Mitigation and recovery of dFADs in the Seychelles: A review of the FADWatch Project

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Abstract

The conservation and management measures of the Indian Ocean Tuna Commission (IOTC) have evolved over the past decade to strengthen regulations on the widespread use of Drifting Fish Aggregating Devices (dFADs) in tropical tuna purse seine (PS) fisheries. Recognising the importance of sustainable fishing practices and the potential risks to marine ecosystems, especially when these devices are abandoned, lost, or discarded (ALD), the Seychelles Fisheries Authority (SFA), in collaboration with Asociación de Grandes Atuneros Congeladores (AGAC) and the Sustainable Indian Ocean Tuna Initiative (SIOTI), initiated the FADWatch Project. This initiative, formalised through a Memorandum of Understanding (MoU), is a proactive effort to monitor, recover, and mitigate dFAD strandings across the Seychelles' Exclusive Economic Zone (EEZ). The project's recovery missions are conducted by the Seychelles Coastguard Vessel (SCGV) *Saya de Malha*. Using the ShoreManager dFAD tracking software, dFADs entering designated buffer zones around 15 monitored islands were identified and recovered. Since 2022, over 150 dFADs and over 170 instrumented buoys have been recovered. While the assessment of materials and conditions was limited to a small sample of dFADs, most dFADs consisted of synthetic and metallic components, although some biodegradable elements were also observed. Key challenges include logistical constraints, a limited number of scientific personnel, and monsoonal weather conditions. Enhanced stakeholder collaboration, expanded monitoring, and improved vessel capabilities are vital for the project's ongoing development. Data collected from FADWatch will inform national dFAD management strategies and support marine conservation efforts in Seychelles.

Introduction

Drifting fish aggregation devices (dFADs) have become an essential tool for tropical tuna PS fisheries, especially in the Western Indian Ocean, where they are widely utilised to enhance catch efficiency. With approximately 80-90% of all sets being on dFADs[(1)], these devices are integral to the economic viability of the fishery. While their intensive use has helped the industry adapt to quota limitations, it has also brought increased attention to the potential for environmental impacts. Management challenges are most acute when dFADs pose a threat to marine ecosystems[(2)], particularly when they become ALD and eventually strand on coral reefs, beaches, or in marine protected areas[(3)].

Considering local and international concerns regarding dFAD use in the industrial tuna PS fishery, the SFA, together with its partners, AGAC and SIOTI, aimed to strengthen the FADWatch Project, which is designed to address these issues. The cooperation advances the capabilities and effectiveness of a joint effort by the Government of Seychelles and the PS industry to mitigate the negative impacts of dFADs on the coastal marine ecosystems within Seychelles' EEZ.

The initial phase of this SIOTI Fisheries Improvement Project began in 2019. To date, three MoUs related to the FADWatch project have been signed. The two MoUs signed before the current one involved the SFA, Seychelles Coast Guard (SCG), Island Conservation Society (ICS), and the Islands Development Company (IDC). In 2022, the *Txori Lau*, a tuna supply vessel, was donated to Seychelles predominantly for dFAD retrieval. The vessel was transferred to the SCG and renamed *Saya de Malha*. Three missions were carried out by the SCGV *Saya de Malha*, which are considered the first phase of operations using this vessel. One mission was curtailed by force majeure. The remaining two missions focused solely on retrieving stranded dFADs. The first phase of the FADWatch project primarily focused on recovery missions, which were conducted in October 2022 and March 2023. During this first phase with *Saya de Malha*, data collection was limited to the material composition of dFADs and their retrieval locations.

A new MoU initiating the second phase of the FADWatch project was signed in mid-2023, for two years following commencement. The objective of this MoU is to "*prevent and mitigate at the maximum level possible stranding and entanglement of drifting Fish Aggregating Devices (dFADs) in coral reefs, shallow water habitats and coastal zones of Seychelles*". As indicated in the current MOU, the FADWatch Project is a collaborative initiative involving several organisations, including SFA, the SCG, SIOTI, and AGAC. During this second phase, the project also provides enhanced tools to identify areas of potential stranding risk better, enabling efficient interception and recovery of the dFADs.

