Sharing Pacific nearshore FAD expertise

Nearshore fish aggregating devices (FADs) are gaining momentum in the Pacific region as a tool to enhance food security and income for fishers and communities, and to reduce pressure on the resources of lagoons and reef fisheries. A lot of experience has been gained by countries across the Pacific. There have been, however, limited opportunities for nearshore FAD practitioners to come together to share this experience in order to advance the implementation and use of nearshore FADs in the Pacific.

In June 2016, twelve experts from the Pacific region came together at the Vanuatu Maritime College in Santo, Vanuatu, to share knowledge and experiences in the design, planning and implementation of nearshore FAD programmes. Countries and territories represented at this first regional Expert Consultation on nearshore FADs were American Samoa, Cook Islands, Fiji, French Polynesia, Kiribati, Papua New Guinea (PNG), Samoa, Solomon Islands, Tuvalu and Vanuatu. These FAD practitioners were identified based on their experience and complimentary knowledge covering the full life-cycle of a nearshore FAD programme. The purpose of the consultation was to gather lessons learnt and to identify the best practice principles to guide future nearshore FAD programmes across the region.

The Expert Consultation included countries' innovations in FAD design and the full cycle of a nearshore FAD programme, including site selection, community engagement, rigging, deployment, fisher training, maintenance, and monitoring and evaluation. Overall programme management and funding models for sustaining long-term national FAD programmes were also discussed.

This article provides an overview of the lessons learnt from the experts' experiences as well as the knowledge and research gaps that need to be addressed. Further feedback from other countries, experts, non-governmental organisations (NGOs) and others in the region would be very much appreciated.

These lessons and the information gathered through this consultation will be used by the Pacific Community (SPC) and partners to develop an updated nearshore FAD manual for the Pacific – anticipated for release in 2017.

Lessons learnt

FAD design and innovation

FAD design is one of the most technical elements of nearshore FADs. Different types, designs and components of FADs have evolved over the years through research and innovation by countries, and regional and national non-government organisations. This has resulted in several nearshore FAD designs now being used in the region – the most popular of which are the SPC modified Indian-Ocean FAD (renamed 'Indo-Pacific' FAD by the regional experts to account for the modifications to the original design), Vanuatu's Vatu-Ika FAD, and the SPC sub-surface FAD. Other designs and innovations discussed at the Expert Consultation included bamboo FADs, spar and catamaran buoys, lagoon FADs and a Tahitian FAD design.

Across the region, the two most common issues identified by regional experts were the loss of nearshore FADs due to vandalism and the difficulty in deploying FADs from small vessels. In essence, these two issues have been largely resolved through technological advances and innovations. In areas of high vandalism, the SPC sub-surface FAD or designs that are based on locally available and less targeted materials (such as bamboos) are the best options. Advances in FAD deployment systems, either through the use of small purpose-built barges, or by using modified anchors (e.g. multiple cement blocks or sand bags) enable the safe deployment of nearshore FADs from small (6–7 m) community boats, even in remote locations.

Detailed discussions were had on most of the nearshore FAD designs that are currently used in the region. For brevity the remainder of the design and innovation section concentrates on the key lessons gathered for surface FADs (e.g. the Indo-Pacific and Vatu-Ika designs).

Surface components (floatation system)

Surface hardware such as swivels and shackles should be avoided as these components become the underlying structural weaknesses within the FAD structure.

Large floats cause greater stress on the mooring system; however, using the hard plastic 30G (or similar) floats provide a good durable floatation device. The 30G type is preferable to Polystyrene (PS) foam floats. A major problem identified with the PS foam floats is that when they plunge repeatedly they become hard and acts as a weight rather than a float and affect the integrity of the system.

Between each surface float a 'buffer' rope should be tied. This reduces both the wear on the system but also acts as a blocker to secure each float individually. This avoids the loss of the whole FAD should one or two floats come loose and float away.

In addition, the mooring rope through the surface buoys should be protected with insulation material (PVC or hose) to protect the rope from chafing that is associated with the

Whipping the end of the buoy line to secure the knot and protect the rope from chafing (image: Joelle Albert).

joining seams on buoys (especially the 30G buoy). The ends of the insulation material should be peeled back and whipped to protect the rope from potential sharp edges.

