

PURSE-SEINE FISHING AROUND MOORED FADs IN PAPUA NEW GUINEA

INTRODUCTION

In Papua New Guinea (PNG), the domestically based purse-seine fleet mainly focuses on moored fish aggregating devices (FADs) and occasionally, drifting logs. This is one of the main reasons for the endurance of this fishery in PNG. Catches have fluctuated over the years due to climatic effects and economic factors, but overall, purse-seine fishing around moored FADs in PNG has provided more consistent and better economic returns than fishing on running schools.

FAD purse-seine fishing operations in PNG duplicate operations carried out in the Philippines. FADs reduce fuel costs for catcher boat activities and increases the chances of catching tuna. Backup operations to support catcher boats in this operation, however, somewhat offset the full benefits that may be attained if only a catcher boat and FADs were involved. Installing, monitoring and maintaining FADs is costly, and includes expenses such as supporting ranger boats to enhance operations. Additional expenses include providing regular supply boat service to ensure the

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purse-seine fleet is adequately replenished. FADs and backup operations greatly reduce catcher boats' operational costs, although support services to fishing company fleets add up and need to be constantly monitored to ensure that the benefits outweigh the costs of supporting catcher boats.

Two purse-seine fishing companies with domestic bases operate in PNG: Frabelle Fishing Company in Lae and RD Fishing Company in Vidar, Madang. Both companies originated in the Philippines where their mother bases still operate. Frabelle has its roots in Manila while RD operates out of General Santos City on Mindanao Island. Both companies predominantly use FADs as the centre of their purse-seine operations.

RD Fishing Company consists of several sections that are interwoven in their functions to sup-

port tuna catcher boats (Fig. 1), including:

- Shore-based operations
 - Main wharf for loading, offloading, replenishment, repairs, etc.
 - Workshop for engineering, mechanical, electrical and electronics repairs
 - Net repair and reconstruction shed
 - FAD construction, maintenance and deployment section
 - Ice plant that produces 150 mt/day (20 kg block @ K12/block)
 - Supplies store for fishing gear, rations, medical kits, spare parts etc.
 - Fish storage rooms with capacity to store 7,600 mt frozen tuna (1,600 mt old storage + 6,000 mt new storage)
 - Piggery, poultry, cattle, copra, rice and vegetable farming to supply provisions for the fishing fleet
- Sea operations
 - Supply and carrier boats: 10 ice carriers, 3 freezer export carriers, 1 provisions supply vessel, 1 tanker, 1 FAD tender vessel solely designated for servicing and replacing FADs at sea
 - 14 catcher boats of which 11 are currently operational
 - 28 ranger boats
 - 485 FADs deployed around PNG; mainly in the Bismarck Sea.



Figure 1. RD Fishing Company base in Madang, PNG

This is a major purse-seine operation, requiring skilled management to keep the company functioning profitably. An operation of this magnitude capitalises on government concessions and "holiday" schemes directed at attracting investment for developing the tuna fishery. Any cost increase that affects a component of the company can ad-

versely affect the economics of the whole operation.

PAPUA NEW GUINEA PURSE-SEINE OPERATIONS

In the Pacific region, tuna purse-seine fishing operations target skipjack (*Katsuwonus pelamis*) and yellowfin (*Thunnus albacares*) but, as is common with large-scale commercial fishing methods, bycatch is an unavoidable part of the operation. Purse-seine bycatch includes undersized yellowfin and big eye tuna (*Thunnus obesus*), wahoo (*Acanthocybium solandri*), rainbow runner (*Elagatis bipinnulata*), mahi mahi (*Coryphaena hippurus*), frigate mackerel (*Auxis thazard*) and triggerfish (Balsitidae).

Occasionally, sea turtles, cetaceans and sharks interact with purse-seine gear, which sometimes results in mortality. These occurrences, however, are not common. RD Fishing Company does not discard or waste any of its bycatch, and uses it to produce value-added products such as fish balls, fish sausages, marinated tuna steaks, and fish patties.

Purse seining is a very efficient fishing method that captures the bulk of the targeted fish school. Catches are large, ranging from 20 mt to more than 100 mt, depending on the size of the school and the efficiency of the setting operation. Tuna caught by purse seine are mainly used for canning. Purse seining is mainly designed to supply quantity rather than quality. Relatively high fish prices offered by canning factories for bulk tuna make this type of fishing viable.

PNG's purse-seine fleet consists mainly of catcher boats constructed to the US system of purse seining (Fig. 2). Most of these vessels were owned by American companies previously engaged in Pacific tuna fishing, but which pulled out because of increasing costs.