The project had previously commissioned a satellite service provider in 2021 to develop an online software that allows for the monitoring of dFAD positions as they approach the islands (Shoremanager FADWatch application).

SFA closely regulated the second phase, and missions were carried out by the SCGV *Saya de Malha*, a former tuna supply vessel donated to Seychelles by tuna PS vessel owners to conduct dFAD missions. During this phase, there were two dFAD recovery missions in November 2024 and March 2025, respectively, with additional missions planned for 2025[4].

The 15 islands included in the FADWatch project are listed in Table 2 below.

Methods

Area and Mission Tracks

The Seychelles EEZ encompasses the selected 15 islands chosen as monitoring sites (Table 2). Other islands (D'Arros, African Banks, Aldabra) were also visited. Due to the paucity of data from the October 2022 and March 2023 missions, this paper will highlight the missions undertaken during the second phase of the project.

Table 1: Islands visited and distance travelled during the FADWatch missions.

Phase	Mission Date	Islands visited	Duration (days)	Distance travelled
I	**Oct-22**	6	10	551 nm
I	**Mar-23**	5	18	2085 nm
II	**Nov-24**	10	19	1981 nm
II	**Mar-25**	8	12	1200 nm

Figure 1 indicates the mission tracks for December 2024 and March 2025.

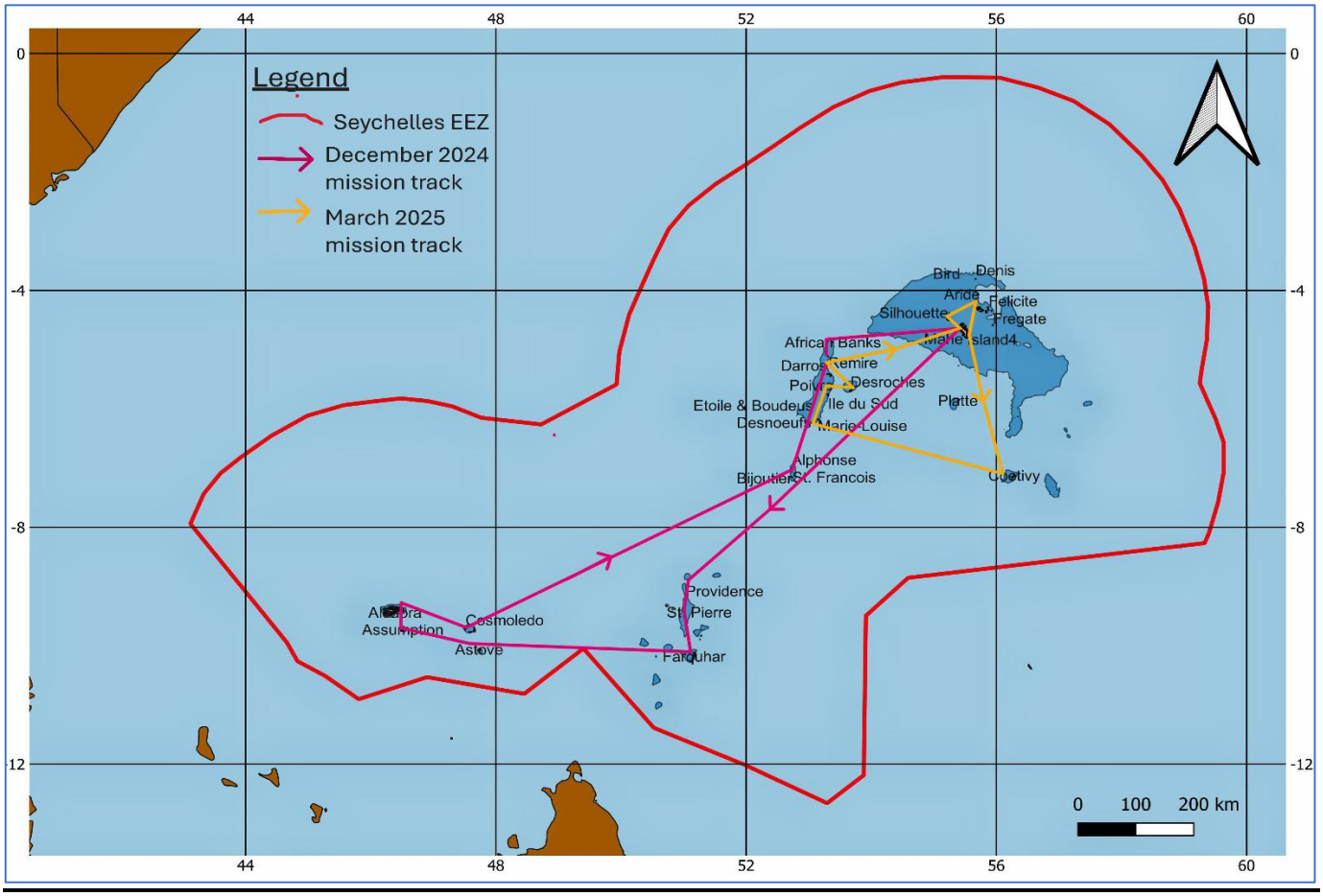

Figure 1: SCGV Saya de Malha mission tracks, December 2024 and March 2025.

The December 2024 mission covered seven of the FADWatch designated islands as well as Aldabra, D'Arros and the African Banks. The March 2025 mission covered eight islands, with a repeat visit to Desroches Island. Platte Island was on the mission itinerary; however, communication with the tourism establishment on the island indicated that there were no strandings at the time of the mission and the island was excluded.

