

Nearshore fish aggregating devices (FADs) for food security in Solomon Islands



NEARSHORE FISH AGGREGATING DEVICES (FADS) FOR FOOD SECURITY IN SOLOMON ISLANDS

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Contributions

The contents of this program brief draw on the experiences of WorldFish, Ministry of Fisheries and Marine Resources (MFMR), Secretariat of the Pacific Community (SPC) and the University of Queensland (UQ) in the deployment and monitoring of nearshore FADs in Solomon Islands and elsewhere in the Pacific region.

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BACKGROUND

Coastal fisheries are central to the lives of rural Solomon Island villages, supplying daily food and serving as one of the few sources of income. Yet, it is predicted that coastal fisheries in Solomon Islands, like many countries in the Pacific region, will not be able to provide enough fish to meet peoples' needs by 2030. Although there will be localized differences across Solomon Islands, this assessment implies that some communities will face hardship from declining reef fish supply over the next few decades. Proposed strategies to prevent this scenario include improving the management of coastal fisheries and diversifying sources of fish by enhancing access to other fishes, either through aquaculture or the use of fish aggregating devices.

Fish aggregating devices, known as FADs or 'rafters' are fishing devices that concentrate pelagic fish (e.g. tuna) in one location to make them easier to catch. Nearshore FADs (sometimes referred to as inshore FADs) are FADs that are anchored to the seafloor, close to the coast to allow access for coastal communities, including by paddle canoe.

Solomon Islands was among the first in the Pacific region to adopt offshore FADs in the industrial fishing sector, yet nearshore FADs remain a relatively new intervention for most rural villages. To enable a strong case to be made by Solomon Island communities or by provincial and national governments for recurrent budgets to support long-term nearshore FAD programs, we need to better understand nearshore FAD effectiveness from both a catch-efficiency and a social perspective.

As part of the Solomon Islands Ministry of Fisheries and Marine Resources (MFMR) strategic priority to improve the health of inshore fisheries and marine resources to support the nation's rural communities, the New Zealand-funded MSSIF (Mekem Strong Solomon Island Fisheries) programme provided funding to WorldFish to work in partnership with MFMR to "develop a Solomon Island National Inshore FAD Programme" (2010–2013). Through a larger collaboration between MFMR, Secretariat of the Pacific Community (SPC), University of Queensland (UQ) and WorldFish, twenty-one nearshore FADs, using four different FAD designs were deployed at various locations across Solomon Islands to assess FAD design and evaluate their contribution to food security. For this purpose, fish catch rates (at FAD and non-FAD fishing areas) and socioeconomic data were collected at locations where FADs were deployed. This program brief draws on data collected from four of the FAD locations, where FADs were in the water long enough (i.e. 3 months) to allow adequate data collection.

ATTRIBUTES OF A SUSTAINABLE NATIONAL FAD PROGRAM IN SOLOMON ISLANDS

This research has provided evidence that nearshore FADs can increase access to fish by coastal fishers and can play a role in future food security for coastal Solomon Islands communities. Key attributes of a sustainable national nearshore FAD program for Solomon Islands identified through this research are outlined below.

Consider site-specific FAD designs to improve longevity

The length of time that FADs last in the water is one of the greatest risks to the viability of a long-term national FAD program. Twenty-one FADs (testing three designs) were deployed

between March 2011 and October 2012 at 13 locations across Solomon Islands. Longevity ranged from 6 days to 3.5 years (six of the 21 FADs remained in the water as of June 2014). Three main factors were found to influence longevity: vandalism, rough seas and technical design. Understanding the reasons for loss has provided us with a number of lessons for future nearshore FAD programs.

Three important characteristics have been used to recommend nearshore FAD designs for Solomon Islands: ability to deal with rough seas; low cost; and accounting for high canoe traffic. (Table 1 and Figure 1).