Figure 2. Typical American style purse seiner used in PNG's purse-seine fishery

FISH AGGREGATING DEVICES

The two companies engaged in PNG tuna purse-seine fishing construct, deploy and maintain their own FADs. RD Fishing Company has 485 FADs deployed, and Frabelle has a substantial number of FADs deployed in similar areas. Most probably, future PNG-based companies that plan to carry out similar operations, will have to deploy their own FADs. This may result in conflicts over FAD access unless the PNG government takes ownership of the FADs, or implements a more comprehensive FAD-sharing code. PNG's National Fisheries Authority established the PNG National FAD Management Policy in 2002. This policy is enforced and works reasonably well with the two domestically based companies; however, only one paragraph (21.a) in the policy actually addresses FAD sharing: "Each FAD and its surrounding area shall not be regarded as an exclusive fishing area for the company that deploys the FAD in the area". However, fishing etiquette suggests that companies do not use each other's FADs. In a situation where two catcher boats of different companies arrive at the same FAD at the same time, the catcher boat from the company

that deployed that particular FAD has the right of exclusive access; the other vessel must move on to another FAD.

Any company concentrating the core of its operations on moored FADs must include in its operations a section dealing only in designing, constructing, deploying, maintaining and replacing FADs. RD Fishing Company is a typical tuna purse-seining company that does this. RD has a section that deals only with FAD work, and also has a vessel dedicated to carrying out this work.

The Philippine-type FAD (Fig. 3) has a 3-m-long float that is bullet-shaped and constructed of a mild steel casing sprayed with two inches of Styrofoam™ on the inside. The mooring system consists of wire cable and polypropylene rope with a combined length that includes the mooring depth plus 30% scope. These FADs are deployed in depths ranging from 1,000–4,000 m with a flat or very slight incline to the sea bottom.

FADs are visited periodically by ranger boats, which give a report on each FAD's i) position and condition; ii) whether the FAD is aggregating fish schools; and iii) the condition of the aggregators connected to the FAD.

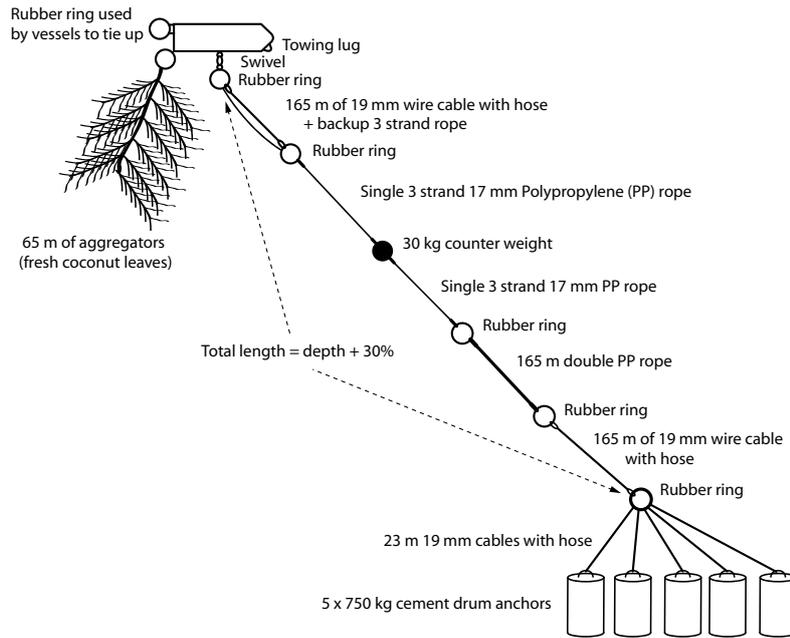


Figure 3. Philippine-type FAD (payao)

Whenever possible, the ranger boat skipper reports on the condition of the wire cable and connections immediately beneath the FAD.

RANGER BOATS AND ECHO SOUNDER INFORMATION

Ranger boats (Fig. 4) are used as scout boats for the larger catcher boats. Each catcher boat has two ranger boats supporting its operations. Ranger boats usually have six crewmen, including the skipper and engineer, who are skilled handline fishermen.



Figure 4. Ranger boat commonly used in the PNG purse-seine fishery

Up to six or more FADs are checked daily to determine which one is most likely to have the highest numbers of fish for the following morning's fishing operation. At each FAD, the size of the school in the area is

determined with the aid of an echo sounder as well as through visual observations of seabirds and fish feeding activity. Hand-line jigging is done at differing depths to determine the size and type of fish in the school. This information is relayed to the catcher boat's skipper.