dFAD Tracking tools

The Shoremanager FADWatch dFAD tracking software suite, developed by Thalos[(5)], includes a specialised application called the FADWatch module. This application, launched in mid-2021, is designed to track dFADs in predetermined zones and was essential in planning recovery strategies through alerts of stranding events. All instrumented buoys used in the PS fishery are registered, allowing the dFADs to be displayed on the map. Currently, only instrumented buoys attached to European Union (EU) flagged and Seychelles flagged purse seiners participating in the FADWatch project can be monitored.

The FADWatch module has established restricted zones around 15 selected islands, each surrounded by a 7-nautical-mile buffer zone. When a dFAD enters this buffer zone, users of the software receive a notification, enabling them to track the dFAD effectively. dFADs entering the buffer zone are considered as being in 'Transit'. The dFADs are indicated as such until they leave the buffer zone and are no longer tracked or become 'Stranded', whereupon a new designation for the dFAD is indicated.

It should be noted that the manager application only obtains information on dFAD deployment, or specifically the instrumented buoys deployed by participant EU and Seychelles registered vessels, which currently comprises 78% (36 of a total of 46) of the total licensed PS vessels.

Table 2 shows an all-record analysis of dFAD information collected through the Shoremanager FADWatch application from its inception in mid-2021 to mid-2025 relating to dFAD transit and stranding events.

Table 2: Historical Shoremanger FADWatch data relating to strandings and transit events on the selected islands

