

INVESTIGATIONS ON THE FISHERIES OF RIVER GODAVARI  
ANDHRA PRADESH: INDIA

by

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**Abstract**

The fishery of the Godavari River in Andhra Pradesh, India was investigated between 1962 and 1969. Evidence was obtained of a depletion of the yield of the fishery and regulatory measures are suggested. Observations are presented on the use of various fishing gears and the location of the breeding grounds of the economically important species. Special reference is made to Hilsa *ilisha* and *Macrobrachium malcolmsonii* with suggestions for their rational exploitation.

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## 1. INTRODUCTION

Investigations on the Fisheries of the River Godavari, in Andhra Pradesh, India, were carried out, from 1962 to 1969, by a team of research workers under the leadership of the Junior author. The project was funded by the Ministry of Food and Agriculture of the Government of India, through the Central Inland Fisheries Research Institute, Barrackpore. The research team devised a survey and research programme to tackle the specific problem of overfishing in this river.

The major difficulty was a complete absence of data on the species composition, fishing effort and yield of the river. 'Overfishing' was only suspected from reports of the fishermen and their evaluation by the Fisheries Department.

The present report is therefore a brief presentation of survey and research work over a seven year period. We are aware that the duration of the work is too short and is necessarily an incomplete approach to a problem of this nature. However, efforts have been made to suggest immediate management measures for a 'rational' exploitation of the Fisheries of the Godavari River.

More detailed research information is freely available at the Central Inland Fisheries Research Institute, Barrackpore, India.

## 2. RESEARCH INVESTIGATIONS

The main investigation related to the possible depletion of the fisheries of the river Godavari; subsidiary investigations ranged from the location of the breeding grounds of major carps, to the location of penaeid prawn fry for purposes of transplantation.

### 2.1 Investigation of the status of the fisheries

For practical reasons these investigations were limited to the region of the 'reservoir' or the part-closed river stretch laying between the two anicuts at Dummagudem (in the upper regions in the forest (Agency) areas of East Godavari District) and Dowleiswaram. This 'reservoir' was divided into three zones (I, II, III).

The main fish groups that contribute to the fishery of the River are the major carps, in order of importance, *Labeo fimbriatus*, *Cirrhina mrigala*, *Labeo calbasu*, *Catla catla* and *Labeo rohita*, and the larger cat fishes *Mystus seenghala*, *Mystus aor*, *Wallago attu*, *Pangasius Sionia childreni* and *Bagarius bagarius*. A single species of prawn, *Macrobrachium malcolmsonii*, holds a position of considerable importance in the landings. The anadromous *Hilsa ilisha* also makes a considerable contribution to the purely freshwater fishery as it migrates into the river to breed. There are several species which make a minor contribution to the landings. The biological studies were limited to five species, i.e., *L. fimbriatus*, *C. mrigala* (being the two most dominant major carps), *M. seenghala* (being the single largest contributor from among the cat-fishes), *Macrobrachium malcolmsonii* (the prawn) and *H. ilisha* (the migratory fish).

From the point of view of the depletion of the fisheries, a detailed study was conducted on the relationship between total yield, total effort and the resulting catch per man-hour.

There are two major types of exploitation affecting the fishery; one from migratory fishermen who come from outside the area and the other is exploitation by the fishermen population of villages along both banks of the river.

The distribution of the total fishing effort, using different types of gear, is given in Table 1.

In 1962 there was a sudden and radical change in the fishing gear with the wider use of synthetic (nylon) fishing twine. In a short time there was considerable increase from 7 nylon nets during 1959-62 to 121 nets by 1965. Conversely, Rangoon nets were reduced from 173 to only 12 by 1965. This sudden increase in the adoption of improved (more efficient) gear coincided with the statistical sampling of fish catches by this survey unit.

With the rise in gear efficiency, the exploited area also expanded and there was a considerable movement of fishing gear between the zones. The maximum change in effort, apart from the use of gill nets, occurred with the *Alivivala* in 1965 with a reduction of about 20 percent. Fishing with nylon gill nets in zone II, the major fishing ground, increased by 136 700 man-hours (244 percent) producing an increase of 5.1 t (37.5 percent) in the yield. In zone III the gill net fishery increased by 44 200 man-hours (421 percent) but there was a decline of 0.3 t (5 percent) in the catch.

The catch per man-hour is generally highest in the gear catching the small-sized fish, i.e., *Jarugavala*, cast net, *Alivi*, etc. The maximum catch observed from any gear in this river was about 0.56 kg per man-hour. In the gill nets which account for the larger size groups, the catch per man-hour was generally very low, about 0.21 kg. to 0.52 kg. This was observed to show further reduction, to a range of 0.08 kg to 0.14 kg, during the period 1965 to 1966.

### 3. CONCLUSIONS

The above investigations have thrown some light on the problems posed by the State Government.