		Characteristics		
		Rough sea/strong current	Low cost	High canoe traffic
FAD design	Poly/nylon rope	4 pressure and 13 purse seine floats with 18–20 mm combined poly/nylon rope. Combined anchor (2 x ½ cement drum/engine block with grapnel) with 2 x 2-eye pressure float above anchor. Use Samson rope connectors for additional strength and plastic strapping for longer lasting attractants.		
	Bush materials		Bamboo (or other floating timber) for floatation, 2 pressure floats (one at 20 m depth) and 18–20 mm poly rope. Use engine block or cement drum anchor.* Use old shredded rope for attractants.	Bamboo (or other floating timber) for floatation, 1 old/used pressure float (for surface float), 1 pressure float (at 20 m depth) and combined poly/nylon rope. Engine block or drum anchor.* Use old shredded rope for attractants.
	Subsurface	18–20 mm poly rope with 5 pressure floats and combination (4 x ½ cement drum/engine block with grapnel) anchor. 1 old/used pressure float (for surface float). Use Samson rope connectors for additional strength and plastic strapping for longer lasting attractants.	18–20 mm poly rope with 4 pressure floats and 4 x ½ cement drum/engine block anchor.* Use an old/used pressure float (for surface float). Use old shredded rope for attractants.	Poly rope with 4 pressure floats and cement drum/engine block anchor. Use an old/used pressure float (for surface float). Use old shredded rope for attractants or plastic strapping for longer lasting attractants.

* On sloping sites, anchor design should include a grapnel along with a cement drum/engine anchor. Note: Nearshore FAD designs are constantly evolving and further advice should be sought from SPC.

Table 1. Recommended nearshore FAD designs for the three selected characteristics (rough seas/strong current, low cost and high local canoe traffic).