Mooring rope

Braided multi-strand rope is currently the best mooring rope available as it does not kink and thus avoids the need to use surface and mid-water swivels (which as identified above can result in structural weaknesses). If, due to budget constraints, three-strand rope is used, a swivel will be required. When this is the case, it will be important to ensure the connection is covered with protective hose or rubber and then whipped with rope for added protection.

A steel-reinforced mooring rope means that the rope and the FAD is more resilient to being snagged by fishing gear or shark bites, which extends the life of the FAD.

Aggregator components

Where possible, biodegradable aggregators should be used (e.g. cotton mussel spat rope and coconut fronds). Biodegradable aggregators will not last as long as plastic aggregators; however, the use of biodegradable materials reduces the impact on the environment. Let's keep thinking 'reduce – reuse – recycle!'

Anchor system

The anchoring system most commonly used across the region is a heavy cement block. When deploying from small boats, a series of smaller cement blocks or sand bags can be used as an alternative to heavy blocks in order to reduce risks associated with deployment. Sand bags are an appealing and cheap option – especially in remote areas with limited access to cement, but the bags need to be able to withstand high pressures and abrasion. Vanuatu, which uses sand bags for the Vatu-Ika FADs, orders bags from Japan to ensure they are sufficiently durable.

When deploying the anchor system on steep slopes, it should be complemented with a Danforth anchor or a grapnel made of rebar to prevent the anchor from sliding down the slope.

Site selection and community engagement

The discussions regarding nearshore FAD site selection, highlighted that it can often be driven by external factors including local agendas and donor preferences. It is recommended that national-level frameworks are developed to guide the nearshore FAD site selection process in order to retain transparency and to ensure that FADs are deployed for genuine purposes and for the relevant end users.

Across the Pacific region, nearshore FADs are becoming increasingly used as a component of community-based fisheries management (CBFM) to 'shift' fishing pressure from lagoons and reefs to more sustainable oceanic fish resources. There is a set of regional guidelines and principles for site selection and community engagement for CBFM, and these may help FAD practitioners select appropriate FAD sites and develop community engagement frameworks.

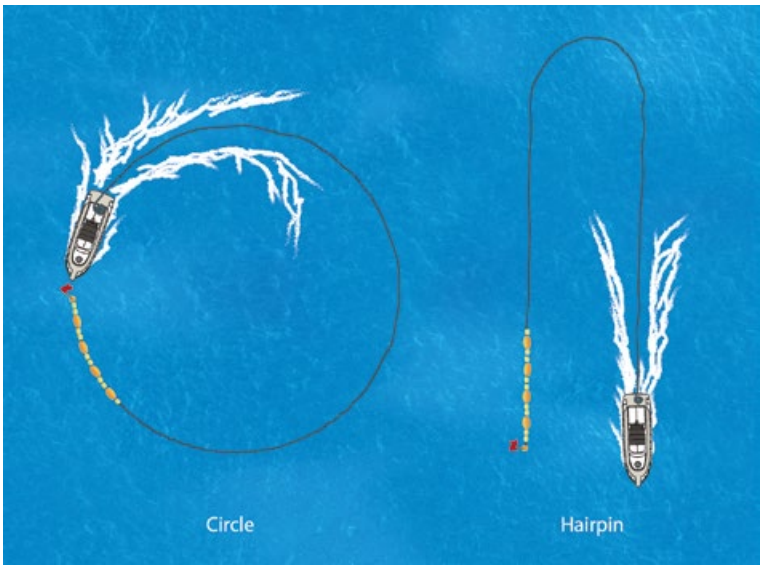
Regional experience highlights that engagement processes need to be consistent with local customs and traditions. Ownership needs to be clearly defined to ensure responsibility for nearshore FADs being successfully transferred to the target

groups. In particular, involving local fishers and fisher associations in the site selection process is important. This local knowledge can also increase the effectiveness of the FAD by locating it at known productive fishing ground. Through the community engagement process, mechanisms are also required to enable conflict and dispute resolution. The process should also identify possible access to funds or materials to enable replacement, repair and maintenance of the FADs for long-term benefits to the concerned communities.