	2021*		2022		2023		2024		2025†	
Island	**Transit**	**Stranded**	**Transit**	**Stranded**	**Transit**	**Stranded**	**Transit**	**Stranded**	**Transit**	**Stranded**
Alphonse	25	6	108	8	122	10	138	0	76	7
Aride	1	5	49	1	58	1	23	1	18	0
Assomption	30	1	104	1	138	2	114	3	22	0
Astove	23	3	111	4	111	5	92	3	32	2
Coetivy	9	1	42	2	52	15	28	5	43	2
Cosmoledo	27	3	163	7	151	4	121	5	23	3
Desnoeufs	3	0	55	1	39	0	45	2	16	0
Desroches	12	4	152	3	225	1	104	3	65	3
Farqhar	27	6	71	14	74	8	64	11	15	0
Marie-Louise	5	3	57	0	39	2	62	5	18	0
Platte	1	1	38	5	46	8	14	2	33	1
Poivre	8	1	70	4	67	2	46	5	12	0
Providence	6	0	44	6	39	7	32	12	10	1
Remire	2	0	46	8	41	8	36	4	19	3
Silhouette	22	1	243	1	195	1	138	0	65	2
Total	**201**	**35**	**1353**	**65**	**1397**	**74**	**1057**	**61**	**467**	**24**

* commencing June 2021, † 2025 - to end July

Estimates of dFAD deployments were derived using data collected by the SFA together with deployment requirements, focusing specifically on participant Seychelles flagged and EU flagged vessels. These fleets were selected as their dFAD deployments are systematically recorded through the Shoremanger Fadwatch application, and the resulting estimates are presented in Table 3.

Table 3. Estimation of the total number of dFADs deployed by the participant EU and Seychelles flagged vessels for the period of the Shoremanager FADWatch application.

Year	EU flagged purse seiners	Seychelles flagged purse seiners	Est. dFAD/vessel	Est. Total dFADs
2021-2022	28	12	350	14000
2022-2023	26	13	350	13650
2023-2024	26	13	350	13650
2024-2025	24	13	300	9300
2025-2026	21	15	250	9000
			Estimated Total dFADs deployed 2021-2025	**59600**

Based on an analysis of all historical data from the Shoremanager FADWatch application (Table 4), it is estimated that approximately 1000 to 1400 dFADs transit within the selected buffer areas of Seychelles annually. The data indicates that 5.69% of all transiting dFADs between mid-2021 and mid-2025 became stranded, while the remaining 94% entered and exited the buffer zones. The transiting dFADs represented only 7.99% of all estimated dFAD deployments by participating EU and Seychelles flagged vessels for the same period.

Table 4: Summary of total transiting and stranded dFADs observed around the selected islands.

		% of Total deployed	% of Total in Transit
Estimated Total dFADs deployed 2021 - 2025	59600	100.00	-
Total monitored in transit 2021 - 2025	4762	7.98	100.00
Total monitored strandings 2021 - 2025	271	0.45	5.69

FADWatch Steering Committee

A steering committee was established in June 2024 to oversee the implementation of the FADWatch project activities. Among other functions, the steering committee meetings enable (i) the improvement of data collection forms used for gathering information on recovered dFADs and (ii) the analysis of the FADWatch module of ShoreManager FADWatch data to identify potential islands to visit during the campaigns.
While the initial aim was to mitigate dFAD strandings, the most recent missions have mainly focused on cleaning up areas where strandings were previously known to have occurred.

Staff/crew Preparation

Before the second phase of the FADWatch project, all participants from SFA, Seychelles Maritime Academy (SMA), and Seychelles Island Foundation (SIF), along with some SCG crew, received pre-mission training from the SFA. This training covered the following topics:

1. Data collection and observational skills, including correct form completion, noting dFAD/biological interactions and environmental interactions.
2. Use of the ShoreManager software suite.
3. Identification of biodegradable and non-biodegradable materials associated with dFAD composition.

