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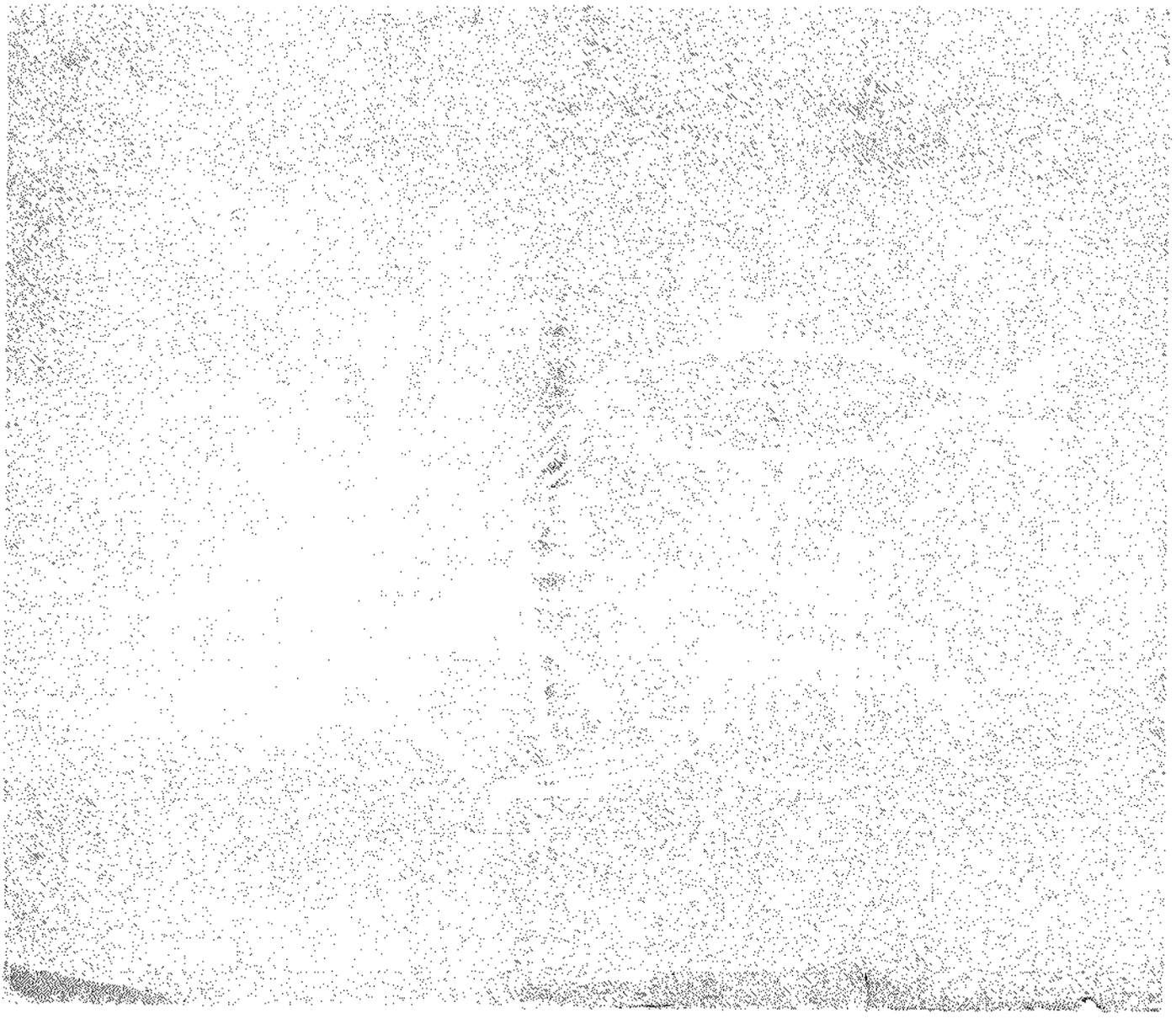

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THE GREY MULLET FISHERY RESOURCES OF INDIA

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ABSTRACT

Thirteen species of grey mullet could be well recognised to be occurring in India. Of these, 8 species contribute to the commercial catches. They are, *Mugil cephalus*, *M. cunnesius*, *Liza macrolepis*, *L. parsia*, *L. tade*, *Ellochelon vaigiensis*, *Valamugil seheli* and *Rhinomugil corsula*. The other known species are *L. carinatus*, *V. buchanani*, *Sicamugil cascasia*, *Plicomugil labiosus* and *Crenimugil crenilabis*.

