TESTING FISH AGGREGATING DEVICES IN THE HUON GULF. CAN THEY HELP VILLAGE FISHERMEN?

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INTRODUCTION

Fish Aggregating Devices (FADs) are used by fishermen in various parts of the world to help gain better catches. They work because objects drifting in the sea tend to attract certain species of pelagic fish. Pelagic fish are those which swim near to the surface of the sea. There are several possible reasons why the fish are attracted to floating objects. These reasons include:

- They are attracted to the shade of the object.
- Fish are attracted to food such as smaller fish, algae, etc. which are found by the FAD and may be easier to see by the shade of the object.
- The floating object offers shelter from predators.
- The object could be used as a spawning place.
- Fish may go to the floating objects to have their parasites removed by the other fish there.

Man made Fish Aggregating Devices usually consist of a raft which floats on top of the water, and which is anchored. Below the raft, under the water, hang a number of weighted lines. Vegetation, or artificial vegetation is attached to these lines to attract the fish.

In 1982, the Fisheries Department of the Papua New Guinea University of Technology began studies to test the use of a low-cost, low-maintenance, non-traditional Fish Aggregating Device. In this article, we give information about the device and an account of its effect on a local fishing village. The numbers of fish and the order in which they arrived at the FAD were noted for 1 year.

THE FISH AGGREGATING DEVICE

The design of our Fish Aggregating Device was based on one used in the Northern Marianas in 1978. This design was used because it is made of angle iron and steel drums which are readily available in Papua New Guinea, and because it is not too costly to make.

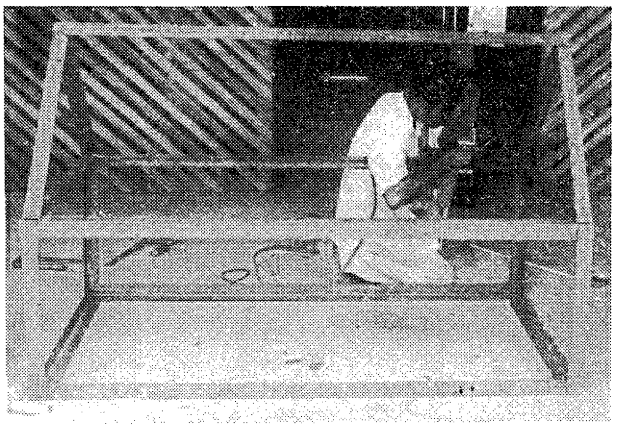
The Appropriate Technology Development Institute, Lae helped with the construction of the FAD.

In this project we painted the angle iron with silver marine primer, then coated it with Durotar to prevent rust. The FAD was made with three steel drums.

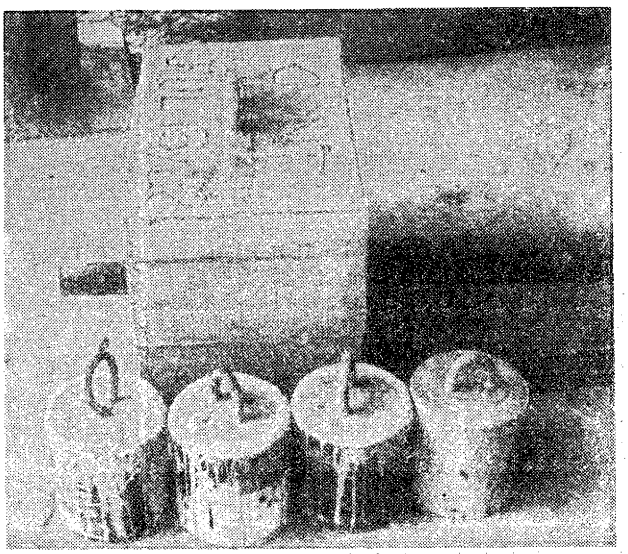
A radar reflector was attached to help in locating the FAD, and for safety in navigation.

The FAD was anchored using a 200 kg engine block encased in concrete. The anchor line consisted of 20 m lengths of 8 mm stainless steel chain at the top and bottom. The chains were linked with swivels to a 50 m length of 18 mm polypropylene rope. The chain was attached to the anchor using shackles. Because the rope floats in water, the chain at the top is needed to stop the rope becoming tangled with the material hanging beneath the FAD.