Results

First Phase

October 2022 and March 2023 Missions

The SCGV *Saya de Malha* was operating in the vicinity of Aldabra, Assumption, Cosmoledo, Astove, Farquhar, Desroches, St. Francois, St. Joseph and Poivre during the two missions. Only 11 records were generated during the mission of October 2022. The March 2023 mission generated 78 recovery records. In

both cases, the records generated only refer to the collection of stranded dFADs (whole or partial dFADs or instrumented buoys); the only other data relating to these missions can be seen in Fig. 3 below relating to dFAD materials. Table 5 provides a summary of the number of whole and partial dFADs and instrumented buoys collected during October 2022 and March 2023, along with the associated stranding locations

Table 5: Stranded dFAD recovery October 2022 – March 2023

		Location Environment			
	Number	**Reef**	**Lagoon/Seagrass**	**Beach**	**Unknown**
Buoys only	7	0	0	7	0
FAD and buoy	35	9	6	8	12
FAD only	47	0	0	47	0
Total	**89**	**9**	**6**	**62**	**12**

Second Phase

November 2024 Mission

During the first campaign of the SCGV *Saya de Malha*, a total of 67 FADs were recovered and their condition assessed by observers (Table 6). Of these, 43 were only partially intact, with elements such as the raft or ropes missing, while 17 were retrieved whole. For 7 FADs, condition data were either not collected or could not be determined.

In terms of recovery location, 40 FADs were stranded on beaches, 13 were caught on reefs, and 7 were intercepted either in transit or within lagoon areas. In addition, 4 FADs had already been collected prior to the mission by island management teams and were transferred on board the *Saya de Malha* for transport back to Mahé.

Assumption Island was searched; however, no signs of any stranded dFAD materials were found. Included are the African Banks, D'Arros and Aldabra, which do not form part of the FADWatch island assemblage, were included in the search operations.

Table 6: Condition and location of dFADs recovered during the first mission of the second phase of the FADWatch project.

Island	**Whole FAD**				**Partial FAD**				**Unknown condition**				**Total**
	Beach	**Reef**	**At sea**	**NC**	**Beach**	**Reef**	**At sea**	**NC**	**Beach**	**Reef**	**At sea**	**NC**	
Aldabra		1		1	4	4			1				**11**
Alphonse			1	4									**5**
Astove					11				1				**12**
Cosmoledo		1	1		1	1		1	1	1			**7**
D'Arros			1							1			**2**
Farquhar		2			10		2	1	1				**16**
Ile Cerf	1	1			3					1			**6**
Providence	2				4								**6**
St. François			1				1						**2**
Total	**3**	**5**	**4**	**5**	**33**	**5**	**3**	**2**	**4**	**3**			**67**
	17				**43**				**7**				

At sea = FAD in transit or in the lagoon area. NC = not collected.

During the first mission of the SCGV *Saya de Malha*, a total of 75 instrumented buoys were recovered (Table 7). Of these, 38 were retrieved while still attached to a FAD, whereas 37 were found adrift. Overall, 72% of the instrumented buoys were recovered from beaches.

Table 7: Location of instrumented buoys recovered during the first mission of SCGV Saya de Malha.

Island	Attached to a FAD				Alone				Total
	Beach	Reef	At sea	NC	Beach	Reef	At sea	NC	
African Banks					1				**1**
Aldabra	2	3		1	4	2			**12**
Alphonse			1	1					**2**
Astove	6				4				**10**
Cosmoledo	1	2	1	1	4	1		1	**11**
D'Arros		1							**1**
Farquhar	12				8	4		2	**26**
Ile Cerf	3				1				**4**
Providence	3				4				**7**
St. François					1				**1**
Total	**27**	**6**	**2**	**3**	**27**	**7**		**3**	**75**
	38				**37**				

At sea = buoy in transit or in the lagoon area. NC = not collected.

March 2025 Mission

During the second campaign of the SCGV *Saya de Malha*, 22 FADs were recovered and their condition assessed by observers (Table 8). Of these, 6 were only partially intact, with components such as the raft or ropes missing, while 15 were retrieved whole. For one FAD, condition data was not recorded or could not be determined.

Regarding recovery locations, 10 FADs were stranded on beaches, 10 were caught on reefs, and 1 was intercepted in transit or within lagoon areas. In addition, 6 FADs previously collected by island management teams were taken on board the *Saya de Malha* for transport back to Mahé.