#### 3.1 Decline in the fishery

A 4-year investigation period is too short to arrive at any positive conclusions concerning the fishery resources of the river. The various fluctuations, sometimes highly variable, could be due to environmental changes and also, possibly, to overfishing. There appears to be a decline in the catches of the major fish, after an increase in catches between 1963 and 1964 (224.7 - 244.8 t). The decline has occurred despite the introduction of more efficient nylon nets and the increase in gill net fishing effort. There has been a fall in the mean size of some of the major species landed. Coupled with possible adverse environmental conditions, the efficiency of gill nets proved detrimental to the fish populations in the river during this period. This was reflected even in the catches from *Benduvava* (drag gill net) which concentrate on one species (*L. fimbriatus*). At one stage, the operations of *Alivivala* having become uneconomic, 50 percent were shifted to other waters. The operation of nylon gill nets, in which cat-fish get entangled, could be one of the reasons for the decline in the catch of these species.

An irrational exploitation of the river fishery by catching very small and immature fish, was observed in the catch composition of nets like the *Alivivala* and *Iragavala*. Combined with the decline in the catches of large-sized fishes in gill nets, this may ultimately lead to depletion of the entire fishery if it is allowed to continue uncontrolled.

Investigations have indicated that in the period May to mid-July exploitation by gill nets is quite considerable. This is the pre-breeding period and the exploitation is concentrated on ripe and ripening fish. Between August and October flooding in the river prevents any large-scale fishing, except for the drift gill fishery of *Hilsa ilisha*.

The breeding grounds of major carps and cat fishes are widely dispersed over the entire investigated stretch with, however, a major concentration in the region "Polavaram to the Papi hills area". This stretch is being exploited by the migratory fishermen.

It was considered that instead of the present closed season extending from May to September, there should be a short closed season, for exploitation by gill nets and *Alivivala*, from 1st May to 30th June and another from 1st October to 30th November. Control by licensing would be the most effective method of enforcement. Since the migratory fishermen come from outside the regions, those units could be permitted to fish from 1st December only. The destruction of juveniles could be restricted by control on the operation of nets like *Alivivala*, *Kontevava* and cast nets in the months of recruitment of juveniles to the fishery, i.e., from October to December. A closed season could be regulated accordingly.

Special mention must be made of the need to enforce the prohibition of fishing for *Hilsa ilisha* by drift gill nets below anicuts from July to October. The present investigations have indicated that despite this area being the concentration point of the migration of *Hilsa* for breeding, there is evidence to suggest that breeding takes place along the entire estuarine stretch of the river. The primitiveness of the boats (being non-motorized) engaged in this fishery limits their operation to certain periods related to the floods. Therefore, it would appear desirable that *Hilsa* fishing, by drift gill nets, should be restricted by limiting the number of licences issued in addition to the total closure of fishery from July to October within a mile of the anicuts.

### 3.2 Regulation of fishing gear

It would be more rational to control the gear in use rather than impose a prolonged closed season. The data on catch and effort of the various gear in use obtained by this investigation will aid in the formulation of the appropriate regulations. It has been shown that the present pattern of fishing is uneconomic and this has to be rectified by restricting the issue of licences. To maintain the *status quo* and to avoid hardship to the fishermen, the existing nylon gill net effort could be fixed as the maximum above which no fresh licences would be issued. The number of licences could be reviewed after some time, after considering the dynamics of the fish populations of the economically important species.

The "migratory" fishermen are an important element in the Godavari fishery and if well regulated can provide a sustained fishery. As a first step the migratory fishermen could be licensed to fish only in freshwaters, from 1st December to 30th April each year. This allows a stabilization of the fishery after the floods, both for adult and juvenile groups, and a period in June for the ripening of mature fish.

Our investigations have shown the necessity for limiting the mesh size of gill nets and cast nets. The fishermen are now using gill nets of from 11.0 cm to 15.0 cm in the higher range and from 6.5 cm to 8.5 cm in the lower range. It appears desirable to prohibit entirely the use of the smaller range of meshes for any type of gear and to permit only the use of the existing range of larger meshes. The State Government's conservancy regulations include a size limit for fish that can be captured. This is a very desirable restriction and should be continued.

The total prohibition of gear such as the large seine (*Alivi*) is not advisable, nevertheless, this gear can be regulated by a 20 percent cut in the existing number of units, or restricting its operation during the juvenile recruitment period (October to June, in zones I and II). The present studies have also indicated that the *Iragavala* (a type of bag net) which is fairly destructive, should be prohibited entirely at Dummagudem, where about 6 units are operating. This type of gear captures and retains small size groups, mainly cat fishes, measuring 20-100 mm in total length. The use of this unit should be prevented in a fishery where replenishment of juveniles is becoming uncertain and irregular.