FAD deployment methods

Safety should be the number one priority when deploying nearshore FADs. Nearshore FADs can be successfully and safely deployed from small boats; however, deployment procedures need to be in place and trained personnel are required for deployments to ensure safety considerations are fully accounted for and evaluated.

Deployment methods should follow the 'hairpin' or circle formation (where the floatation system is put in the water near the allocated deployment location then the rope is released and the vessel returns to the deployment location where the anchor is finally dropped overboard). Both techniques are far more accurate than a straight line deployment method and reduce the risks of entanglement and stress on the mooring rope.



The circle and hairpin techniques that are recommended to set FADs (illustration: Boris Colas, SPC).

The use of an echo-sounder and GPS is essential for safe and accurate deployments. On the other hand, detailed bathymetric charts like those produced by the SPC Geoscience Division will ease and streamline the deployment procedures as pre-deployment surveys of the seabed are no longer required – however the availability of such charts is still limited across the Pacific region.

Fisher training

Fishers training is important, especially for communities without prior FAD experience, as specific fishing methods are required to fish FADs efficiently and FADs are usually located further offshore than usual fishing grounds – this places small-scale fishers out of their comfort zone. Fisher training is, however, labour intensive and can be costly. Given these constraints, it is not always possible to train fishers on FAD deployments, particularly in countries with a large FAD programme that covers a wide geographical area.

SPC and countries have developed courses that address the key training needs of FAD fishers, including FAD fishing skills, small boat safety and catch handling. A possible approach to this training is to conduct 'train the trainer' workshops to enable a wider transfer of knowledge with limited funding through the training of key community fishers and national fisheries instructors. This approach could utilise existing networks like fisher organisations to strengthen these bodies and provide a greater reach to other fishers.

Two key lessons from past fisher training initiatives were identified by the regional experts. Firstly, it is essential to show local fishers how to be innovative by using locally available fishing gear; however, the training itself usually utilises the best available gear, which is ordered from overseas if necessary. Secondly, it is recommended to conduct the training at a productive FAD to show that the techniques and practices being demonstrated 'actually work'.

FAD maintenance

The life-span of FADs is impacted by the maintenance schedule. Maintenance of nearshore FADs including the removal of entangled fishing gear, removal of fouling materials (e.g. coral growth) and replacement of degraded structural materials can increase the time that FADs remain in the water.

Maintenance of submerged hardware can be difficult and often requires expensive, well-trained and experienced dive teams, which many countries do not have. While experience demonstrates that joint collaborations in maintenance programmes (e.g. between scuba divers, fisher associations and government) can help reduce maintenance costs, this may not be an option in all countries and locations. Therefore, most countries only maintain surface hardware at best. A number of countries are exploring programmes to delegate surface hardware maintenance and even FAD replacement to communities and fisher associations.

Monitoring and evaluation

Across the Pacific region there is a dearth of coastal fisheries data generally and even more so for the impacts of nearshore FADs. This lack of data is attributed to the remoteness of most Pacific Islands, the costs involved in implementing

extensive monitoring programmes, the lack of appropriate data collection methodologies and the shear difficulty in collecting the data required.

Within the region there has been some success in developing community-based monitoring programmes through a network of trained community resource people in order to enable monitoring at remote locations that are inaccessible by fisheries officers on a regular basis. Community-based monitoring requires a robust design, the 'right' community resource persons with the knowledge and skills to undertake the data collection required, along with an extensive training programme that includes a mechanism to feed-back information (in an appropriate form) to the communities involved. The expansion of computer assisted data collection is expected to improve the feedback of data to communities as it reduces data entry time.

Monitoring and evaluation is required to assess the effectiveness of nearshore FADs and to 'prove' the value of these – the measure of which depends on the objectives of the national FAD programme or of a particular FAD project. Although it is recognised that 'forever monitoring' is not necessary, and that monitoring and evaluation should be carefully targeted. A key recommendation, therefore, is to develop clear objectives at a national or project level to guide the collection of data that is fit for purpose. Sufficient funds are then required to implement an effective and directed FAD monitoring and evaluation programme.

Programme management and funding

First and foremost, it was recognised that there have been successes in the region in developing longer-term nearshore FAD programmes through partnerships with fisher associations, NGOs, other ministries and stakeholders. It was highlighted that by placing FADs as part of the broader community development planning process, FADs can become more than a fisheries management tool.