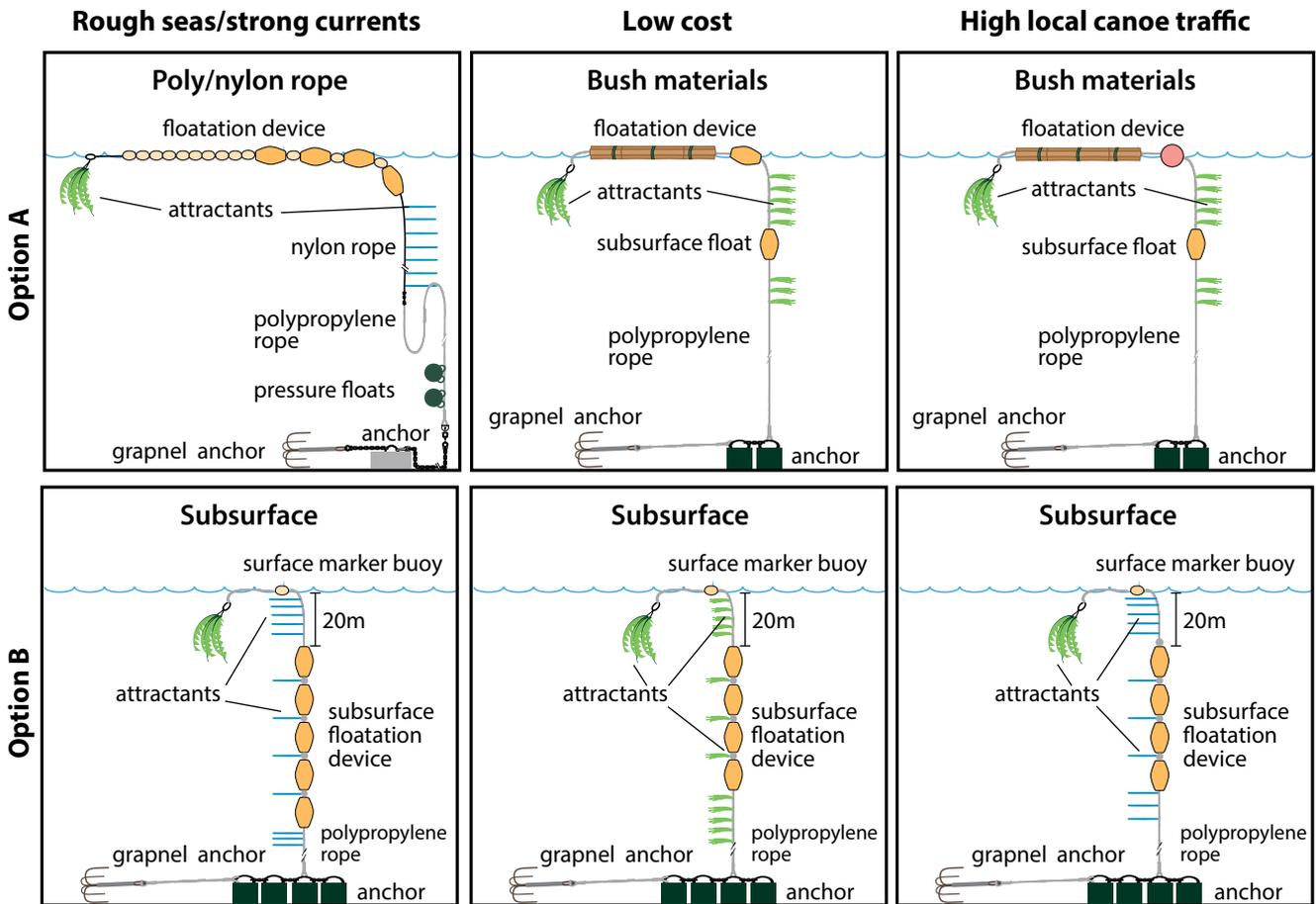


Figure 1. Visual representation of recommended nearshore FAD designs for Solomon Islands, dependent on three key site characteristics.

Subsurface FADs are becoming increasingly popular in the Pacific region, due to the reduced opportunity for sabotage and reduced wear and tear due to wave action. To date, only two nearshore subsurface FADs have been deployed in Solomon Islands, and their efficacy and degree of fisher acceptance remain under research. Early results suggest that subsurface FADs require a surface buoy (as a visual marker for fishers) and surface attractants (e.g. coconut leaves) to increase fish aggregation potential. Subsurface FADs are more difficult to deploy than surface FADs as the anchor system is heavier and more difficult to handle, and accurate deployment locations are required (to ensure that the floatation device remains at 20 m under the water surface). Care must be taken to ensure accurate rope length calculations (accounting for rope stretch) are carried out and sufficient anchor weight is used to counterbalance the floatation device so it remains stationary on the seafloor.

Use local fishers knowledge to optimize FAD location

Establishing criteria for the distance to deploy nearshore FADs from shore and appropriate distances between FADs is difficult, as information from Solomon Islands and the wider Pacific is sparse and largely dependent on the characteristics of the local environment. Experience from the industrial fisheries sector indicates that anchoring a series of FADs within a given area is most likely to aggregate and maintain schools of pelagic fish. However, there is a risk that if too many FADs are deployed close to one another, FADs or fishing gear can become tangled and nearby FADs may interact, attracting fish from one another FAD rather than from the open ocean. In Solomon Islands, most local fishers indicated that they were not willing to paddle more than 2 km to fish at a FAD. However, FADs also need to be at least 1 km away from seaward reefs to attract pelagic fish and reduce aggregation of reef-associated

