logsheet, observer and VMS data, to further investigate feasibility of each option and associated rates of decrease in dFAD loss and abandonment.

Finally, a regional workshop is planned with key stakeholders and representatives from countries involved in the stranded FAD data collection programmes. The workshop "*International workshop on mitigation of dFAD loss and abandonment in the Pacific: Insights from fishing industry to communities*" planned in ***French Polynesia from February 9th to 12th 2026***, will present results from the scientific analyses of stranded dFADs and opportunities for peer-to-peer exchange and learning. It will include findings on dFAD drift beyond fishing areas, the legal review of the international and regional regulatory frameworks

governing dFADs, and the economic and feasibility analyses of mitigation options, drawing on results from stakeholder consultations. The workshop will also offer a platform for feedback and discussion on mitigation strategies and the associated environmental and socio-economic impacts of dFAD loss and abandonment, particularly in coastal areas.

Conclusion and recommendations

The current paper summarises the activities to be implemented by SPC under the project "*Assessment of the Impacts of Drifting Fish Aggregating Devices on Marine Environment in Pacific Island Countries: Recommendations for Mitigation Strategies*" funded by the World Bank. At this stage, the Review of the regulatory framework of dFAD loss and abandonment is almost complete, with key findings from a RFMO point out view presented here.

The monitoring of dFADs outside fishing grounds is underway and is showing promising results, with 109 buoys monitored so far and the identification of stranding events in areas with currently very limited information from trajectory data. Partnerships with other organisations, in the form of pilot dFAD recovery projects are also under development. To date, three dFAD tracking buoys and associated dFADs structure, where present, have already been recovered. It is worth noting that while this project is the first of its kind, the budget needed to implement such monitoring is important, which is currently supported by SPC, under the current World Bank funding.

Finally, the economic and feasibility analyses of options to decrease dFAD loss and abandonment, including retrieval is currently underway, with preliminary results from a large stakeholder consultation, with 72 respondents so far to the online survey. Results from analyses of the respondents' answers indicated that the knowledge of stakeholders was generally good in terms of dFAD use, deployment and stranding events, but less clear in terms of dFAD loss and abandonment and recovery. Respondents generally agreed that the five options considered in this study and listed below would lead to decrease in dFAD loss and abandonment:

1- Modification of the deployment areas to limit dFAD loss from fishing grounds.
2- A greater emphasis on retrieval by purse seine vessels before dFAD loss and abandonment (including collaboration between fishing companies).
3- Dedicated / chartered vessel(s) for at-sea collection of lost or abandoned dFADs at the edge of fishing grounds.
4- At-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea (in areas outside the purse seine fishing grounds).
5- dFAD retrieval programs from shore (e.g., 'FAD watch' systems) that enable community collection of dFADs prior to stranding events in sensitive areas.

While at-sea collection from non-purse seine vessels (e.g., longliners) already present at-sea outside the purse seine fishing grounds and higher recoveries by purse seine vessels before dFAD loss and abandonment were considered both the most feasible and most cost-effective options, respondents generally considered that:

- the main limitations for these options would be logistical issues; cost; lack of willingness from the industry to collaborate; and current lack of coordination;
- the possibility of longliners to retrieve lost and abandoned dFADs was debated among stakeholders, with some already having programmes recovering dFADs from longliners with financial incentives and others considering that the lack of appropriate deck and storage; the lack of incentives; inappropriate equipment; as well as operational, logistical and regulatory barriers would limit longliners' abilities to retrieve dFADs.
- some regulations limited recoveries of dFADs by purse seiners;
- some form of requirements for dFAD recovery by purse seiners should be considered by RFMOs;
- prohibiting or regulating buoy deactivation could increase dFAD recoveries (generally, not only by purse seiners);
- dedicated/chartered dFAD retrieval vessel(s) could be considered to reduce dFAD loss and stranding.

Finally, while dFAD recovery programmes are more and more debated and implemented, stakeholders are still not widely aware of them or there potential. Likewise, initiatives to re-use dFAD tracking buoys are not well known throughout the range of stakeholders consulted.

Additional analyses and stakeholders consultations are planned over the next few months, as well as a regional workshop "*International workshop on mitigation of dFAD loss and abandonment in the Pacific: Insights from fishing industry to communities*" to present results from the whole project and provide opportunities for peer-to-peer exchange and learning.

