FISH-AGGREGATING DEVICES (FADS) AS A TOOL TO ENHANCE PRODUCTION OF ARTISANAL FISHERMEN: PROBLEMS AND PERSPECTIVES

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ABSTRACT

Mauritius is one of the first countries in the South West Indian Ocean to have started a fishery associated with Fish-Aggregating Devices (FADs). The productivity of fishermen engaged in this fishery is quite low compared to neighbouring Réunion and Comoros Islands. A FAD efficiency assessment survey revealed that production of fish could easily increase. This paper analyses the fishermen's catches, the problems they encounter, and the high performance some of them achieve.

INTRODUCTION:

Although Mauritius has a total land area of 2200 km^2 and an EEZ of 1.6 million km^2 due to the presence of outer islands, its total production of fish is relatively low. This is due to the fact that the primary productivity of the surrounding sea is one of the lowest in the Indian Ocean, at 0.15 g/m^2/day (FAO/IOP, 1978). In the lagoon and reef drop-off of Mauritius, 2,840 artisanal fishermen produced only 1,663 t of fish in 1993. The MSY of this area is estimated at 1,669 t (Samboo & Mauree, 1987).

The demand for fish products is on the increase in Mauritius, due to the improving living standards of the population, and to the increasing consciousness of the benefits to health of fish protein; the per capita consumption has increased from 12.5 kg in 1985 to 19 kg in 1994.

As the catch from the lagoon can hardly be improved, the development of other fisheries has gained importance. It is in this context that a FAD-associated fishery was introduced in 1985 to tap the migratory pelagic resources of the near offshore waters of the island (Roullot *et al.,* 1988). At present there are 21 FADs in operation around the island, in waters from 400 to 3000 m deep and at 1.5 to 12 nm from the coast.

FAD EFFICIENCY ASSESSMENT PROJECT

A project for assessing the efficiency of the FADs was initiated in 1993. Two enumerators were recruited on a contract basis to collect data from the western coast of the island, where eight FADs are located. One enumerator was assigned to cover the west and northwest region and the other the southwest region. Altogether 9 landing sites used by artisanal fishermen were surveyed. About 60 fishermen in this region were considered to fish regularly on FADs, and 20 others used them occasionally.

During the six working days the enumerators visited the landing sites, weighed the catches, measured the fork length of the fishes, and interviewed the fishermen.

As the other regions were not surveyed, it is not the intent in this paper to give a total catch figure for landings from all FADs extrapolated from the available data. Moreover, an important number of leisure and sports fishermen operate successfully around FADs, and their landings are also not considered here.

RESULTS:

Landings

Table 1 shows the catch for the period under study, May 1993 to March 1995.

For 1994, when data were available for the whole year, total landings from the 8 FADs on the west coast were 84,947 kg, of which 2735 kg, or 3.2 %, represented the catch of sports fishermen around FADs. However, this figure does not reflect the actual catch in the regions covered by the enumerators because of the following:

1. Simultaneous landings at different sites made it difficult for the enumerators to record all landings.
2. The enumerators did not work on Sundays and public holidays; therefore landings made on those days were not recorded.
3. The enumerators were absent from duty from time to time because of illness, breakdown of motorcycles, etc.

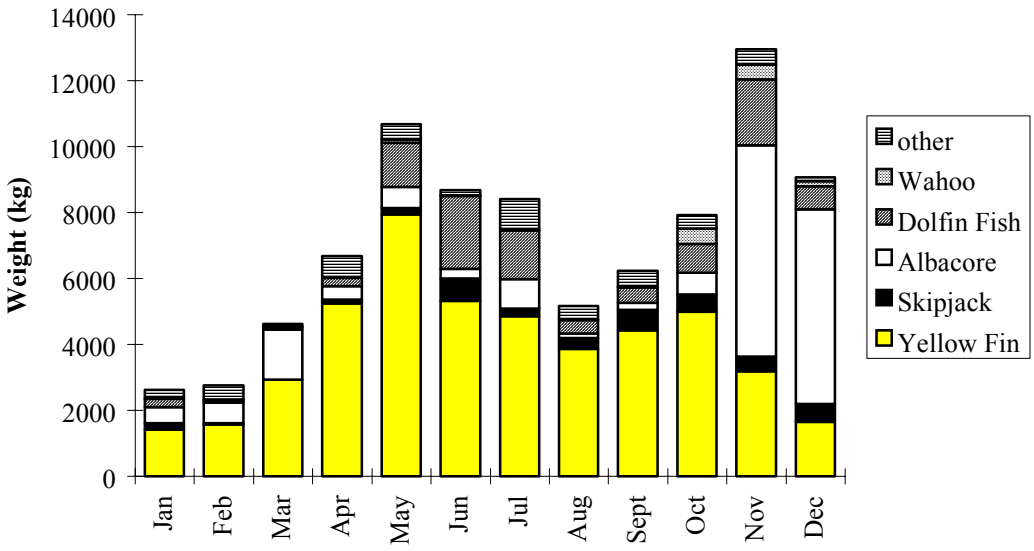
Table 1. **Total catch from the eight FADS.**