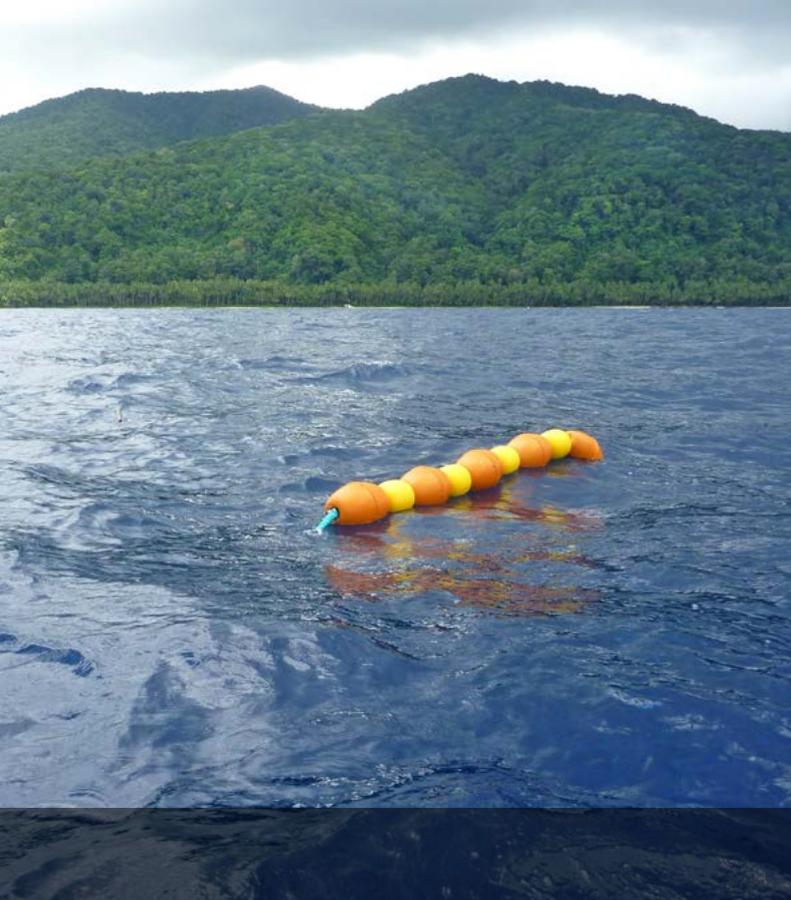


Photo Credit: Simon Albert, left; Beale Albert, right

Surface FAD (left), Subsurface FAD (right).

fishes. Using the best information available, as a general rule, nearshore FADs should be deployed in water depths of 200–500m and greater than 1 km from the coast (or seaward reef). The recommended minimum distance between nearshore FAD sites is 5 km. Recent observations by SPC indicate that at a particular FAD site, a cluster of three FADs separated by ~500 m is optimum. Ultimately, the selection of the FAD deployment site should be undertaken with local village fishers who have an in-depth knowledge of existing pelagic fisheries. This should ensure FADs are placed in an optimal site to aggregate pelagic fish and are well-utilized by local fishers using boats available in the village.

Community awareness can promote effective use of FADs and negate losses

Vandalism is by far the most common reason for loss of FADs. Participatory planning (provider and community) and community awareness programs prior to FAD deployment (both within the immediate community and the surrounding communities) about the purpose and responsibilities related to a nearshore FAD can promote the effective use of FADs and reduce the risk of early losses. Awareness and sharing lessons between communities can facilitate informed discussions on the positive

and negative social impacts communities might encounter and help with making plans to mitigate these before FADs are deployed.

Focus FAD deployments on food 'insecure' communities that have a high dependence on fish and limited access to diverse or productive fishing areas

In contrast to other studies that have shown higher catch rates at nearshore FADs compared to open water fishing in some Pacific Islands nations, catch and effort monitoring in Solomon Islands did not consistently show significantly higher catch rates at the FADs compared to non-FAD fishing areas (in terms of either weight or number of fish caught). The average weight-based FAD catch rates ranged from 1.0 to 2.9 kg fisher⁻¹ hr⁻¹ at the four study villages and was similar to the average non-FAD catch rate, which ranged from 0.9 to 2.2 kg fisher⁻¹ hr⁻¹. These results suggest that in general, fishing at the nearshore FADs was not more efficient than existing fishing grounds, but there were important differences amongst villages.

FADs were utilized by 35% to 75% of local fishers, depending on the village. There were a greater proportion of FAD fishers at villages with lower non-FAD catch rates and reef fish diversity.

Conversely, a lower proportion of FAD fishers were observed at villages with higher non-FAD catch rates and greater diversity of reef fishes. This suggests that villages with limited access to diverse or productive fishing areas are more likely to use FADs to better effect.