Table 8: Condition and location of FADs recovered during the second mission of SCGV Saya de Malha.

Island	Whole FAD				Partial FAD				Unknown condition				Total
	Beach	Reef	At sea	NC	Beach	Reef	At sea	NC	Beach	Reef	At sea	NC	
Aride	1												**1**
Coëtivy	1	1			1								**3**
Desnoeufs		2			1								**3**
Desroches		3											**3**
Marie-Louise	1				1								**2**
Poivre, Ile du Sud *	1	1	1	1	2				1				**7**
Remire		2				1							**3**
Total	**4**	**9**	**1**	**1**	**5**	**1**			**1**				**22**
	15				**6**				**1**				

At sea = FAD in transit or in the lagoon area. NC = not collected.
***-** Ile du Sud is part of the Poivre atoll

Twenty-two instrumented buoys were recovered during the second SCGV *Saya de Malha* mission (Table 9). Eleven instrumented buoys were found attached to a dFAD, and 11 were found alone. Thirteen instrumented buoys were recovered on the beach, of which one was located above the high tide mark, and eight were caught on reefs.

Table 9: Location of instrumented buoys recovered during the second mission of SCGV Saya de Malha.

Island	Attached to a FAD			Alone			Total
	Beach	Reef	At sea	Beach	Reef	At sea	
Aride	1						1
Coëtivy	1			4			5
Desnoeufs	1	2		1			4
Desroches		3					3
Marie-Louise				1			1
Poivre, Ile du Sud				4		1	5
Remire		3					3
Total	**3**	**8**		**11**			**22**
	11			**11**			

At sea = buoy in transit or in the lagoon area.

dFAD Material Composition

Based on data collection, observations by the retrieval crew and photographs, a breakdown of dFAD material composition was established and divided into raft/frame, raft/frame covering and the tail materials. The stranded dFAD condition was a prohibiting factor in identifying the exact area of the dFAD from which the recovered materials came. The results are shown in Figures 2,3, and 4 below.

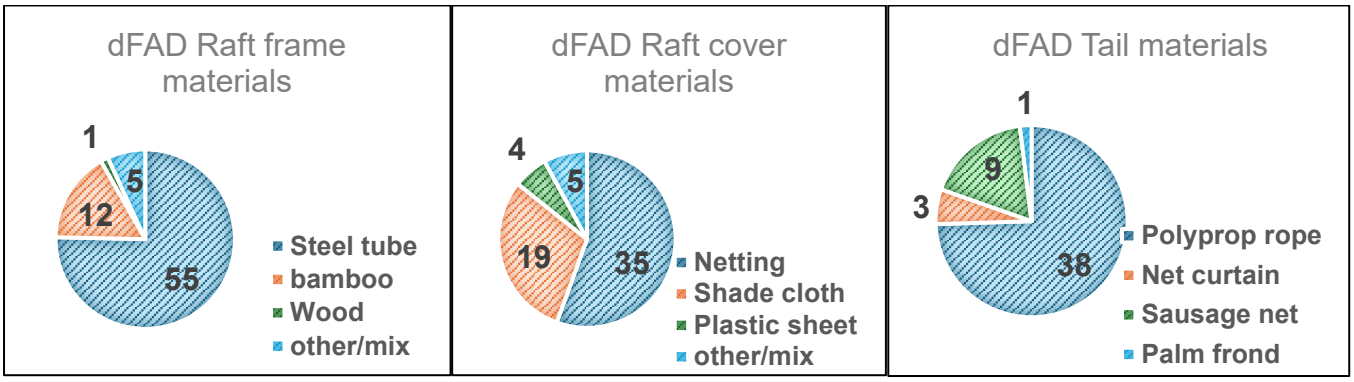

Figure 2: Material composition of recovered dFADs during the October 2022 and March 2023 missions.

