

***Bagan* and pole-and-line fishing trials in Kavieng, Papua New Guinea**

Industrial pole-and-line fishing has seen its “boom and bust” days in the Pacific Islands region, thriving in some places throughout the 1970s and 1980s and then almost disappearing by the mid-1990s. Nowadays, the only industrial pole-and-line fishery still operating in the region is run by the Tri Marine Group in the Solomon Islands, with four pole-and-line boats as part of its fleet that includes purse-seine vessels.

Pole-and-line fishing can be adjusted to target specific fish species and sizes. In the Pacific Islands region it is mostly used to target skipjack tuna and, to a lesser degree, large yellowfin tuna, for the canning factories. Bycatch species include rainbow runner, frigate mackerel, dolphin fish, and small yellowfin tuna. However, in the region no part of the fish goes to waste. Whatever the canning factories do not use is sold by the crew or taken home for the family. Unlike purse-seine or longline fishing, pole-and-line fishing almost totally excludes bycatch of protected species such as marine mammals, sharks or turtles. This is why pole-and-line fishing is generally considered to be one of the most “environmentally friendly” tuna fishing techniques.

Pole-and-line and *bagan* fishing trials

During September 2014, a two-week, small-scale pole-and-line fishing trial was conducted in Kavieng, Papua New Guinea (PNG), using the *bagan* bait fishing method to supply live bait for the operation. The trial was conducted under the auspices of the Pacific Islands Forum Fisheries Agency (FFA)/DEVFISH and the PNG National Fisheries College (NFC), with support from SPC. Both pole-and-line and *bagan* fishing methods were reviewed in order to assess the potential revival of industrial pole-and-line fishing in PNG’s New Ireland Province (NIP). Two advisors, Dr Antony

Lewis and William Sokimi, were engaged to work with NFC Commercial Fishing Operations staff to undertake the review.

Dr Lewis is a well-known fisheries scientist in the Pacific Islands region and a former head of SPC’s Oceanic Fisheries Programme. He is a former coordinator of several large-scale tuna tagging projects on chartered pole-and-line vessels in the western and central Pacific Ocean (WCPO) area and has also carried out tuna and baitfish studies and small-scale, pole-and-line fishing in PNG. William Sokimi is SPC’s Fisheries Development Officer (Fishing Technology) and a former pole-and-line and tuna longline Captain/Fishing Master with wide experience in many aspects of tuna fisheries in the WCPO area.

This study was the third phase of the work carried out by FFA/DEVFISH Fisheries Development Officer, Robert Stone, who made two previous visits to initiate the construction of the *bagan* platform and the restoration of the fishing vessel, and to run the first fishing trials.

Pole-and-line fishing vessel

The FTV *Malui* is a 15-m, fibreglass pole-and-line fishing vessel built in Indonesia, brought to Kavieng in 1997 (by a local fisherman), and bought and restored by NFC in 2009 to be used as an experimental and training platform.



The restored FTV Malui is ready for fishing.

Bagan

A *bagan* is a moored platform used to catch food fish and small baitfish for the pole-and-line fishery. Fishing takes place at night, using powerful lamps to attract baitfish. The lamps are turned off one-by-one in order that only one lamp is left on over a wide net that is lifted when a sufficient number of baitfish have been attracted to the light.¹

Bagan fishing is widely practiced in Indonesia. In 2013, four Indonesian fishermen were hired by the FFA/DEVFISH project to supervise the construction of the *bagan* at Nago Island, off Kavieng.

Bagan and pole-and-line fishing activities

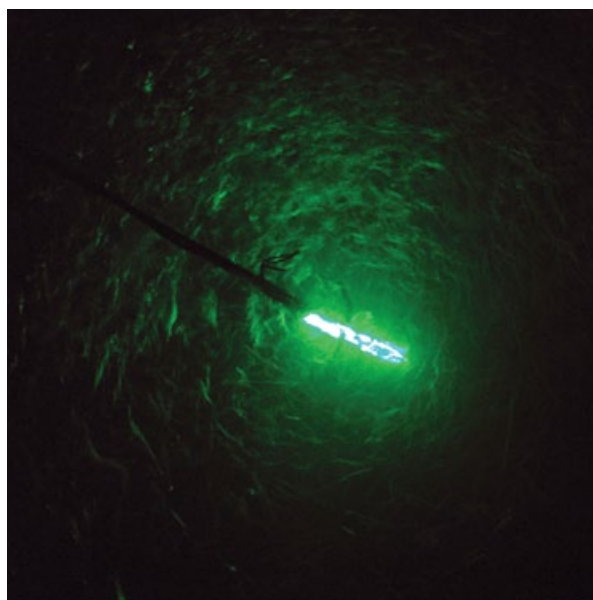
The first week of the trial was used to work on both the *bagan* platform and the FTV *Malui* and prepare them for the trials ahead. From the second week onwards, the fishing trials took place with six nights spent on the *bagan* catching baitfish (including silver sprat, blue sprat, gold-spot herring, hardy heads, cardinals and the spotted sardinella) and four days on the boat pole-and-line fishing. The operation involved 10 or more people, including NFC staff and hired casuals.