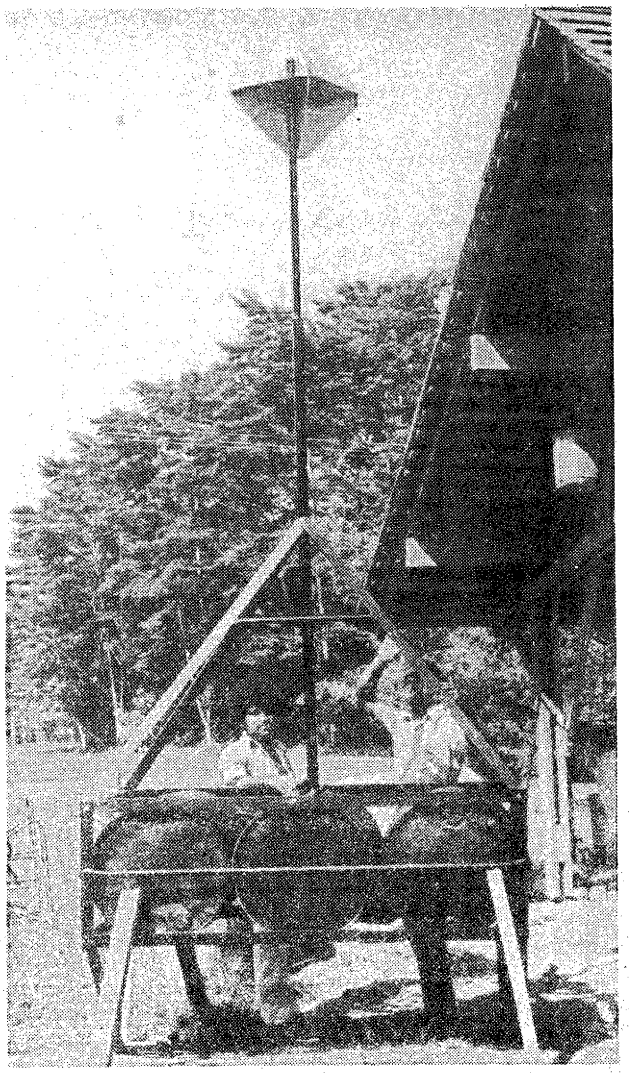
This FAD cost K374.00 in early 1982. This was quite cheap, as it cost over K4,500 for a larger Hawaiian Fish Aggregating Device.



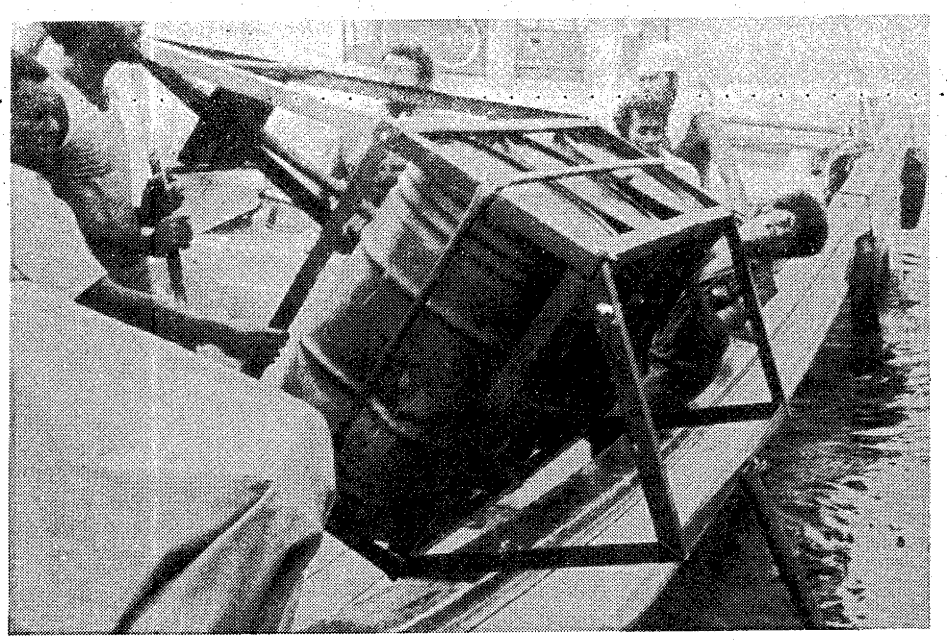
Welding the frame which holds the drums



An old engine encased in concrete is used as an anchor. The smaller anchors weigh down the lines holding the coconut fronds