Year	*Catch (kg)*
May 1993 - Dec 1993	18,557
Jan 1994 - Dec 1994	84,947
Jan 1995 - Mar 1995	22,237

Table 2. **Percentage composition for the main species.**

Species	*1993*	*1994*	*1995*
Yellowfin	52 %	55 %	49 %
Albacore	8.4 %	21.2 %	40 %
Dolphinfish	16.6 %	11.8 %	4.1 %
Skipjack	4.3 %	4.5 %	3.2 %

Figure 1. *Species composition of catch for 1994.*



It is estimated that the enumerators missed about 25% of the landings. Therefore a more accurate figure for the total catch would be 84 947 + 25%, or 106,183 kg, representing the catch of around 80 fishermen.

Species composition

Table 2 shows the percentage composition of the main species for the period under study.

It is to be noted that the landings of albacore tuna have been on the increase during the period under study. Whilst for the 8 months of 1993 the total catch was 1,796 kg, in 1994 it amounted to 18,184 kg, and in the first three months of 1995 was 8,998 kg. This increase is explained by the fact that fishermen are increasingly using vertical longline gear to reach depths of 200-300 metres, where larger tunas are more abundant.

An analysis to determine seasonal abundance by species shows that yellowfin tuna and dolphinfish are relatively abundant throughout the year, with peaks in May-June and October-November. Albacore seems to be more abundant in November-January (Figure 1).

From Figure 2 a certain pattern can be detected in the landings of fish caught on FADs, with peaks in April-May and November-December, indicating a seasonality in the fishery with relatively higher abundances during those months. This was also found by Roullot *et al.* 1988.

The production from FADs is relatively stable over the year, and the abundance of the main species is satisfactory. Lower catches in the winter months can be attributed to bad weather conditions, shorter fishing trips, and a relative decrease in the abundance of the fish.

Catch and Effort

The gradual general increase in catches of all species during the period under study indicates that the effort around FADs is increasing correspondingly. This is verified by the number of fishermen-days, which rose from 2159 in the 8 months of 1993 to 7244 in 1994 and 1551 in the first three months of 1995.

The increase in landings is due not only to the increase in the effort, but also to the quality of the effort: in other words, the fishermen have improved their capture techniques. This is illustrated by the steady rise of the

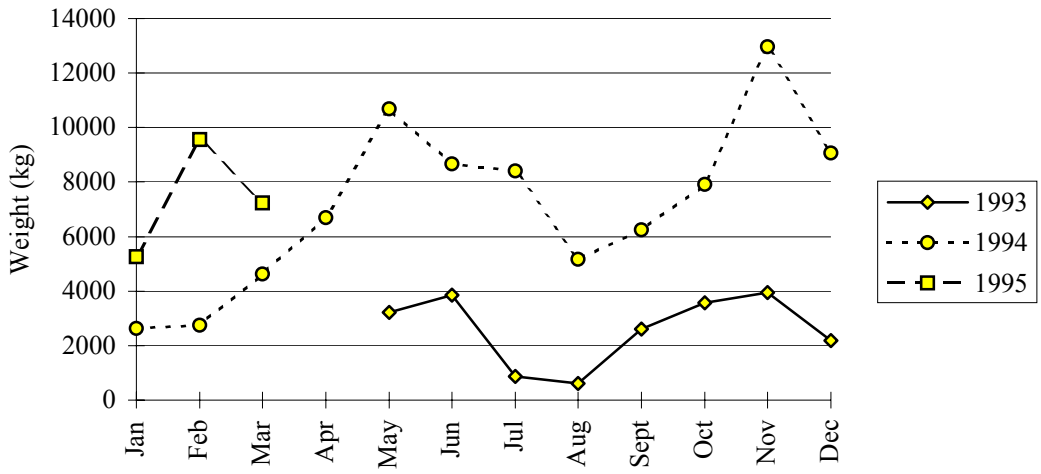
Table 3**. CPUE, in kg/fisherman day, May 1993-March 1995.**