The majority of the dFADs collected during the October 2022 and March 2023 missions were composed of synthetic and metallic elements. Fifty-five dFADs had metal frames, and 12 had bamboo frames. The raft cover material tended to be predominantly netting type, associated with 35 dFADs. Polypropylene rope was the dominant tail material.

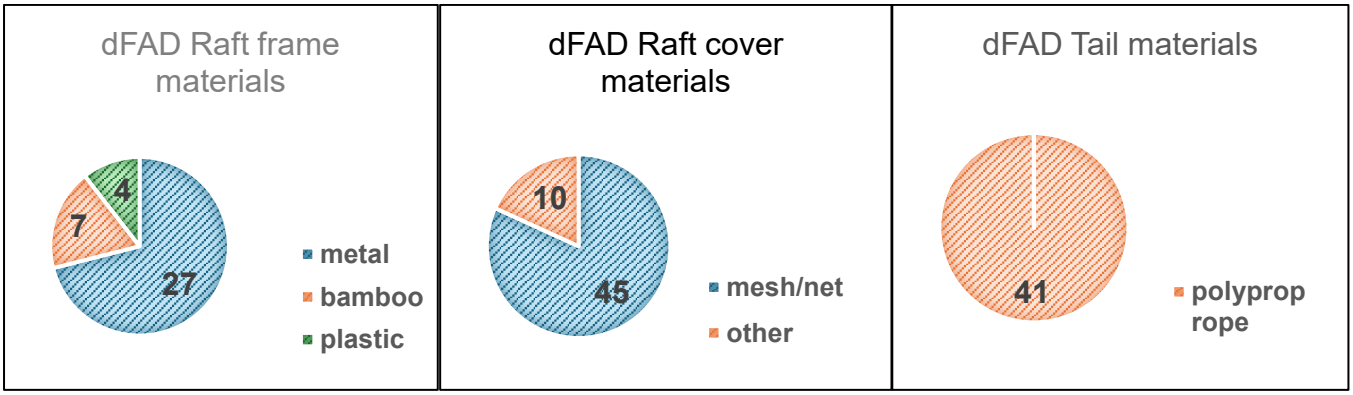

Figure 3: Material composition of recovered dFADs during the December 2024 mission.

Most of the dFADs collected during the December 2024 mission consisted of synthetic and metallic elements. Mesh or netting components were identified as the primary material of the raft covering for 45 recovered dFADs. All rope associated with the dFAD tail material recovered was of the polypropylene type.

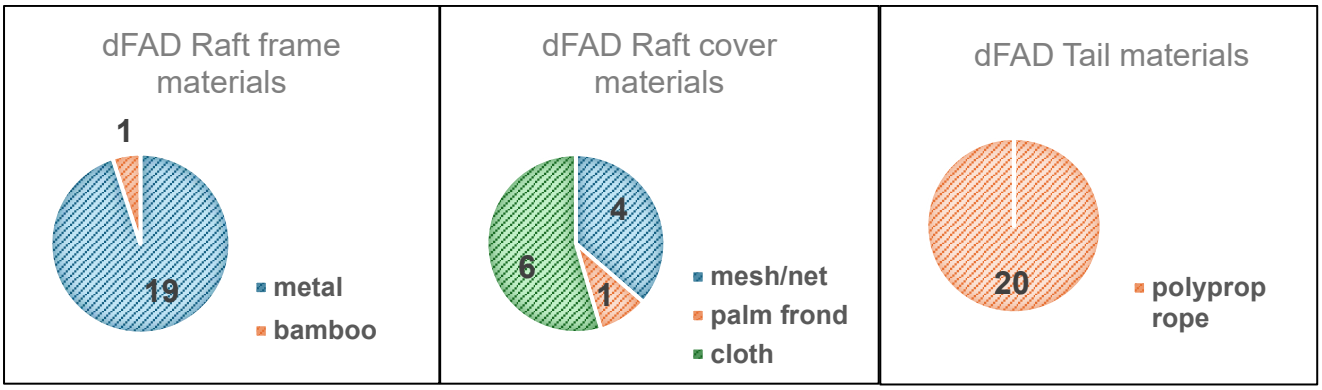

Figure 4: Material composition of recovered dFADs during the March 2025 mission.