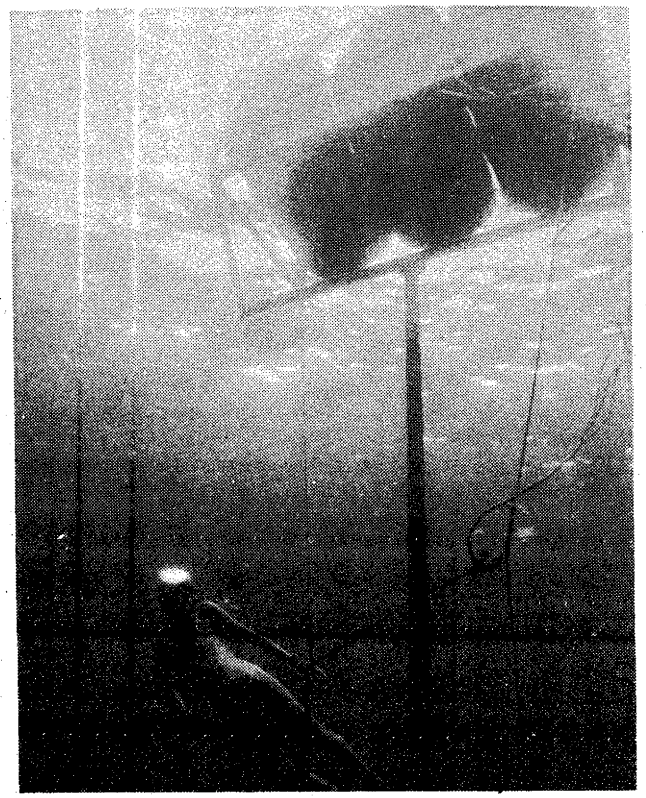


The 3-drum FAD, 190 x 90 x 150 cm. The galvanised pipe which serves as a counterweight under the water is not shown.



Setting the first FAD in the Huon Gulf, July 1982

The first FAD was anchored on 24 July 1982, after being transported to the site on the University of Technology training vessel 'Scomber'. Four 12 m weighted nylon ropes were attached to the FAD. Vegetation was tied to the ropes. After trying green coconut fronds, coconut husks and bamboos as appendages, without much success, we found that dry coconut fronds worked better. They needed replacing every 2-3 months.

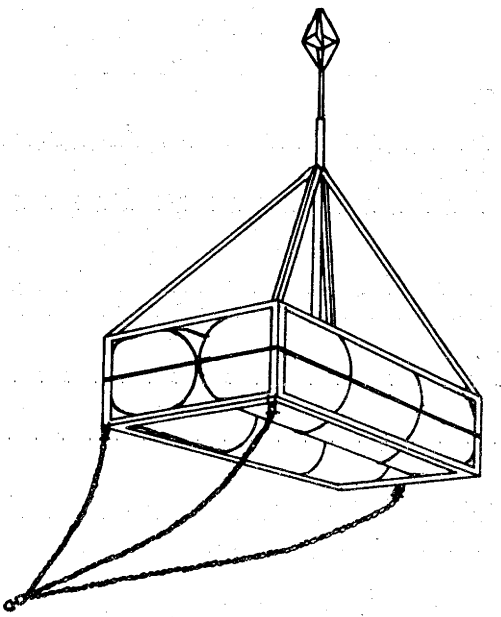


An underwater photograph of the FAD, without appendages

Coconut fronds (appendages) attached to the FAD attract fish to the device

Seven months after anchoring one of the drums developed a leak and the FAD was replaced. The second FAD consisted of two 200-litre drums filled with epoxy foam. The use of foam ensures that the drums will float even after they rust through. It was made in the same way as the first except that the V-shaped structure and pipes below the surface were replaced with 3 lengths of chain.

The second FAD cost K420. The extra cost was because foam was used. However the foam helps the FAD last longer, making it cheaper in the long run. This FAD was anchored in April 1983.

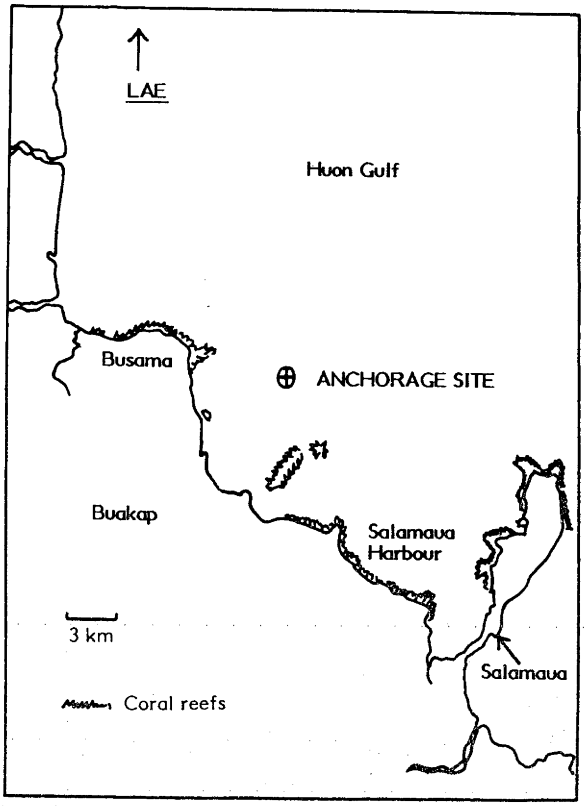


Drawing of the second FAD, anchored in 1983. Instead of a pipe as a counterweight, there are 3 chains attached to a swivel.