Mullets are caught along the sea coast, in the lagoons and the adjoining brackish-water lakes, and in the estuaries. As they are caught almost throughout the year, they are a valuable source of food-fish during the offseason of the other commercial fisheries. Since mullets in general are hardy fish they are best suited for fish farming through which could be obtained better increments in growth and a ready source of fish.

Although repoits are available about the mullet fishery resources from the sea on an all-India basis, similar information for the brackish-waters is lacking. Therefore an attempt has been made to estimate the brackish-water and total mullet fishery resources of India. Information on the availability of fry and fingerlings has been given.

THE grey mullets occur all along the sea coast, in the lagoons and the adjoining brackish-water lakes, and in the estuaries. While estimates of the quantity of mullets caught in the sea are available on an all-India basis, similar consolidated information is not available for the coastal brackish-waters of India, wherein mullets abound. Such an information is not readily available for the different regions along the east and west coasts of India. In the present account, therefore, the available information on the grey mullet fishery is presented together with some description and consideration of the resource in general.

The estimated landings of mullets from the sea in India during the years 1961–67 ranged from 862–3,155 tonnes with an average at 1,761 tonnes. Their percentage composition State-wise is as follows: Gujarat 31%, Maharashtra 10%, Goa 2%, Mysore 1%, Kerala 9%, Madras 37%, Andhra Pradesh 9% and West Bengal and Orissa 1%.

Of the mullets caught from the brackish-waters of the country, data are limited to certain States only as given below. The source of the information has been cited under remarks.

State	Average annual landings in tonnes	Remarks
Kerala ..	512	Govt. of Kerala, Fisheries Dept. Administrative report for the years 1965–66 and 1966–67.
Madras ..	335	Chacko and George, 1958.
Andhra Pradesh ..	105	Govt. of Andhra Pradesh, Dept. of Fisheries. Annual Administration Report—1965–66 and 1966–67.
West Bengal and Orissa ..	906	Shetty, Chakraborty and Battacharya (1965), and Annual Report of the Central Inland Fisheries Research Institute, Barrackpore. Data limited to the Chilka Lake (1960–61 to 1966–67), Mahanadi estuary (1960–61 to 1964–65) Hooghly and Matlah estuary (1963–64 to 1966–67).
Total ..	1,858	

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Thus, information on the brackish-water mullet resources from States of Gujarat, Maharashtra, Goa and Mysore was not available. If it could be assumed that a minimum of 400 tonnes of mullets are annually landed from the above four States together the total mullet catches annually in India come to about 4,000 tonnes. The principal regions supporting mullet fishery in India are the estuaries of the rivers Ganga, Mahanadi, Godavari, Krishna and Cauvery and the brackish-water lakes of Chilka and Pulicat on the east coast, the estuaries of the Narmada, Tapti, the Gulf of Kutch and the backwaters of Kerala, notably the Vembanad Lake, the Kayamkulam Lake, and the Ashtamudi Lake, on the West Coast.

In India nets specially meant for catching mullets are devised with regard to their peculiar habits. They are known to ascend in schools to the shallow littoral areas and connected creeks and channels with the high tide for feeding purposes. Such schools when scared, leap and rush in their effort to escape. Mullets are caught mainly in the gill-nets, *Mangan jal* and *Khanderi jal* in the Gulf of Kutch and Gulf of Cambay. *Kendai valai* in the Coromandel coast, *Khainga jalo* or *Nolijalo* and *Menjia jalo* in the Chilka Lake; in the cast nets, *Pag* in Konkan area, *Shendi* in North Kanara; *Veechu valai* in the Coromandel Coast and *Kapla jal* in Bengal; in the dip nets, in Kanara and Kerala, *Hela jal*, *Kharra jal* and *Korsula jal* in Bengal, in the stake nets or barrier nets, *Jadi jal* in the Gulf of Cambay, *Valu valai* and *Waghur* in Kanara and Kerala, *Kalamkattivalai* in the Palk Bay and Gulf of Mannar, *Kala valai* and *Kattu valai* in the Coromandel Coast, *Jano* in the Chilka Lake, and *Char-gherra jal*, *Bher jal*, *Charhatta jal* and *Komar jal* in Bengal; and in the pouch nets, *Ghalwa* in the Gulf of Cambay and *Vidu valai* in Palk Bay and the Gulf of Mannar, and *Iriga valai* in the Coromandel Coast. The last mentioned net is specially adapted to catch mullet in the spawning run.