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Average*
1993					13.78	14.14	6.58	5.19	11.22	7.66	10.03	8.99	9.69
1994	8.99	10.26	12.44	17.59	15.53	12.76	12.99	7.33	8.16	10.72	13.55	12.03	11.86
1995	11.80	15.92	14.37										14.03

Table 4. *Distribution of CPUE in the fishery.*

CPUE	*5-10 kg*	*10.1-20 kg*	*20.1-30 kg*
No. of boats	18	23	4

Figure 2*. Fish landings from FADs.*



CPUE from 9.69 kg/fisherman day in 1993 to 11.86 kg/fisherman-day in 1994 and 14.03 kg/fisherman day in 1995. The CPUE is calculated as the total monthly catch divided by the total number of fisherman days. The CPUE varies considerably among months in the period under study (Table 3).

In 1994 the lowest average CPUE for artisanal fishermen was 3.10 kg, and the highest 30.48 kg, with the majority of fishermen falling in the 10-20 kg bracket. In that year a total of 45 boats that regularly visit FADs were surveyed. Their logbook data are presented in Appendix 1, and Table 4 shows the breakdown of the CPUE for these boats.

A few encouraging facts have emerged from the assessment of the FAD-associated fishery. A few fishermen have adapted themselves well to it by mainly using live bait, and their average catch per trip is as high as 56 kg. Also during two demonstrations of fishing with live bait by a master fishermen, higher catches were recorded. During the first, carried out during May, one of the two peak months of the year for catches, in 9 fishing trips a total of 1,743 kg of fish were caught, an average of 158.4 kg per trip. During the second, carried out in June-July, a period of low productivity, a total of 1680 kg of fish were caught in 29 fishing trips, an average of 57.9 kg per trip.

PROBLEMS AND PERSPECTIVES

From the results of the assessment, especially from the performance of a core group of fishermen, it is clear that the FAD fishery in Mauritius can be further improved and that higher production can easily be achieved. The average CPUE of 10 to 20 kg is much higher than the 5.5 to 6.8 kg obtained in the traditional fishery. Moreover, in neighbouring Réunion Island, 300 fishermen are producing an estimated 1,500 t of fish, and landings of pelagic fish in the Comoros Islands have increased from around 5,500 t to 13,000 t (Conseil Scientifique, Mahé, Seychelles, April 1995).

Two main reasons can be attributed to the relatively low production from FADs in Mauritius. The artisanal fishermen are by tradition not generally venturesome, and

are slow in accepting new challenges and hesitant in changing ingrained habits. The slightly higher investment in fishing gear - small longlines, and improvements in boats for safer navigation further offshore - cools down any motivation they may have. The biggest hurdle, however, is the current legislation which does not allow fishermen to freely be in possession of live fish for use as bait, nor to use certain gear to catch it (cast net, artificial light).

Those fishermen who achieve good catch rates have been quick to adapt to new fishing techniques. They manage their financial resources better, which enables them to purchase more advanced gear and rapidly replace it when damaged or lost. Furthermore, they were willing to participate in demonstrations or short training sessions. They have also been lucky in catching live bait; stay longer at sea, and do not go back home even when the early morning catches have been good. Depending on weather conditions, water turbidity, the behaviour and species of the fish, and the season, they quickly change fishing techniques and may use several techniques within the same day or concurrently.

