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Effectiveness of Fish Aggregating Devices in Freshwater Reservoir Fishery

N. Madhavan and N. Neethiselvan*
College of Fisheries Science, Andhra Pradesh Agricultural University
Muthukur - 524 344, India

Two types of bottom set Fish Aggregating Devices (FADs), one of pyramidal shape and another of semi-prismatic shape were constructed using used tyres having a total outer surface area of 60 m^2. They were tested for their aggregating efficiency in an artificial freshwater reservoir stocked with freshwater carps such as catla (*Catla catla*), rohu (*Labeo rohita*), mrigal (*Cirrhinus mrigala*) and silver carp (*Hypopthalmicthys molitrix*). The gill net catch around FADs and in non-FAD sites showed significant difference. Pyramidal FAD of 1.6 m height with tyres arranged in vertical orientation attracted more of surface feeders such as catla and silver carp compared to semi-prismatic FAD of 1.3 m height with tyres arranged in horizontal pattern. The gill net catch around pyramidal FAD was significantly higher than that of semi-prismatic FAD. The use of pyramidal FAD to improve catch per unit effort of gill netting in perennial reservoirs of the country, is suggested.

Key words: Fish Aggregating Devices, reservoir fisheries, catla, rohu, mrigal

Efforts have been made to study the fish aggregation efficiency of bottom set fish aggregating devices (FAD) in freshwater bodies by Prince *et al.*, 1985; Prince *et al.*, 1977; Gannon *et al.*, 1985; Mathews, 1985; Rutechki *et al.*, 1985. In India, however, studies on FADs in freshwater systems are scarce. In this paper, an attempt is made to study the effectiveness of two types of bottom-set FADs in a freshwater reservoir stocked with carps.

Materials and Methods

Three types of used tyres viz., type A, type B and type C (Table 1) were procured from local workshops and were used for the construction of the FADs. In pyramidal FAD, the tyres were oriented vertically and in the semi-prismatic FAD, the tyres were oriented horizontally. As the outer surface area of the tyres mainly decides the extent of algal settlement and growth, the tyres for both the FAD designs were selected in such a way that the total outer surface area was similar (60 m^2).

Type A and type B tyres were used to make pyramidal FAD. This design required 12 nos. of type A and 12 nos. of type B tyres. Type A tyres were arranged as bottom row, over which type B tyres were arranged in a hexagonal wheel pattern (Fig.1). Cast iron pipe of 76 mm diameter with mild steel base plate served as the central supporting structure. The junctions of the tyres were bolted using stainless steel bolt and mild steel supporting plates. Total height of the FAD was 1.6 m and the weight was about 600 kg.

Semi-prismatic FAD was fabricated using 110 nos of type C tyres. The supporting frame was constructed using 51 mm diameter pipe in a three-rack arrangement (Fig.2). Tyres were arranged on each rack, held in position using ropes. The height of the completed FAD was 1.3 m and weight 450 kg.

Both the FADs were installed in a freshwater reservoir belonging to a fertilizer company (Southern Petro Chemicals, Tuticorin). The reservoir had an area of 13 ha with a constant depth of 2 m. The reservoir had been stocked with 10,000

* Department of Fishing Technology and Fisheries Engineering, Fisheries College and Research Institute, Thoothukkudi-628 008, Tamil Nadu, India

Table 1. Specification of tyres used in FAD construction

Parameters	Type A	Type B	Type C
Outer diameter, mm	1000	650	400
Inner diameter, mm	500	350	260
Width, mm	200	120	100
Weight, kg	41	6.75	1.8

fingerlings each of *Catla catla, Labeo rohita, Cirrhinus mrigala* and 20,000 fingerlings each of *Ctenopharyngodon idella, Hypopthalmicthys molitrix* and *Cyprinus carpio*, a year before the start of the experiment. The FADs were positioned 60 m apart from each other and 500 m away from the shore. Care was taken to avoid inlet and outlet points at the installation site of the FADs. Ten cement blocks of 50 kg each were used as anchors to hold the FADs in position and an indicator float was attached by a short length of rope to each of the FADs to identify their position.