Key outcomes of the project will include the development of recommendations for mitigation and management of dFADs and their associated impacts in the Pacific Ocean. A final report will be prepared and presented to SC22 in 2026. While analyses, reviews and stakeholder consultations are still ongoing, the authors invite SC21 to:

- Provide feedback on the project and planned or ongoing activities presented in the paper.
- Note the preliminary findings of the legal study on the international and regional framework of dFADs loss and abandonment.
- Note the monitoring of buoys outside fishing grounds and pilot projects to retrieve buoys and FADs close to shore.
- Encourage members and the fishing industry to filled out the stakeholder surveys and share the link with their national industries and other interested parties.

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- Note the plan for the workshop entitled *"International workshop on mitigation of dFAD loss and abandonment in the Pacific: Insights from fishing industry to communities"* in French Polynesia from February 9th to 12th 2026.

Acknowledgements

The current project is funded by the World Bank under the project Pacific Ocean Advisory Program (POAP), supported by the PROBLUE Multi-Donor Trust Fund. Justin Rose led the legal study on the international and regional framework of dFADs for SPC, and MarFishEco is supporting SPC and ISSF with the economic and feasibility analyses of options to decrease dFAD loss and abandonment. We thank all the participants to the stakeholder consultation. The authors are grateful to the fishing companies participating (the American Tunaboat Association, Tri Marine and Bolton Food and Caroline Fisheries Coorporation) and supporting the task to monitor buoys outside fishing grounds, as well as Satlink for their support and collaboration. We also thank Kydd Pollock and TNC for the support and coordination of dfDA recoveries and in the development of dFAD recovery pilot project.