Bait fishing was conducted at two locations fringing Kavieng Harbour. These areas were far from the main bait fishing grounds that were used on pole-and-line fishing days but were convenient to start off the operations, and were close to the NFC base in case major adjustments needed to be made to the system. Thirteen bait fishing operations produced 143 2-kg buckets of usable bait, which was sufficient to almost fill the three bait tanks on the FTV *Malui* for each of the four pole-and-line trips. Throughout the trials, improvements were made to the gear and technique in order to increase efficiency. The system could be refined even more if this were to be a long-term process.

The *bagan* bait fishing procedure is very similar to the *bouke-ami* system in terms of luring and centralising bait around a light at night. In Indonesia, most systems use a series of above-water lamps that are all turned on at dusk to lure baitfish towards the *bagan*. The net — a lift net made from light weight nylon filament — is lowered immediately after the lights are turned on. When a sufficient number of baitfish have aggregated around the *bagan*, the lights are gradually turned off until only a single dim light is left on and centrally located above the

netting area. After an adequate amount of time has been given for the bait to aggregate under the light the net is lifted and the baitfish are entrapped.

During the fishing trials in Kavieng, two 500-W HydroGlo underwater lights and six Coleman (250 lumen) lamps were used. The underwater lights had a dimmer switch that further enhanced the close aggregation of the baitfish around the remaining light. An echo sounder was also used to better observe the aggregation of the baitfish and to signal the optimum time to close the net. Without an echo sounder, the net can be prematurely closed if the baitfish are not given sufficient time to draw in closer to the light. The echo sounder picks up this movement and can identify when the baitfish have reached the proper depth for entrapment.



Baitfish aggregated around an underwater light before the net is closed.

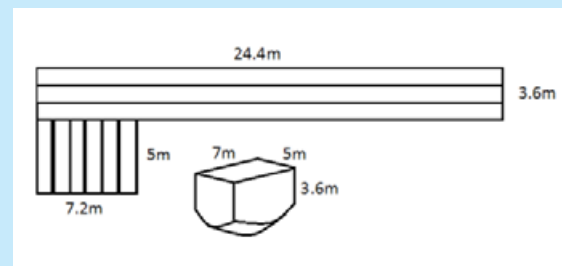
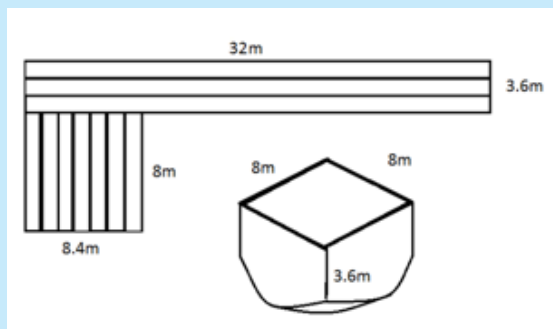
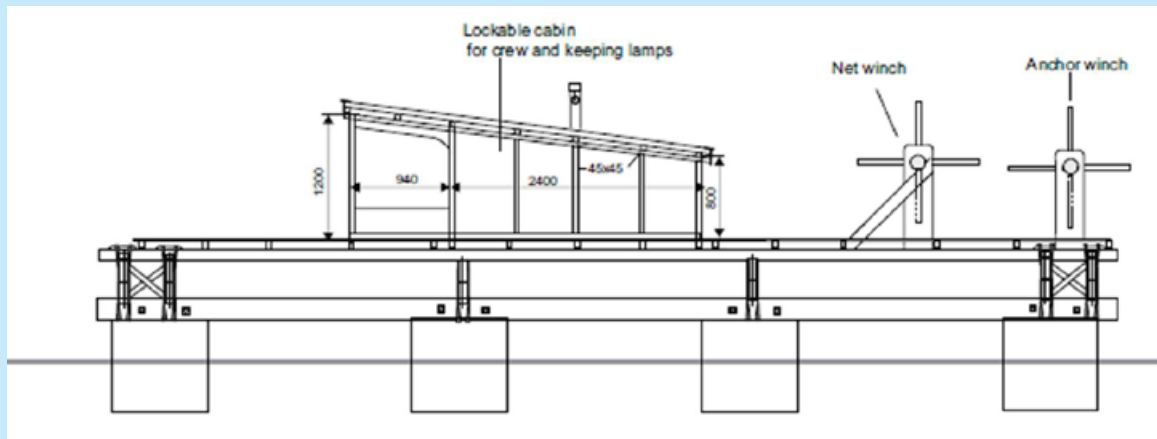
Pole-and-line fishing was carried out at two fish aggregating device (FAD) locations. Overall, the fishing was poor, probably because the season was not optimal for skipjack tuna in the area. Schools of juvenile yellowfin tuna were encountered close to the FADs and in running schools, but they could not be enticed to encircle the vessel like skipjack usually do. They were attracted to the bait, and passed beneath the vessel but not within range of the lures. The “sprays” and chumming techniques worked reasonably well, but the sprays were only fitted on the bow. Using stern sprays could have made a difference to catching yellowfin tuna.