Village-based fisher training can improve catch rates and FAD longevity

Troll-line fishing was the most commonly recorded mechanism for fishing at nearshore FADs despite no evidence of higher weight-based troll-line catch rates compared to non-FAD fishing grounds. The aggregating nature of FADs is such that larger fish are located at deeper depths; fishers may underutilize FADs because of limitations in fishing gears and techniques that target larger fish. Lack of knowledge on appropriate methods to catch fish at a FAD can lead to catch rates that are less than their potential, fishers not using the FAD, or early loss of the FAD due to vandalism from frustrated fishers. In recognition of this, SPC have developed FAD fishing and sea safety training modules (Preston et al. 1998). Boat and sea safety training are important to address issues relating to fishers travelling further away from the shore. Village-based training of fishers, using a slightly modified version of the SPC modules (taking into account gears and boats available to rural fishers) were undertaken in a small number of the villages where FADs were deployed in this study. The training sessions were well received by fishers and in some cases resulted in higher (gear specific) FAD catch rates, promoted the transfer of knowledge between fishers, and improved fishers' knowledge of the behavior of fish around FADs. These outcomes highlight the importance of village-based training of fishers, sharing knowledge between villages and drawing on lesson learned by fishers.

Implement nearshore FADs as part of broader development planning

Household and fisher interviews highlighted that nearshore FADs can have positive and negative impacts on village life. The perceived benefits of nearshore FADs were relatively uniform across villages where interviews were undertaken. The main benefits of FADs to local families were a source of income (through the sale of fish) and improved nutrition (through an increase in fish

consumption). At the community level, FADs provided fish for fundraising and feasts (e.g. funerals, weddings, church and community events) and as a source of income for community related expenses (e.g. church and schools).

There were some negative elements identified in relation to the presence of FADs. At the family level, FADs were said to create arguments between husbands and wives (mostly attributed to husbands spending more time fishing and less time assisting with household activities, such as gardening). In one particular village, the resulting neglect of gardens led to a period of hardship when the FAD was lost in rough seas. At the community level, the most commonly mentioned negative aspect of FADs was a reduction in fishers' attendance at church and other community activities. Fishing at nearshore FADs, while using existing skills and being consistent with daily village life, has some characteristics consistent with the introduction of a new livelihood option to the community. A reduction in the time male fishers spend attending to other household and community activities may have both short-term and long-term impacts for households and communities. A national FAD program could benefit from being embedded in the wider development planning by communities and national agencies in order to recognize and respond to benefits and trade-offs, including those that disproportionately affect some members of society such as women gardeners.

Monitoring can build an information base to allow informed policy making

A general acceptance that FADs are effective in increasing access to fish for a rural community has resulted in investments to date being dominated by practical issues about FAD design and deployment, rather than quantifying realized benefits and their distribution amongst communities. These results suggest that benefits can be variable and depend on a range of socio-ecological conditions. If nearshore FADs are to become more widespread, a robust analysis of their contribution to gender-equitable development outcomes is required.

The study reported here has provided important lessons for site selection, FAD design and mechanisms for improving FAD longevity, as



Fishing method training.

well as highlighting social dimensions around FAD deployments in Solomon Islands. It has also shown that nearshore FADs are used by rural fishers, albeit to varying degrees amongst villages, and highlights the potential role that FADs can play in rural communities by providing fishers with access to a 'new' or otherwise underutilized source of fish. Continued monitoring and assessment of nearshore FAD deployments will provide an ongoing mechanism for the government to assess the contribution of nearshore FADs to food security, livelihoods and income generation for rural communities and to inform future policy.

A national nearshore FAD monitoring program should include at a minimum, information on FAD deployment location, longevity and the reasons for losses. More detailed recording and analysis of fisher use, fish catches, as well as social, ecological and economic dimensions of the impact of nearshore FADs could be included. Monitoring fish catches prior to the deployment of a nearshore FAD, or at least assessing indicators of the productivity and diversity of existing fisheries, can provide an initial indication of likely FAD use, assist with site selection and contribute to better understanding of the potential impacts of FADs (the shift of fishing effort from reef species to more resilient oceanic species).

Source recurring funds to maintain a national FAD program

Nearshore FADs have a finite lifetime and all FADs, regardless of vandalism, will eventually break free. Recurrent and readily available funds should be in place at national level to deploy, redeploy and provide ongoing support to communities (i.e. training, technical advice, site surveys, FAD maintenance). Nearshore FADs that are routinely maintained (e.g. checking of the floatation system, removing excess growth from the FAD ropes) are more likely to remain in the water for a longer period of time. Building community ownership and the capacity to maintain and redeploy their own FADs (particularly designs that use local materials) can increase FAD longevity and reduce the burden on limited government resources.

