

Preserving Coral Reefs: OCEANIKA's actions to safeguard Seychelles coastal ecosystems through the retrieval of abandoned, lost, or discarded dFADs

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Setting the scene of abandoned, lost, or discarded dFADs

Marine debris derived from fishing operations are of international concern and have been acknowledged to be one of the most important and destructive sources of waste in the oceans (FAO, 2020). Abandoned, lost or discarded (ALD) fishing gears and equipment are increasingly pervasive with severe environmental and socio-economic impacts (Richardson et al., 2019). The tropical tuna purse seine fishery significantly/substantially contributes to ALD fishing equipment by deploying large numbers of drifting Fish Aggregating Devices (dFADs), originally used to increase tuna catch. A dFAD is typically made of a bamboo and/or metal raft equipped with plastic or balsa wood floats to ensure buoyancy, a submerged substructure that typically consists of ropes or rolled old purse seine nets that can stretch up to 100 m below the surface, and a satellite-transmitting GPS-tracking buoy. Many of these materials consist of highly durable synthetic materials such as netting made from nylon, net corks from Ethylene Vinyl Acetate (EVA), or pipes from polyvinyl chloride (PVC) (Zudaire et al., 2018) that take thousands of years to decay.

In the Western Indian Ocean (WIO), around 46 large-scale purse-seine vessels were operating in 2021 catching more than 480,000 tons of tunas (IOTC, 2023); more than 85% of the tuna catch was made on dFADs with an estimated number of such devices being deployed exceeding 25,000 annually (IOTC, 2023). Recent studies estimated the probability of dFAD beaching events to be comprised in between 0.5-45% in the WIO, a percentage highly dependent on the areas and seasons of deployment, and to a lesser extent, the depth of its subsurface structure and the material it is made of (Maufroy et al., 2015; Davies et al., 2017; Zudaire et al., 2018; MacMillan et al., 2022). The most sensitive and impacted WIO areas to beaching events are the Seychelles, the Chagos archipelago, the Maldives, Somalia and Sri Lanka (Maufroy et al., 2015; Davies et al., 2017; MacMillan et al., 2022).

The Seychelles is a global biodiversity hotspot consisting of 115 islands spanning an area of 1.4 million km². Seychelles' key marine ecosystems include coral reefs, seagrass beds, mangrove forests and the pelagic open ocean, all of which provide important ecosystem services including habitat, nursery, coastal protection, tourism and fisheries. However, Seychelles marine ecosystems are of high concern being severely exposed to dFAD stranding because of their prominent position within the main fishing grounds of the purse seine fleet. MacMillan et al. (2022) highlighted the extent of dFADs stranding events throughout the Seychelles, in particular on the Mahé Plateau and in the Amirantes islands group (Figure 1). dFADs stranding occurred in both nearshore and offshore regions, predominantly in estimated depths less than 60 m characterised by coral/algae benthic habitats (MacMillan et al., 2022). The impacts of stranding include the degradation of sensitive habitats (e.g., coral reefs, seaweed beds) and disruption of the diverse associated marine fauna depending on it, the contamination of the food web through the introduction of microplastics and its accumulation by marine fauna, and physical damage or mortality to species including sensitive marine ones, such as marine turtles and sharks, through entanglement in the nets used for the construction of dFADs (Macfadyen et al., 2009; Davies et al., 2017; Murua et al., 2017; ISSF, 2019). It is thus of utmost importance to rapidly and effectively address the issue of potential stranding of ALD dFADs in the Seychelles EEZ that constitutes a major concern for conservation.

