JICA COURSE ON COMMUNITY-BASED FISHERIES DIVERSIFICATION IN PACIFIC ISLAND STATES (FIJI STUDY)

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The 2007 Japan International Cooperation Agency (JICA) course on "Community-based Fisheries Diversification in the Pacific Island States (Fiji study)" took place in Japan and Fiji. The course covered a broad range of fisheries related studies, including fisheries diversification, community fisheries management and social development, coastal fisheries resources and management, aquaculture, interaction of tourism and fisheries, sub-surface FAD construction and deployment, basic fish aggregating device (FAD) fishing methods, and a tour of case study areas around Fiji. This course was the second of three phases to be implemented over a three-year period. The first phase — implemented in 2006 in Okinawa, Japan — provided participants with the opportunity to examine and apply Japanese experiences and techniques relating to the sustainable use of fisheries resources. The second phase (implemented in 2007) commenced in Okinawa for two weeks and then continued in Fiji for five weeks. Participants gained an idea of the differences in fisheries development between Japan and the Pacific region, which helped to identify, select and propose suitable measures and directions towards the sustainable use of fisheries resources in their island countries.

Because the Secretariat of the Pacific Community (SPC) has done considerable work on fisheries development in the Pacific region, JICA sought SPC's input in two areas: community fisheries management and FAD development. SPC's Coastal Fisheries Management Officer, Etuati Ropeti, discussed community fisheries management, while FAD development was covered by SPC's Fisheries Development Officer, William Sokimi, who authored this article.

Eight participants attended the 2007 (phase II) course. The preferred approach was to have the same participants attend the course throughout the three phases although this was not possible in some cases as in-country commitments and personal developments prevented some participants from attending.

The 2006 course was attended by one participant each from Fiji, Nauru, Palau, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, and Vanuatu, and two from Samoa. In 2007, participants from Nauru, Palau and Tuvalu, and one from Samoa could not attend. The 2007 participants (who also attended the 2006 course) were Tekata Toaisi, Fiji; Ferron Kolose Fruen, Samoa; Lionel Luda, Solomon Islands; Sione Tuimoala Mailau, Tonga; Graham Nimoho, Vanuatu; and Ephraim Ridley, Papua New Guinea. Two new participants joined the 2007 group: Candice Guavis from the Marshall Islands and Peter Louis Logomina from Papua New Guinea.

Course objectives

Course objectives for phase II included:

- Expose various management and diversification methods in Okinawa's fisheries sector, such as FAD fisheries, aquaculture, tourism, etc.
- Identify possibilities and constraints in applying Okinawa's scenario to the Pacific region.
- Identify actual situations, issues, and possibilities faced by the fisheries sector in Fiji, which is similar to the situation faced by other Pacific Island countries.
- Prepare presentations for an action plan relevant to the development of fisheries in each participant's island state.

Activities

Prior to the course, a subsurface FAD was constructed by JICA's sub-surface FAD adviser with assistance from Fiji's Fisheries Department staff member Sailosi Drili. A second sub-surface FAD was constructed, engaging the author and course participants in all facets of the operation. The plan was that as soon as the two subsurface FADs were completed, they would be deployed in two different locations on the same day. The design and construction method was led by Takayuki Kai, JICA's course adviser on subsurface FADs. The course leader was Hideyuki Tanaka of JICA Fisheries and Aquaculture International Co., Ltd., with the author assisting in coordinating participants in carrying out the actual construction work on the second subsurface FAD, and leading the loading and deployment of the FADs.

Subsurface FAD constructed and deployed in Fiji

The Fiji sub-surface FAD has three sections. The top section consists of a cylindrical cage 1 m in diameter X 1 m in height to hold ten 360 mm hard plastic pressure floats that make up the flotation section. The middle and bottom sections are two more cylindrical cages but are 1 m in diameter x 2 m in height. The top of the flotation cage was shaped with a circular vinyl pipe 30 mm X 1 m diameter. Three 20-mm metal rings were used as the floor of each cage, acting as a weight to keep the cages from collapsing. Cage nets were constructed from 8 mm polypropylene rope with a net mesh of 300 mm.

Participants were divided into three groups, with each group constructing one section of the FAD. Although it was the first time that most participants constructed a FAD, they took to the work well. At the end of the first day, three quarters of the flotation section was completed (Figs. 1 and 2).

At the end of the second day, the three sections were completed but were kept separated while the individual hard plastic buoys were fitted with a layer of netting to prevent them from knocking into one another while in the cage. On the third day, all sections of the sub-surface FAD were connected and adjustments were made where needed (Fig. 3). Meanwhile, the 24 strand, 22 mm polypropylene

Figure 1 (top): Sub-surface FAD construction.

Figure 2 (middle): Sub-surface FAD section almost complete at the end of day 1.

Figure 3 (bottom): FAD constructed and ready to be loaded on the deployment vessel.

mooring ropes were uncoiled, spliced and flaked ready for stretching. The next day the mooring rope was stretched using a forklift. Depth marks were placed on the rope every 100 m for the first 400 m, and every 10 m thereafter. The rope was then reflaked and the FAD was prepared for transfer to the deployment vessel. A group was assigned to prepare the FAD anchors, which were constructed from reinforced cement, and weighed 1600 kg each.