A common national approach for nearshore FADs

Developing a coordinated national approach for implementing a long-term nearshore FAD program for Solomon Islands is proposed. A ten-step process to guide those who commonly implement nearshore FADs (government, NGO and provincial and national political representatives) is outlined in Figure 2.

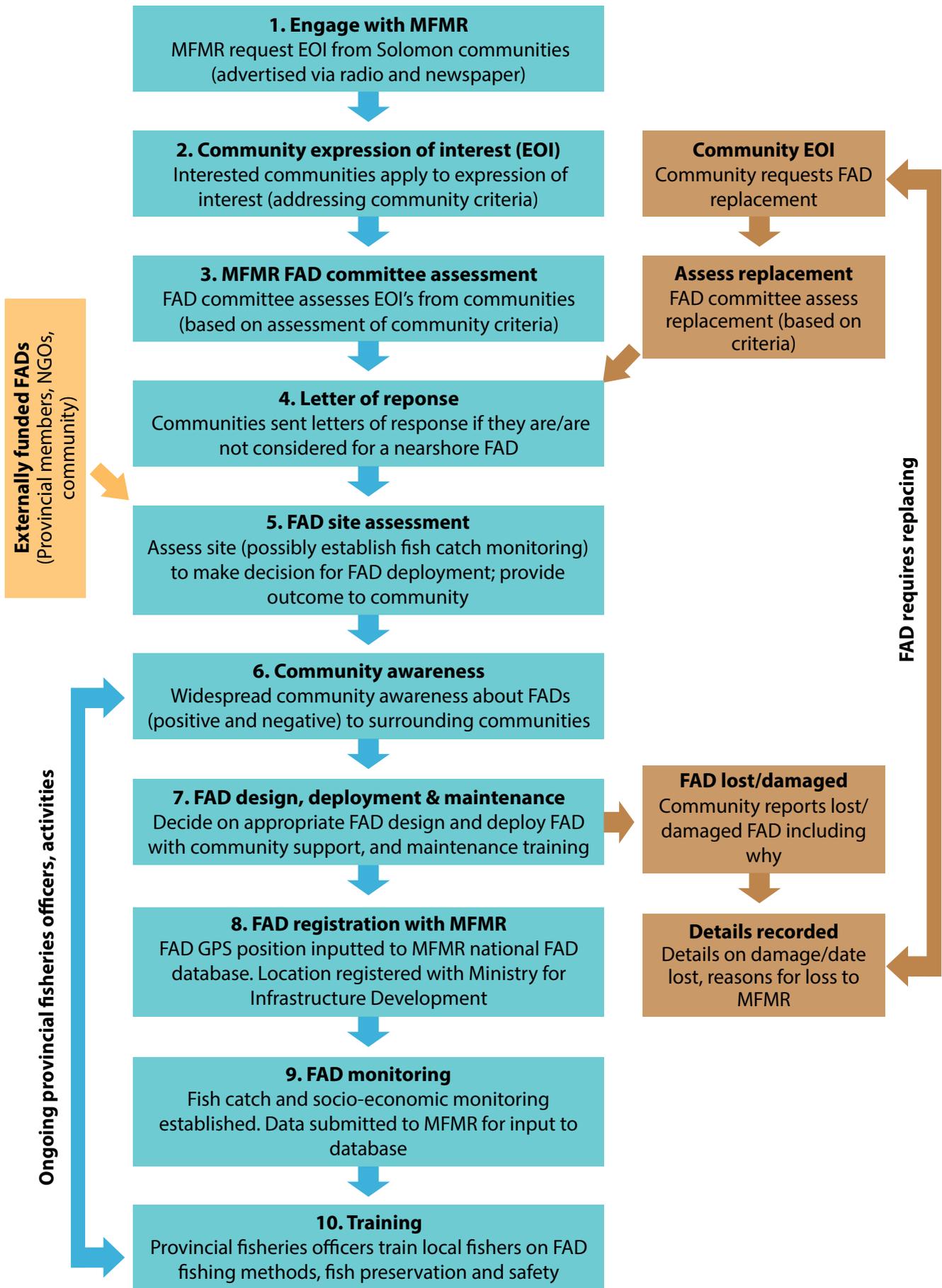
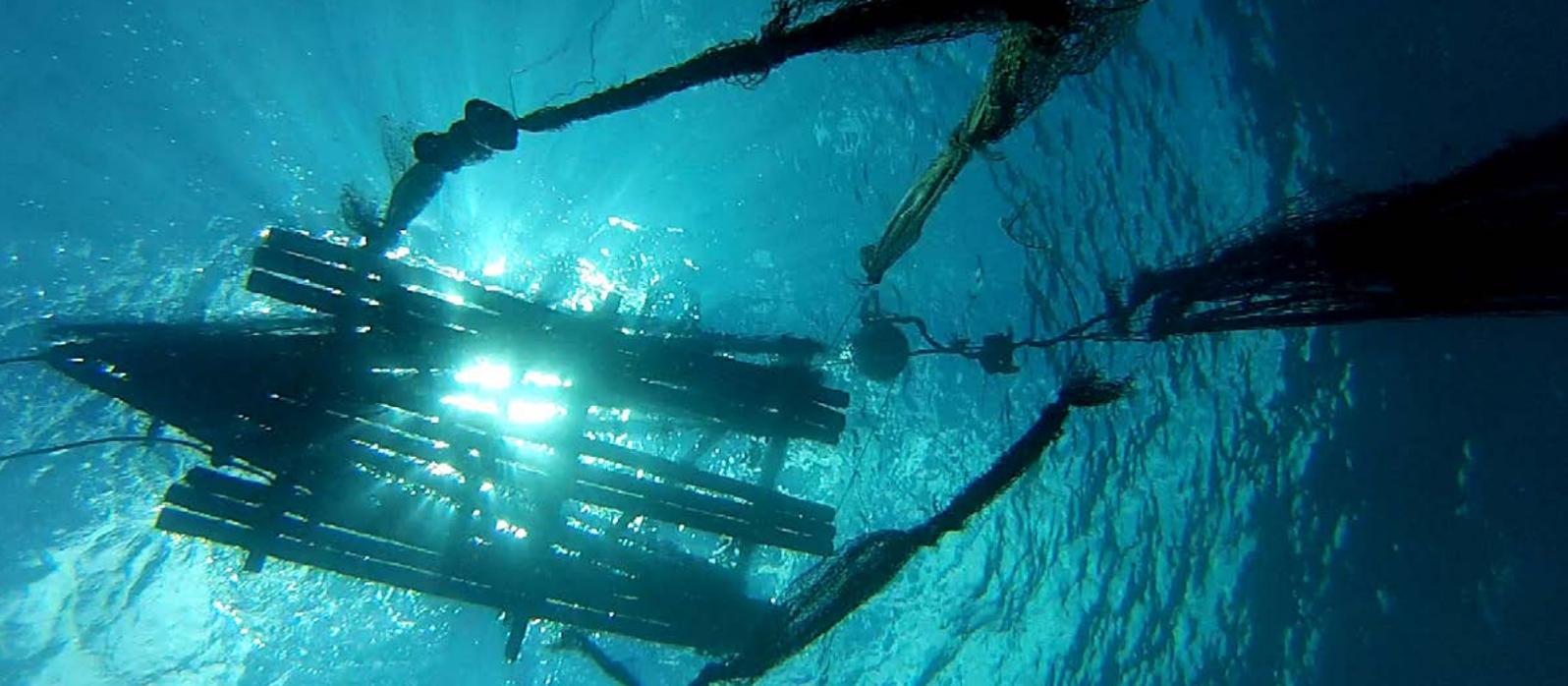


Figure 2. Ten-step process for implementation of nearshore FADs in Solomon Islands

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Approximately 500 million people in Africa, Asia and the Pacific depend on aquatic agricultural systems for their livelihoods; 138 million of these people live in poverty. Occurring along the world's floodplains, deltas and coasts, these systems provide multiple opportunities for growing food and generating income. However, factors like population growth, environmental degradation and climate change are affecting these systems, threatening the livelihoods and well-being of millions of people.

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