### 3.3 Location of breeding grounds

Investigations over a period of five years show a concentration of maturing or ripe major carps and cat-fish in the upper reaches of the river during pre-monsoon months. Even larger age groups of *C. mrigala*, *L. calbasu* and occasionally *C. catla* concentrate from Polavaram to the Papi Hills Range from May to July. All age groups of *L. fimbriatus*, *L. calbasu* gather in large groups from Kinnersanivagu near Bhadrachalam to Dummagudem upstream and beyond. Thus, it has been possible to delimit the spawning area for all the major carps, except *L. fimbriatus*, as being between Polavaram and the Papi Hills Range, and a spawning area for *L. fimbriatus* and other major carps from Kinnersanivagu near Bhadrachalam to Dummagudem.

Among the cat-fishes, while *M. seenghala* was seen to be maturing in these waters and ova-maturation studies further indicated its breeding in both of the spawning grounds mentioned above, other species such as *Silonia childreni* and *Bagarius bagarius* were not observed to breed in this region at all. It is highly probable that they breed further upstream above the Dummagudem. However, juveniles of these species, ranging in size from 15 to 30 mm, could be commonly collected as far down as Dowlaiswaram during the floods.

### 3.4 Occurrence of juvenile Penaeid prawns

During 1964, the Unit conducted investigations in the estuaries of the Godavari, using similar sampling techniques as in the freshwater stretch. Data were obtained on catch and effort, species and size composition, etc. During this period, regular tow-net samples in the estuary showed a large-scale occurrence of larvae, post-larvae and juveniles of penaeids, alpheids and sergestids.

Several penaeid prawns have a prolonged breeding period of from 6 to 10 months. The occurrence of fresh waves of larvae and post-larvae is a constant factor in that area of the estuary influenced by tides. Post-larvae and juveniles of *Metapenaeus monocera*, *M. dobsonii*, *M. affinia*, *Penaeus monodon*, *P. semisulcatus* and *P. indicus* (mixed with alpheid species) in the size range 8 to 30 mm, were available in the middle and lower sections of the estuary during January to March and October to December.

### 3.5 Investigations on *Hilsa ilisha*

In addition to the investigations conducted with specific reference to the problems posed by the State Government, some attention was given to the study of 'Hilsa' in view of its great economic importance and its wide distribution. *Hilsa* is known to migrate up the estuaries of rivers in two waves, in the monsoon period and during the winter months. This was the normal phenomenon in the Godavari river until the early sixties. Since then, heavy siltation of the river bed, at and below the anicuts at Dowlaiswaram, has made the winter "run" impossible.

Earlier investigations of the Hilsa Research Unit, Barrackpore have, however, shown that ripe and running fish are encountered along the entire estuarine length of the Godavari and that breeding is probably taking place all along that stretch. There has probably been a modification in spawning habits and spawning grounds of this fish. The study so far carried out has proved that the fish does breed just below the Dowlaiswaram anicuts in late September. It has also indicated that stripping and artificial fertilization, followed by pond rearing, could be a fruitful line of investigation and development.

The juveniles of *H. ilisha*, ranging in size from 45-270 mm, form a fishery in the 'reservoir' region from December to July and are exploited by the *Alivivala*. It is perhaps possible to capture them alive and attempt to grow them in freshwater ponds.

### 3.6 Investigations on *Macrobrachium malcolmsonii*

Special attention has also been given to the study of *M. malcolmsonii*, in view of its economic importance and the large numbers caught. Breeding was observed to last from July to October, with two peaks. The heavy exploitation of the juveniles and hydrobiological factors affecting the survival of the larvae are presumed to be two of the reasons responsible for the wide fluctuations in the catch of these prawns.

The extraordinary phenomenon of a mass movement of juveniles of this prawn across the anicut at Dowlaiswaram into the deeper water 'reservoir' region is noteworthy. The juveniles are in a size group of from 15 mm to 30 mm (3.0 mm to 6.0 mm carapace lengths). The capture of these size groups by the fishermen has been pointed out to be a destructive practice adversely affecting the fishery in the 'reservoir' portion. A record catch of 25 kg per night has been observed. The total number of juveniles per kg varies from 4 000 to 5 000. It is suggested that this capture of juveniles below the anicut, aprons of scouring sluices, etc., be prohibited and a better utilization of this size group be made by transplantation to other water areas where they can be grown to a marketable size. The rational use of this valuable prawn "seed" is especially important in view of the high market price obtained for prawns and the large potential for freezing and export.

## 4. ACKNOWLEDGEMENT

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TABLE 1

THE GODAVARI RIVER FISHERY: THE DISTRIBUTION OF FISHING EFFORT  
(PERCENTAGE OF MAN-HOURS) AMONG DIFFERENT GEAR TYPES

Zone	Nylon set gill nets (%)	Drift gill nets (%)	Drag gill nets (Benduvāla) (%)	Shore seine (Jaruguvāla) (%)	Large seine (Alivivala) (%)	Drag nets (Kontevāla) (%)	Cast nets (%)	Stake nets (Kattuvāla) (%)	Other gear (%)
I ...	11.2	28.2	—	28.8	8.2	3.9	11.4	4.8	3.0
II ...	71.1	—	—	8.8	12.8	—	2.8	—	4.4
III ...	19.6	—	7.7	2.2	—	5.4	60.5	—	4.7