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Additional figures

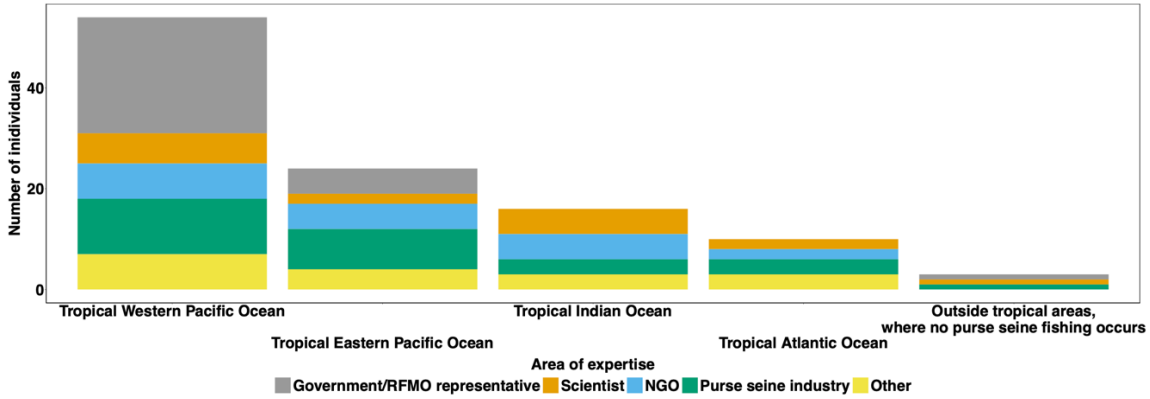

Figure S1. Area of expertise of respondent to stakeholder survey**.**

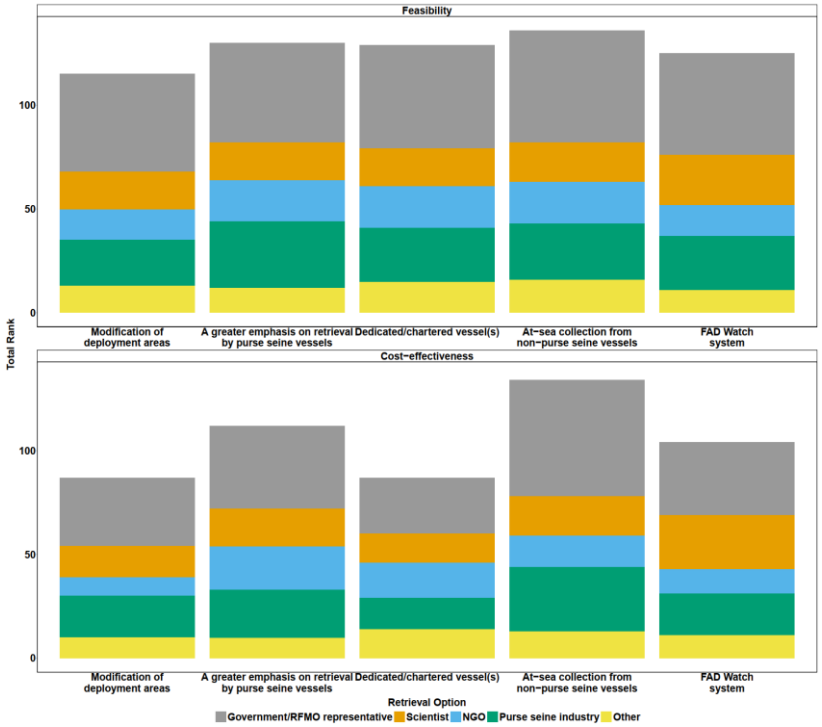

Figure S2. Ranking by survey respondents of the different options considered to decrease dFAD loss and abandonment and increase dFAD recovery in the Pacific Ocean from most feasible to least feasible (top) and from most cost-effective to least cost-effective (bottom). Each option was given a note from 1 (least feasible or cost-effective) to 5 (most-feasible or cost-effective), these scores were then added to gather view across all responses.

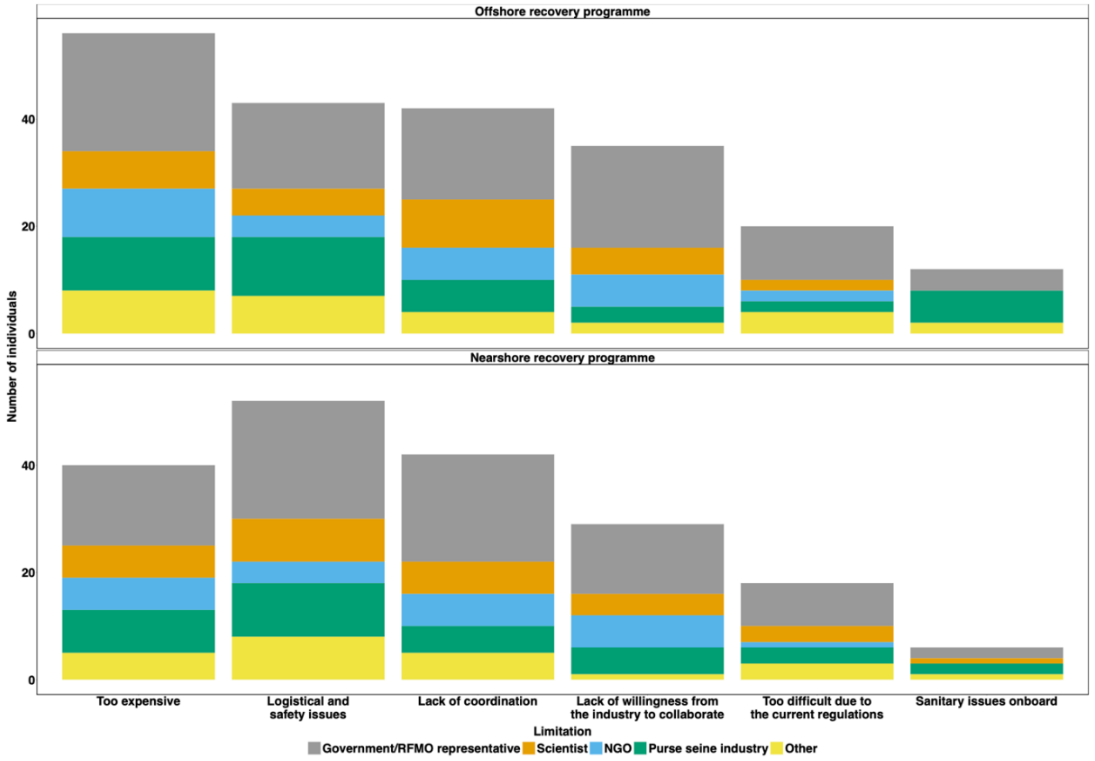

Figure S3. Main limitations considered by survey respondents for dedicated dFAD recovery programmes i) offshore (top) and ii) from shore.