A gill net 120 m long and 5 m high, with a mesh size of 60 mm was operated around both FADs giving a clearance of 10 m from the FADs. Gill netting was carried out in non-FAD sites, which were about 300 m away from the FADs and the dike. Six fishing trials were conducted at an interval of 20 days. The total catch around both FADs and non-FAD sites were analyzed using ANOVA technique.

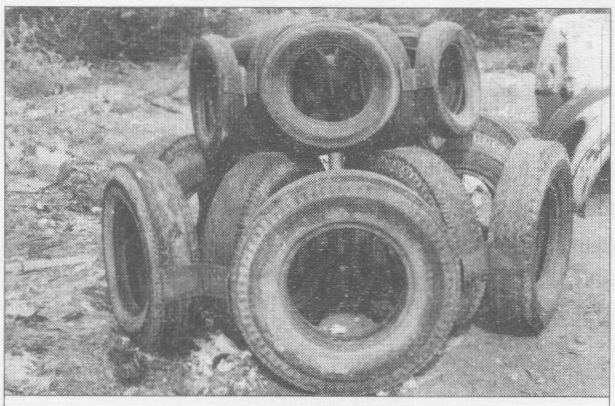

Fig. 1. Side view of Pyramidal FAD

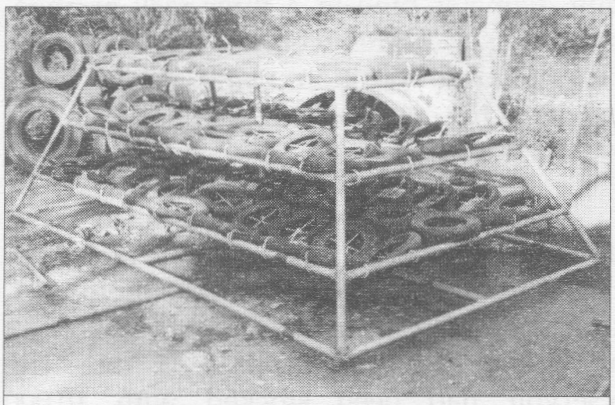

Fig. 2. Side view of Semi-prismatic FAD

Results and Discussion

Composition of fish catch around the pyramidal FAD, semi-prismatic FAD and non-FAD site are given in the Figs. 3, 4 & 5, respectively. Percentage composition at the time of initial stocking of reservoir was catla, 12.5%, rohu 12.5%, mrigal 12.5%, grass carp 12.5%, common carp 25% and silver carp 25%. During the study period, a higher proportion of catla was observed in the catches around both pyramidal (47.3 %) and semi-prismatic FADs, (47.5%) (Fig. 3 & 4) compared to other carps. Rohu was dominant in non-FAD site (72.2%), followed by mrigal (15.2%) and catla (12.6%) (Fig.5). The semi-prismatic FAD was found to attract relatively a higher proportion of midwater and demersal fishes, apart from pelagic species like catla. However, the pyramidal FAD attracted mainly the pelagic species viz., catla (47.3%) and silver carp (36.8%) (Fig. 3). Relatively higher proportion of midwater and demersal fishes in the catches around semi-prismatic FAD could be attributed to rack like arrangement which provides horizontal shelter spaces, facilitating aggregation of these fishes. Next to catla, silver carp was the dominant group in the catch around pyramidal FAD (Fig. 3) while it was mrigal in the catch around semi-prismatic FAD (Fig. 4). Silver carp did not appear in the catches from non-FAD sites (Fig. 5). Better catches of silver carp around pyramidal FAD may be related to higher amount of algae settled at the top of the pyramidal FAD compared to semi-prismatic FAD. Further, silver carp being a surface feeder (Jhingran, 1991), it is obvious that it could easily be attracted to Pyramidal FAD which extended more to the surface than the