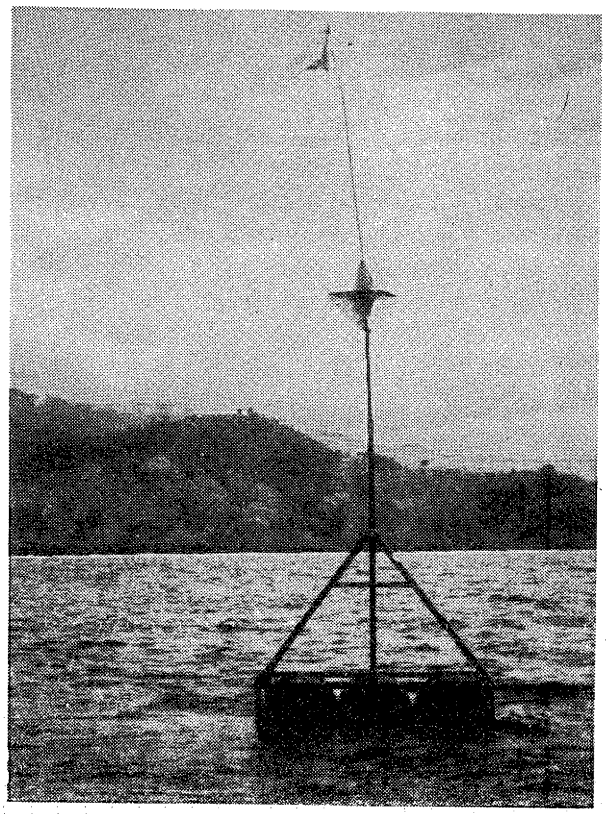
ANCHORAGE SITE

With the help of Mr E. Mueller of the Lutheran Economic Service we found an active family fishing co-operative in Buakap who were willing to help with the study. The anchorage site was chosen after discussion with the villagers. The position is shown on the map on page 150.

The site chosen was in 90 m of water, but within easy reach of the village. It is in a partly sheltered area as it is protected from the southeasterly winds by the Salamaua peninsula.



Map of the site of the FAD in the Huon Gulf, Morobe Province



The first FAD on site at Buakap, Morobe Province

RESULTS

We visited the first FAD at least once a month to check the appendages and to record the species and numbers of fish present. Fish counts were done by divers using masks and snorkels. This method cannot give accurate counts as pelagic fish move away from the area as a boat approaches and a diver enters the water. However the divers could estimate the numbers of smaller fish present. We assumed that these attracted large predatory fish such as sharks, skipjack tuna and Spanish mackerel.

Fish counts were carried out from July 1982 until February 1983. The results of the fish counts are shown in Table 1 opposite.

The first fish (sergeant majors) were seen after about 3 weeks. By October, a school of baitfish (about 50,000 fish) arrived. At this time, local fishermen reported catching more dolphin fish around the FAD.

The fish attracted to the FAD can be divided into two groups:

1. Residents - small fish which stay around the FAD. They are either herbivorous, feeding on the organisms settled on the FAD and appendages; or they are plankton feeders. Plankton are very tiny organisms which live in the sea. Residents include sergeant majors, leather jackets, drummers, juvenile crescent bass and baitfish.

2. Visitors - usually larger pelagic fish which stay at the FAD for only a short time. They are usually predators, feeding on the resident fish. Visitors include sharks, rainbow runners, dolphin fish, Spanish mackerel and skipjack tuna.

As the number of resident species increased, the number of visitors increased too. Changes in the populations present over the months could be caused by changes in water temperature and clearness, natural changes in populations, and the condition of the appendages.