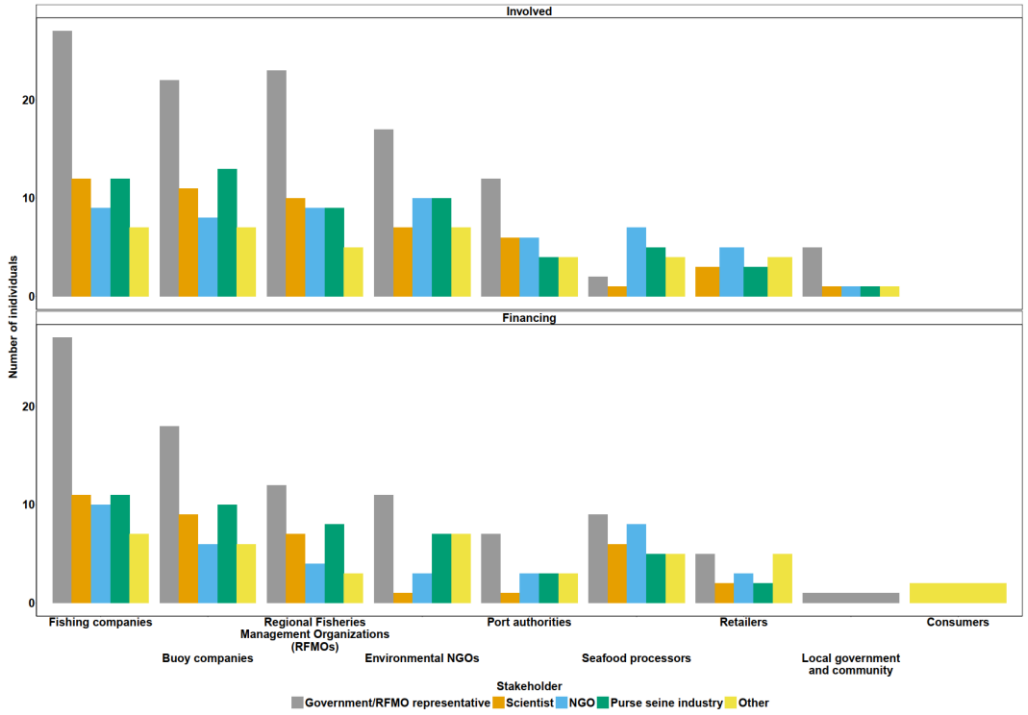

Figure S4. Survey respondents' views on main stakeholders that should be involved in implementing (top) and financing (bottom) dFAD recovery programmes.

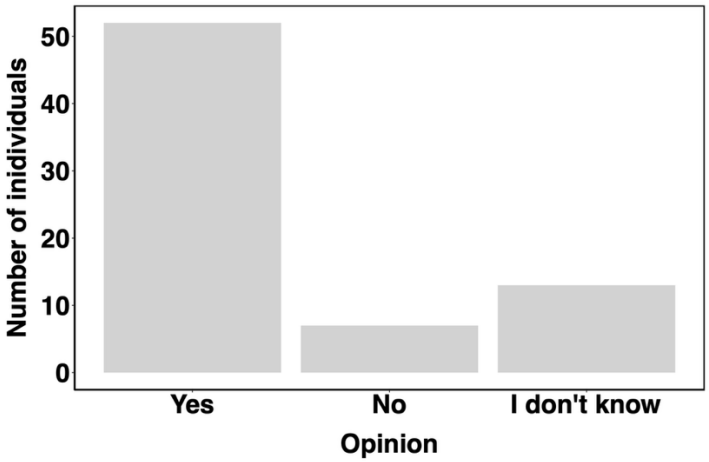

Figure S5. Survey respondents' views on whether having a dFAD or buoy registry platform, with positions of all buoys lost (outside a fishing company fishing grounds), could promote recovery.

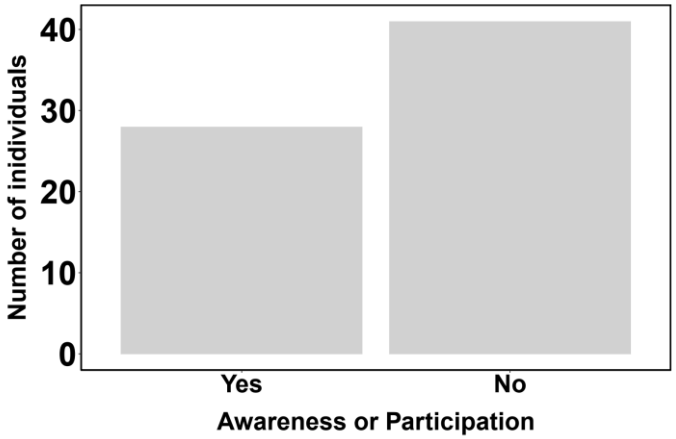

Figure S6. Stakeholder's awareness of any recycling/disposal facilities (for FADs or nets).