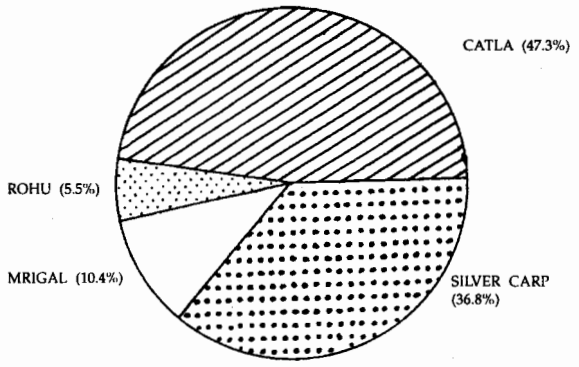

Fig. 3. Species composition of fish caught around Pyramidal FAD

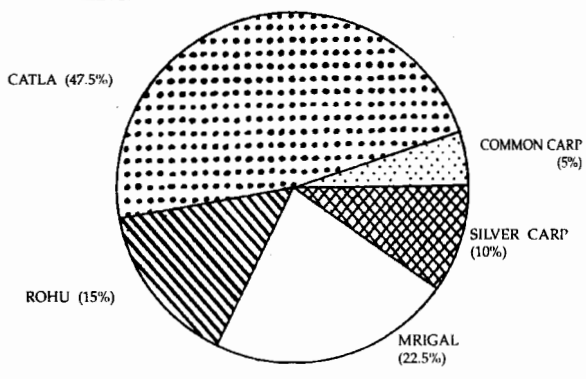

Fig. 4. Species composition of fish caught around Semi-prismatic FAD

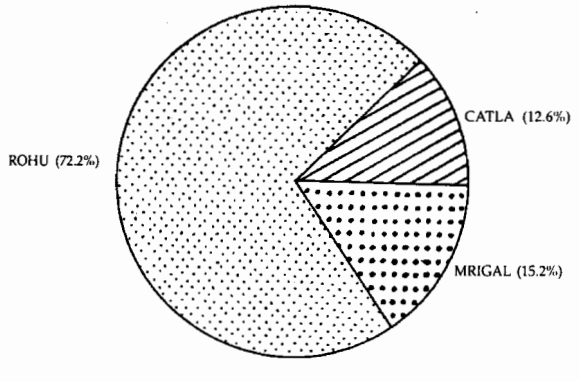

Fig. 5. Species composition of fish caught at Non-FAD sites

semi-prismatic FAD. Therefore, it is advisable to construct taller FADs extending to the water surface in order to attract pelagic fishes. Stone (1985) has suggested that for better availability of fish, high profile artificial reefs are more versatile than low profile reefs because they potentially harbour wider diversity of fish species. The present

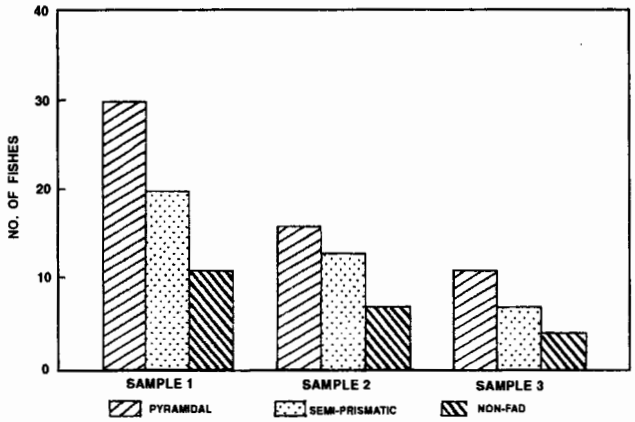

Fig. 6. Average number of fish caught per operation around FADs and in non-FAD sites

findings also support this view. A relatively higher proportion of catla around FADs in general, may probably be due to the relative abundance of zooplankton foraging on the algae settled on the FAD structures. The average number of fish caught per operation of the gill net around FADs and in non-FAD sites is shown in Fig.6. The total fish catch around FADs and catch during each fishing trial differed significantly ($p<0.05$) (Table 2).

Table 2. Analysis of variance of fish catch around FADs and non-FAD sites

Source of variation	df	ss	mss	F value
Between samples	2	260.22	130.11	12.0695**
Between FADs	2	204.22	102.11	9.4**
Error	4	43.2	10.18	

**Significant at $p<0.05$

Significant difference between the total fish catches around FAD and non-FAD site indicates the effectiveness of FADs in attracting the Indian major carps and exotic carp like silver carp. Comparatively higher fish catch around pyramidal FAD indicates its better efficiency over the semi-prismatic type.

The pyramidal type FADs may be used in perennial freshwater reservoirs for improved harvest of carps. The number of tyres of pyramidal FAD in vertical direction may be adjusted depending upon the depth of the reservoir so as to extend from bottom up to the surface layers.

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