Other species used the FAD as a breeding

TABLE 1. FISH COUNTS AT THE FAD IN THE HUON GULF

Month	Date of observation	Number of observation	Fishes observed	Estimated number of individuals
July		1	Nil	Nil
August	3	2	Sergeant major	1
	17	3	Sergeant major	4
			Leather jacket	3
September	3	4	Sergeant major	10
			Leather jacket	7
			Rainbow runner	2
	24	5	Sergeant major	13
			Leather jacket	8
			Rainbow runner	
October	7	6	Sergeant major	17
			Leather jacket	11
			Drummer fish	12
			Sardines	50 000
			Rainbow runner	2
	21	7	Sergeant major	50
			Leather jacket	20
			Drummer fish	100
			Sardines	100 000
November	17	8	Sergeant major	100
			Leather jacket	20
			Drummer fish	70
			Sardines	500 000
December	22	9	Sergeant major	150
			Leather jacket	22
			Squid	2
			Drummer fish	40
			Indian mackerel	5 000
			Sardines	600 000
January	4	10	Sergeant major	200
			Leather jacket	15
			Drummer fish	80
			Squid	6
			Sardines	600 000
	19	11	Sergeant major	100
			Leather jacket	15
			Drummer fish	100
			Shark	1
			Dolphin fish	1
			Squid	4
			Sardines	1 000 000
			Indian mackerel	10 000
February	3	12	Sergeant major	200
			Leather jacket	29
			Drummer fish	100
			Sardines	900 000
			Squid	3
	15	13	Sergeant major	200
			Leather jacket	30
			Drummer fish	100
			Squid	6
			Sardines	900 000
			Dolphin fish	1
	24	14	Sergeant major	200
			Leather jacket	33
			Drummer fish	100
			Scad	30
			Rainbow runner	4
			Crescent bass	100
			Sardines	12 000 000

A dolphin fish (Family: Corphaenidae) caught near the FAD by a villager

station. Squid were seen from December to February and their egg masses were seen on the appendages.

As of January 1985 the second foam-filled FAD is still in position in the Huon Gulf - 19 months after it was put in place. When we stopped regular visits to the FAD in September 1983 it supported a large community of baitfish and pelagic fish around the appendages. However, the villagers did not replace the appendages as they wore out. By March 1984, the baitfish and pelagic fish were gone. We put new appendages in position in August 1984, but within a month the lines and lead weights had been removed.

DISCUSSION

How useful are FADs for Papua New Guinea's village fishermen?

Our FAD definitely attracted many baitfish and several species of pelagic fish. However the villagers did not make good use of it. Why not?

- The village fishing group made most of its income from handline and beach seine fishing. They had no gill nets or long lines suitable for catching the fish at the FAD.

- Although demonstrations of other fishing methods were given to the villagers, they were not willing to try them out.

- The villagers said that they do not fish pelagic fish much because the fish spoil quickly and do not fetch a good price in the market. The fishermen's cooperative had a diesel generator and a deep freezer, but freezer space was saved for bottom fish like snapper which could be sold for over K2 per kg at the local restaurants and supermarkets. Any pelagic fish were smoked and sold in the local market for less than K1 per kg.

- Using dry coconut leaves hung from weighted ropes as appendages meant that the FAD had to be maintained regularly. The villagers were not prepared to do this.

When we visited the village, the villagers were keen to help us set the FAD and attach the coconut fronds. They even defended the FAD from other villagers who tried to fish near it. However when our regular extension visits stopped, they lost interest. Even though we tried to involve the villagers in making and anchoring the FAD, we believe that they felt they only had to protect the device, rather than maintain it and use it.

Buakap villagers preparing the beach seine for fishing

CONCLUSION

We believe that the Fish Aggregating Device described in this article is an effective low cost, low maintenance structure for attracting large numbers of baitfish and pelagic fish. However our efforts to get the villagers to use the FAD failed probably because they did not feel they owned it and therefore were not interested in maintaining it.

More extension work on how to catch fish around FADs, and market development for the type of fish caught is necessary. Village fishermen will need help to exploit the urban market for these fish.

We strongly recommend that in any future projects, the devices are designed and made in the villages, with the help of the villagers who will use and maintain them.

FURTHER INFORMATION

For further information about this project you can contact:

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LAE

Another article about Fish Aggregating Devices is in this issue of HARVEST.

FURTHER READING

Mala, S. (1984). Payao construction and setting. *Harvest* 10 (4): 154-157.

EDITORIAL NOTE

The Fisheries Division of D.P.I. would like to make the following comment about Fish Aggregating Devices:

'Whilst FADs have had some success in other regions, their usefulness in Papua New Guinea is not clear at present. In particular, the economics of making them and using them under conditions found in Papua New Guinea are not well understood.

Before FADs are recommended for use, it must be shown that these devices produce increased fish catches, reduce fishing time and effort, and reduce fuel costs. These benefits must also be shown to be greater than the costs involved.

Therefore, at the moment FADs should not be regarded as an economic proposition; but research into their use should be continued by Government Departments and Institutions'.