This small core of motivated fishermen would certainly lead the way for others to follow, but the pace would be faster if the number of FADs could be increased, thus situating them closer to fishing villages. A few nearshore FADs placed as close as 1.5 nm from villages have been yielding results comparable with FADs placed 3 nm or more offshore. Increasing the number of nearshore devices would certainly more easily attract new fishermen and those reluctant to venture too far out to sea.

Moreover, fishing techniques based on live bait appear to be a major breakthrough in the FAD-associated fishery. If fishermen could use live bait freely, it is expected that the CPUE could easily double in the short term, attracting yet more fishermen.

However, rapid increases in the production of a specific kind of fish may generate problems at the level of the market, and this aspect of the industry should be given due consideration.

CONCLUSIONS

Production from the FAD-associated fishery is set to increase in the coming years. Mauritius, which started a FAD fishery programme 10 years ago, ahead of Réunion Island and the Comoros, still lags behind in the amount landed. The FAD survey carried out from May 1993 to March 1995 indicates that there is a clear tendency towards an increase in production. The study has also brought to light certain aspects of this fishery such as the relative abundance of the fishes at different periods of the year, the percentage composition of the resource, and the gears best suited to this fishery. The fishery is at present underexploited, and its full potential has yet to be tapped. A target of 500 t in the short term is realistic and can be achieved, but for this a greater number of fishermen must be encouraged to join the fishery and the quality of the fishing effort around FADs must be improved.

Fish-Aggregating Devices are presently the only alternative available to artisanal fishermen to allow them to increase their daily fish production, and their level of achievement will depend mainly on how much they accept the need to change old habits.

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Appendix 1 : *Data of the 45 boats surveyed*

Boat No.	***No. of fisherman days***	***No. of trips***	***Average no. of fishermen per trip***	***Total catch (kg)***	***Catch per trip (kg)***	***CPUE***
0002	267	96	2.78	3,735	38.91	13.99

0004	142	66	2.15	2,378	36.03	16.75
0005	158	62	2.55	1,949	31.44	12.34
0008	198	112	1.77	3,041	27.15	15.36
0009	96	40	2.40	1,034	25.85	10.77
0013	115	57	2.02	1,128	19.75	9.81
0014	54	43	1.26	1,427	33.19	26.43
0015	73	73	1.00	2,096	28.71	28.71
0016	52	21	2.48	582	27.71	11.19
0017	369	133	2.77	5,958	44.8	16.15
0018	457	147	3.11	7,634	51.93	16.70
0033	355	86	4.13	1,303	15.15	3.67
0034	123	29	4.24	381	13.13	3.10
0051	162	75	2.16	817	10.89	5.04
0054	78	55	1.42	308	5.6	3.95
0057	540	184	2.93	3,097	16.83	5.74
0059	65	24	2.71	578	24.08	8.89
0061	215	140	1.54	2,341	16.72	10.89
0063	33	24	1.38	1,006	41.92	30.48
0064	209	117	1.79	2,155	18.42	10.31
0066	33	23	1.43	358	15.57	10.85
0067	75	36	2.08	539	14.97	7.19
0071	160	68	2.35	1,121	16.49	7.01
0073	233	219	1.06	6,029	27.53	25.88
0074	297	129	2.30	5,241	40.63	17.65
0075	120	65	1.85	1,468	25.58	12.23
0076	69	23	3.00	1,193	51.87	17.29
0082	67	20	3.35	776	38.8	11.58
0088	145	116	1.25	1,857	16.01	12.81
0089	329	128	2.57	1,602	12.52	4.87
0090	153	72	2.13	774	10.75	5.06
0093	291	149	1.95	2,434	16.34	8.36
0094	63	40	1.58	363	9.08	5.76
0098	53	26	2.04	440	16.92	8.30
0124	92	49	1.88	1,011	20.63	10.99
0138	53	28	1.89	872	31.14	16.45
0144	65	28	2.32	547	19.54	8.42
0145	68	30	2.27	441	14.7	6.49
0146	63	28	2.25	916	32.71	14.54
0147	193	130	1.48	3,232	24.86	16.75
0148	178	62	2.87	1,462	23.58	8.21
0153	179	84	2.13	3465	41.25	19.36
0168	64	32	2.00	833	26.03	13.02
0170	136	46	2.96	2603	56.59	19.14
0177	42	21	2.00	405	19.29	9.64