This said, a number of management issues surfaced through the experts' discussions including limited capacity at national level. Even where capacity does exist, a lack of planning means that when FAD-competent staff members change to another work area, or retire, their knowledge and technical skills are lost with them. The management and capacity issues are related to national fisheries administrations being unable to secure recurring funds in support of long-term nearshore FAD programmes. The lack of monitoring and evaluation data to 'prove' the impacts of FADs was identified as a major weakness in being able to secure this support.

When discussing the elements that are required for governments to develop long-term, sustainable national nearshore FAD programmes, four key elements were highlighted. These were as follows:

1. **Funding**: ongoing funds must be available to support dedicated FAD staff, materials, deployments, maintenance and monitoring. This may be through government, donors or cost-sharing arrangements with end users.
2. **Capacity**: countries must have competent personnel and the necessary equipment (e.g. deployment vessel equipped with suitable echo-sounder and GPS) to undertake FAD-related activities.
3. **End-user engagement**: countries must have national awareness and community engagement processes in place and partnerships that are developed between governments and end-users.
4. **Management**: countries must have a national FAD plan (or similar) in place, supported by legislation and corporate/strategic plans that showcase nearshore FADs as a priority.

Further work will be undertaken by SPC in coordination with member countries to determine the main characteristics of a sustainable FAD programme, which will enable regional and national organisations to better target support to Pacific Island countries and territories to achieve sustainability in their nearshore FAD programmes. These will be summarised in a policy brief or similar product aimed at senior fisheries personnel and policy makers, planned for release in 2017.

Research and knowledge gaps

There have been substantial advances in nearshore FADs programmes in the Pacific region in recent years, in particular around the technological aspects of FAD designs and deployments. Advances in technology have enabled safer and easier deployments in remote locations, even when using small vessels.

FAD monitoring and evaluation efforts are still limited in the region. Consequently, there remain a number of knowledge gaps for which sound research and experiments are required. Five priority questions were formulated by the experts to guide relevant nearshore FAD research to assist practitioners in developing sustainable nearshore FAD programmes. These were (not in order of priority):

1. Do nearshore FADs contribute to food security and income generation?

   This includes a better understanding of catch rates (CPUE) and catch utilisation at both FAD and non-FAD fishing locations as well as understanding the end use of fish caught in different locations.

2. How useful are nearshore FADs in support of coastal fisheries management?

This research question relates, in particular, to community-based fisheries management. Data is required to determine whether fishers change their practices as a result of the presence of nearshore FADs and shift fishing effort away from lagoons and reefs.

3. What are the underlying factors that influence the longevity of nearshore FADs?

   These underlying factors include both the structural weaknesses in the FAD itself as well as social components such as the root causes of vandalism and conflicts between users.

4. What are the social impacts of nearshore FADs?

   Across the region we need a greater understanding on the social impacts of nearshore FADs programmes on the recipient communities. This will require an understanding of the governance and ownership structures that impede or facilitate success and how the presence of nearshore FADs influence the trade-offs that communities make in terms of livelihoods (e.g. shifting from farming to fishing and the influence of a new income source). Such research will enable the development of mechanisms to mitigate conflicts between different users (e.g. subsistence and artisanal fishers).

5. How do oceanic and coastal fish interact with earshore FADs and what is the seasonality in aggregations around nearshore FADs across the region?

   To aid both site selection and fishers use of nearshore FADs, greater understanding is required on the seasonality and interactions between coastal and oceanic fish. While this will be different across the region, this knowledge will help inform both national and regional tuna fishery management decisions to ensure that coastal communities do share the benefits of their countries' tuna resources.

Without further research and evaluation, the ability to prove the effectiveness and value of FADs in achieving the objectives of a country will be limited. This will severely impact the ability of national fisheries departments to secure recurring budgets and ensure food security and alternative livelihoods of their communities.

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A flagpole buoy indicates the location of a subsurface FAD set during the workshop (image: Philip James, SPC)

Contributions

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For more information:

Joelle Albert
Scientist, WorldFish Solomon Islands
J.Albert@cgiar.org

William Sokimi
Fisheries Development Officer, SPC
WilliamS@spc.int