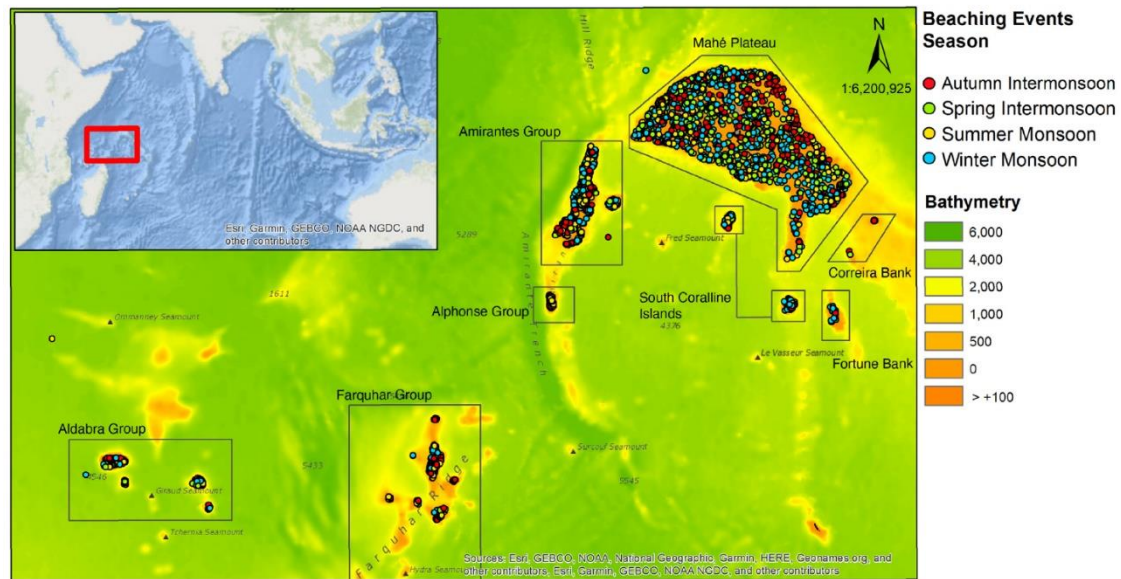


Figure 1. Extent of beaching events across the Seychelles Archipelago, coordinated to the season the event occurred, including bathymetry of the area. Inset: location of the Republic of Seychelles within the Indian Ocean. Source: MacMillan et al. (2022)

Time has come for collaborative and effective actions against stranded dFADs

FAD stranding events in the Seychelles were first reported in 2015 by the Island Conservation Society (ICS) who conducted a baseline survey around St. Francois atoll collecting a total of 214 stranded dFADs (Balderson and Martin, 2015). Following this work, a multi-sectorial initiative, the so-called FAD Watch program, was launched in 2016 to reports on dFADs that would strand in the Seychelles reefs to local organizations that can retrieve them (Zudaire et al., 2018). The system works on a proximity alert system, with a local organisation (ICS) receiving from the satellite service provider the position of the GPS buoy attached to the dFAD when it enters a buffer zone (first and second alerts within 9.26 km and 5.6 km, respectively) around a coral reef in the Alphonse, Farquhar, Desroches, Poivre, Aride and Silhouette islands (Zudaire et al., 2018). However, the recovery program has faced a number of challenges in accessing remote areas, locating dFADs (poor quality or no internet connection preventing the use of the system), safely disentangling netting caught on deeper habitat and handling heavy structure in the water, because of a lack of human resources and/or proper equipment (ICS, pers. comm.; Opagac, 2021). To ensure the success of the FAD Watch program and efficient removal of ALD dFADs stranded throughout the Seychelles waters, damaging its unique and fragile marine ecosystems, it appears essential to multiply local efforts and promote the collaborative use of the FAD Watch system.

Created in early 2023, Oceanika is a Seychellois non-governmental organisation committed to the preservation of coral reefs. The primary and common objective of Oceanika's voluntary members is to clean the Seychelles waters from the ALD FADs. Equipped with a 28 meters mother boat and three additional small boats, Oceanika operates at sea throughout the entire Seychelles EEZ, complementing the efforts of the government, ICS and other local stakeholders. The search of dFADs is facilitated with onboard VSAT Satellite Internet, two high technology transducers (StructureScan® 3D Thru-Hull Transducer and ForwardScan™ Transducer), and long-distance observation binoculars (Fujinon LB 25*150 MT). Once spotted, the stranded dFAD are being carefully extracted by the experienced Oceanika's professional divers ensuring as minimal impact as possible on the habitats. One or more lifting bags (100/250/500 kg) are used to lift the found structure, and divers are equipped with powerful small scooters (Divertug DT12 compact) to facilitate and secure underwater work. dFADs are

finally boarding the mother boat with a 450 kg crane, the different components are sorted according to their nature and fate, and stored onboard until landing on Mahe. Three trips were conducted during the inter-monsoon, in February-April 2023, leading to a total of 46 successful retrievals of stranded dFADs in the Seychelles outer islands and the Mahe Plateau (Figure 2). Only a minority (10-20 %) of the recovered dFAD components could be given to a local partner for recycling, while the rest was disposed in the landfill.



Figure 2. Illustrations of Oceanika's actions carried out between February and April 2023 to retrieve stranded dFADs from the Seychelles waters. Source: Oceanika

Discussions are ongoing between Oceanika, the FAD Watch program's partners and the Seychelles Ministry of Fisheries and Blue Economy to access the FAD Watch system that would optimize the search for stranding dFADs, as well as to expand the FAD Watch program to the whole Seychelles archipelago including the entire Mahe Plateau, as recommended by MacMillan et al. (2022). Furthermore, limits on daily numbers of active buoys monitored by each purse seine vessel implemented by the IOTC since 2020 may have resulted in increased buoy deactivations, reducing the ability to locate dFADs that may end up stranded in sensitive habitats. As the number of ALD dFADs will continue to grow with time, especially if there are no requirements to retrieve them (Escalle et al., 2019), a long-term multi-sectorial collaborative network is key to monitor and mitigate dFADs stranding across the Seychelles. Oceanika could significantly contribute to such network through the removal of stranded dFADs in the Seychelles in complement to the ongoing initiatives aimed at reducing marine pollution through increased biodegradability of dFAD components.

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