¹ See for more details: http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/FishNews/137/FishNews137_13_SharpBagan.pdf

² The “sprays” are flattened nozzles spaced about 70 cm apart around the bow area that sprays or sprinkles water on to the sea surface to excite and confuse tuna into thinking there is a lot of bait activity around the vessel. The sprays also partly “hide” the fishermen hovering above the water with their poles.

Bagan characteristics

- ✓ Bagan frame: 10 m x 10 m
- ✓ Bagan net: 8.4 m x 8.4 m x 4 m deep, on frame; windlass with pulleys
- ✓ Net mesh: 5 mm square mesh, nylon; stretched mesh: 7 mm
- ✓ Holding/keeper net: 6 m x 4 m x 4 m
- ✓ Lighting: 5–6 Coleman electric lamps (250 lumen) + 2 x 500 w HydroGlo lights
- ✓ Buckets: 2.0 kg each (estimated)



Cut plans of the bait net (left) and holding net (right)



The bagan platform ready for the trials

Results of the trials

In a briefing session with NFC staff and the local fishermen involved during the trials, several technical issues and possible improvements were identified for all operations. However, after the trials, it was determined that a revival of the pole-and-line fishery in NIP, at least on a commercial scale, was unlikely under the prevailing circumstances. It was also estimated that the FTV *Malui* was not properly adapted to assess the feasibility of such a revival.

According to William Sokimi, a possible alternative to further evaluate the feasibility of a pole-and-line operation in the area would be for the NIP administrative council to enter into an agreement with Tri Marine Group, and have one of their fully manned boats with trained crew carrying out pole-and-line fishing operations over a set term during the peak skipjack season in NIP waters. The results of the experiment would give a better idea of the economical feasibility of a pole-and-line operation in NIP.

A bagan could be used to catch food fish for a community

A *bagan* could be a good tool to contribute to community food security because it targets stocks of species that are still healthy in most parts of the Pacific Islands region. But, if a *bagan* is to be owned and run by a community, several issues will need to be addressed, such as: Who has the right to use it? Who pays maintenance costs?

How will the catch be sold and/or distributed? Community-owned and operated fishing tools are not common in the Pacific Islands region, as they are in many parts of Asia; sorting out these logistical and operational issues will require innovative ideas.

A bagan could also be a good tool to produce live bait for pole-and-line operations

In PNG and the Solomon Islands, many coastal fishing ground owners have closed off their territories to bait fishing activities. However, if they were trained in *bagan* operations and could earn a living from harvesting their own baitfish, they might be willing to supply bait to pole-and-line boats. However, because pole-and-line fishing requires live bait, which has a very limited lifespan, the timing of the bait fishing needs to be closely matched with the timing of the pole-and-line fishing. Pole-and-line operators are, therefore, reluctant to rely on outside entities to provide live bait. Yet again, these are logistical issues that can be overcome with careful planning and motivation. The system could work, but it would require consistent and reliable community involvement. How to obtain it will be the biggest challenge to be faced, if such an operation were to be set up.

For more information:

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

All images in this article by William Sokimi



Fishing crew anxiously waiting for a school of juvenile yellowfin tuna approaching the vessel.