Robert Smith, senior adviser on marine geophysics at the Pacific Islands Applied Geoscience Commission (SOPAC) presented SOPAC's work in using multi-beam surveys and mapping, and the application of maps to FAD deployment. Sam Zinck, a local fisherman, was consulted on his use of the previous FADs and the effectiveness of the locations for local fishermen. Sam and Robert were asked to assist in selecting two sites for deploying the newly constructed FADs, preferably in depths between 400 m and 500m, and up to 3 nm from the reef breakers.

The author gave a presentation on recent development of FADs in the region, highlighting the new Indian Ocean type FAD constructed with pressure floats, deployment of FADs in Papua New Guinea, and the deployment of inshore FADs in Nauru for a canoe fishing project.

Figure 4 (top): Loading the FADs on to the vessel FV *Tabusoro*.

Figure 5 (bottom): Transporting the FAD to the deployment sites.

FAD DEPLOYMENT

The two sub-surface FADs and moorings were loaded on the Fiji inter-island government freighter M/V *Tabusoro* (Fig. 4). The FADs were positioned with one on each side of the vessel and the ropes flaked to ensure smooth deployment (Fig. 5). It would have been preferable to have the anchors rigged and ready for deployment on a tilting platform as recommended by the author, but since this was the first time the vessel's skipper performed this type of operation, he preferred to have the anchors sitting securely on the deck and lifted for deployment at the required time. The tilting platform would have guaranteed immediate deployment of the anchors at the designated time and reduce risk factors that might arise from using the derricks. When a heavy weight is lifted out over the open sea, the centre of gravity for that weight moves to the far end of the derrick, creating a potentially unstable condition for the vessel as a whole. There is also the danger of the anchor swinging out of control due to the vessel's pitch and roll motion caused by swell. Fortunately, the sea was reasonably calm and the deployments went well, except for slight delays in getting the anchors overboard and some apprehension when the anchors were lifted.

The first FAD was deployed at 18° 13.992′ S and 178° 27.425′E in 500 m depth, approximately 2 nm from the sandbank next to Nukulau Island. The second FAD was deployed at 18° 13.787′S and 178° 18.878′E, approximately 2.5 nm from Naqara Passage also in 500 m depth. Robert assisted in marking the spot where the FADs were to be deployed. Two Fiji Fisheries Department staff checked the submerged depths after FAD deployment. SOPAC's equipment was rigged on a chartered vessel from the Suva Yacht Club. The vessel drifted above the deployment position to mark the deployment site and later record the depth and final settling positions of the FADs (Fig. 6).

The first FAD was successfully deployed. This was measured by a marked pilot line that ran from the submerged FAD to the surface. The second FAD, however, did not submerge, although the mooring section was rigged for 460 m (Fig. 7). A check of the deployment site after the FAD had settled confirmed that the site was in fact 510 m deep.

During the end-of-day debriefing, it was determined that the reason the FAD failed to submerge, even though the mooring section was rigged shallower than the deployment depth, was because of the elongation percentage of the polypropylene mooring rope being more than what had been calculated. Although this was considered in the calculation for a stretch of up to 8.7%, the rope stretched more than this. This was probably because the rope for this FAD was stretched by a forklift instead of by hand, as was done for the first FAD. Because the flotation section had a buoyancy of 242 kg, the rope should only have been stretched to this limit or slightly less. This was a good point to take note of for future sub-surface FAD moorings.

Figure 6 (top): Streaming the FAD mooring while the SOPC vessel marks the deployment site.

Figure 7 (bottom): FAD floating on the surface instead of submerging.

Correctional plans were made for the Fiji Fisheries Department staff to return with 4 x 50 kg cement weights, and to attach these gradually to the FAD until it submerged to a depth where the water pressure would assist the buoys in bearing the surface displacement of the weights. As long as the buoyancy properties remain higher than the sinking properties, this should not be a problem. However, the heavier the weights added, the deeper the subsurface FAD will settle.

It is hoped that the sub-surface FADs will be of benefit to local fishermen and that they develop the skills to work with these types of FADs. The subsurface FADs have several advantages to surface floating FADs. They sit at a depth of at least 20 m below the surface so that transiting ships do not hit them.

Also, their inaccessibility prevents vandalism, and the deeper they sit beneath the surface, the less chances they have of being exposed to surface forces that place heavy stress on surface floating FADs. Studies of sub-surface FADs in Okinawa have proven that these FADs have as good an aggregating quality as surface FADs. However, because it they are underwater, it is difficult for banana boat fishermen to know the location of the FADs without a GPS. To actually sight the sub-surface FAD, fisherman will also need an echo sounder or sonar. Sonar would be handier as it has side-scanning, whereas an echo sounder needs to be directly over the FAD in order to spot it on the screen. Regardless of whether it can be seen or not, fishermen are concerned with whether or not there are pelagic schools aggregated in the vicinity of the sub-surface FAD to provide them with sufficient catch to make their trip cost effective and worthwhile.