Before dusk, the ranger boat returns to the FAD with "best potential" and ties up to it. Four to six 1,000 W halogen lamps are turned on at sunset and pointed at the water's surface to aggregate baitfish and tuna closer to the FAD. At night, the skipper periodically checks the echo sounder to evaluate the aggregated school's size (Fig. 5).



Figure 5. Echo sounder showing fish school passing beneath the vessel

(The echo sounder is the main equipment used by the ranger boat skipper to determine the size of a fish school near the FAD.) The method is not infallible, but it has worked over the years and is the accepted mode for determining whether a set should be made or not.

Just before daybreak the tuna school typically settles directly beneath the lights of the ranger boat. This enables the skipper to assess the school's size and relay this information to the catcher boat. The catcher boat's skipper then matches this with his sonar scan and makes the final decision on whether to fish or not.

CATCHER BOAT OPERATIONS

There are two types of catcher boat operations. One involves catcher boats that are also mother boats, which store their catch in brine or freezer holds; the other involves small catcher boats that offload their catch to fresh fish ice-carrier vessels, which, when full, return to their base for offloading. Catcher boats remain in the fishing grounds for as long as possible.

PNG purse-seine FAD operations more or less follow a routine schedule. The lead up to the morning's fishing operations depends on the time of sunrise, although generally at 03:00 each morning the catcher boat closes in on the ranger boat, which is still moored to the FAD. It then drifts about 500 m away while the skipper scans and monitors the FAD school with sonar for about an hour. At 04:00, both skippers liaise again on the fish aggregated at the FAD. Once the catcher boat skipper is satisfied that there is good potential, he gives the signal to lower the workboat, which proceeds to assist the ranger boat in separating the fish school from the FAD.

The ranger boat crew first removes the aggregator from the FAD and ties it to their vessel.

Simultaneously, the workboat hooks up to the FAD and slowly tows it up current. The ranger boat, with its bright halogen lights still on, then drifts with the FAD aggregator, drawing the fish away from the rest of the FAD.

In the meantime, the catcher boat skipper continues to monitor the movement of the fish school until it is again aggregated under the drifting ranger boat and orbiting in formation. It usually takes between 30 minutes and an hour to have the fish school settled again under the ranger boat lights.

Once the catcher boat skipper judges that the situation is right, the signal is given to standby for deploying nets. The skipper then manoeuvres his vessel into position and gives the signal to deploy the skiff, thus commencing the fishing operation.

Progressive stages of the operation after deploying the skiff include: closing and pursing the set (Fig. 6), hauling in the net (Fig. 7), drying the net in preparation for brailing (Fig. 8), and brailing (Fig. 9). Each of these stages must be carried out systematically and efficiently to ensure that the bulk of the fish school is caught and brought aboard for freezer storage.

OFFLOADING FISH AND TRANSSHIPMENT AT SEA

The basic approach to efficiently operating a fishing vessel is to attain as many fishing days possible during a fishing season. In light of this, transshipment at sea is a strategic measure to cut travel costs to and from fish bases as well as to produce more fishing days for catcher boats.

Transshipment at sea (Fig. 10) is part of the *modus operandi* of PNG's purse-seine fleet (unless the catcher boat has to return to base for repairs or in circumstances of prolonged adverse weather conditions).



Figure 6. Closing and pursing the net



Figure 7. Hauling the net



Figure 8. Drying the net in preparation for brailing



Figure 9. Brailing fish out of the net



Figure 10. Transshipping fish at sea

SAFETY

To conclude, purse-seine fishermen, as all modern seafarers, pay constant attention to safety. This is fuelled by necessity rather than a routine obligation to maintain safety standards. Almost all aspects of a purse-seine operation involve some form of possible hazard, which requires the crew to be alert and aware of activities happening around them at all times.

Fishing operational hazards include danger from the use of high-powered winches and steel wire cables; net entanglement; falling objects such as fish, blocks and tackle parts; slippery decks; capsizing of skiffs and workboats; and falling booms and rotating rollers. While every precaution is taken to make the work environment as safe as possible, and ensuring that crew are equipped with the appropriate tools and clothing to counter hazardous situations, accidents may still occur.

Other than the fishing operational hazards, crew should be prepared for the normal seafaring hazards through periodic drills. "Muster lists" are displayed on the bulkhead in the wheelhouse and the mess room, in a position that can be viewed by all, stating each crew member's name, his position on board, his distress (abandon ship) station and duties and his fire (emergency) station and duties.

The periodic "muster" drills focus on six areas:

1. Safe watchkeeping principles
2. Safe working practises
3. General emergency drill
4. Fire fighting drill
5. Abandon ship drill
6. Man overboard drill

Posters on safe working practises are also posted throughout the vessel.