Most of the dFADs collected during the March 2025 mission consisted of synthetic and metallic elements. Two dFADs also included natural elements such as bamboo or plant material. Mesh elements were noted for four recovered FADs. All ropes recovered were of the polypropylene type.

It should be noted that it has not been established whether the dFADs recovered were legally deployed prior to the commencement of the IOTC's requirements, which first came into force in 2019 (resolution 19/02[6] prohibiting the use of meshed and entangling materials.

Discussion

Current Efforts

In the context of the Seychelles situation, most of the outer islands have some human activity, whether through tourist facilities, research, sport fishing, aquaculture, or island managers. Focusing more on these local operators and managers could greatly help mitigate the stranding of dFADs or enable their retrieval before excessively damaging the reef.

Collaborating with these operators and organisations can significantly reduce the costs of managing a recovery project over such a large area. Currently, local NGOs such as the SIF), ICS, the Save Our Seas Foundation (SOSF)[7], and various tourism operators are engaged in collecting stranded dFADs within their designated regions. The FADWatch project will support these operators by removing debris from the islands once the dFADs have been collected. The high-value tourist destination islands also actively monitor the beaches and reefs around their areas and conduct recovery activities. Engaging NGOs and other stakeholders is crucial for reducing the localised impacts of dFADs.

ICS and SIF presented unpublished findings during the 2024 National Symposium on FADs, which, along with the SFA/FADWatch photo archive, provided numerous examples of ALD FADs[8][9].

The FADWatch project aims to coordinate the efforts of all parties concerned with the recovery of dFADs and to offer a solution for disposing of these devices from the respective islands.

Challenges

Given the extensive area of the Seychelles EEZ and the distance from Port Victoria to the outer islands, regular monitoring and recovery of FADs is both difficult and costly. The monsoon seasons also pose constraints, as access to the islands and dive operations during rough seas can be unsafe. Therefore, the best times for collection are during the inter-monsoon periods, which occur between March and April and between October and November.

Another significant challenge is the limited pool of scientific personnel available to undertake the necessary work and data collection, especially in environmental assessments on land and during diving operations.

Consideration will be given to retrieving dFADs that are found transiting within the buffer zones around the designated islands. This activity has proven to be time-consuming, as real-time data transmission of the instrumented buoy's position is not available, making outcomes more reliant on a 'right time, right place' scenario. The increased costs associated with search and recovery efforts can also become prohibitive.

Additionally, it is worth noting that once dFADs become stranded, the buoy tracking signal is deactivated by the operator, allowing for the deployment of a new instrumented buoy in accordance with the regulations governing dFAD deployment. This process makes it more difficult to locate the stranded dFADs. Furthermore, observations from the Shoremanager Fadwatch application have indicated that stranded dFADs can sometimes become freed and resume drifting. Of concern is that this may also occur after the buoy has been deactivated and is no longer visible in the Shoremanager Fadwatch application.

Generally, the second phase missions have been quite successful. The SCGV *Saya de Malha* is a highly capable platform for the project. An important point to note is that the primary mandate of the SCG is to provide search, rescue, and security services, which has previously resulted in a truncated mission.

Future Objectives

The FADWatch project is scheduled for renewal this year, with plans to enhance coverage of the islands and increase the frequency of annual site visits. In line with this, the SFA will endeavour to improve coverage of the islands through the Shoremanager application.

Improvements will be made to the SCGV *Saya de Malha* to enhance safety during sea operations, extend deployment durations, and improve diving operations.

The SFA aims to make the project more accessible to scientists interested in participating in the missions, which will enhance data collection and environmental assessment.

The Seychelles DFAD management plan is under review and is due to be submitted to the IOTC in March 2026.

Acknowledgements

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