The estimated annual mullet catch for the Chilka Lake during the years 1960–61 to 1966–67 ranged from 362–919 tonnes with the average at 647 tonnes, which formed 18·35% of the total fish landed. In the Mahanadi estuary during the years 1960–61 to 1964–65, it ranged between 134 and 329 tonnes with the average at 228 tonnes, which formed 34·45% of the total fish catch. Here the mullets form the second biggest fishery. In the Hooghly-Matlah estuary during 1963–64 to 1966–67 the mullet catch ranged between 51–68 tonnes with the average at 57 tonnes, forming 0·75% of the total fish catch. In the Pulicat Lake it ranged between 181 and 317 tonnes during 1964–65 to 1966–67 with the average at 234 tonnes, which formed 39% of the total fish catch.

Brief descriptions of the mullet resources of the above areas and a few other places are given here based on information available from published accounts (Pillay, 1949, 1954; John, 1955; Sarojini, 1957, 1958; Jhingran, 1958; Luther, 1968), reports of the Central Inland Fisheries Research Institute (India) and from the author's observations.

Of the 13 species of grey mullets that could be well recognised to be occurring in India, the following eight species contribute to the commercial catches. *Mugil cephalus*, *M. cunnesius*, *Liza macrolepis*, *L. parsia*, *L. tade*, *Ellochelon vaigiensis*, *Valamugil seheli* and *Rhinomugil corsula*.

M. cephalus

This is the most common and widely distributed species of the mullets in India. It is known to occur in sea, brackish-water and freshwater. However, this species appears to be rare in the Hooghly-Matlah estuarine system. In the Chilka Lake this is the most common mullet with an annual catch ranging between 269 and 355 tonnes and forming 9–14% of the Lake's annual production, and 60–70% of the total mullet catch. Fishing season extends almost throughout the year. It is mostly caught by *Jano* fishing. The total size range is 15–78 cm. with a common size between 22 and 42 cm. Fish up to 35 cm. form about 59% and 35–52 cm. fish form about 36%. Fish with roe is common during September–January forming a peak in October–November. This species undertakes seaward breeding migration from September/October to December, when sizes between 35 and 53 cm. are common in the catches. In the Mahanadi estuary, the species is available throughout the year, with the peak fishing season during September–November/December. It

forms 12–15% of the total fish catch, with a total size range of 10–84 cm. and a common size of 21-32 cm. In the Godavari estuary this species formed 4·4% of the total annual catch of 3,116 tonnes during 1964–65. In the Pulicat Lake, this is very common in the mullet catch, and is abundant during April, June–July, December and March with the dominant size between 20 and 43 cm. Fish with roe occurs for a few months from November onwards. At Mandapam sizes between 7 and 31 cm. are commonly caught from the Palk Bay and the Gulf of Mannar. In the Kayamkulam and the Vembanad Lakes the species is very common, occurring in the size range of 23–61 cm. and with roe from October to January in the former. Fry of about 25 mm. are abundant from November to February, fingerlings 40–70 mm. being common during January-February in the Chilka Lake. In the Mahanadi estuary, post-larvae of 12–13 mm. occur from January to April. In the Pulicat Lake and at Mandapam fingerlings of about 70 mm are common in January.

L. macrolepis

This is the second important species of mullet in India. It is known to occur in the sea, brackish-water and freshwater. In the Chilka Lake its annual contribution ranges from 36 to 235 tonnes forming 1–7% of the Lake's annual fish production and about 20% of the total mullet catch. It occurs throughout the year with the peak fishing season between December and January. The total size range in the fishery is 12–60 cm. Fish between 18 and 42 cm. form 80% of the catch. Seaward breeding migration was observed in December–January when sizes between 29 and 39 cm. were common in the catches. Fish with roe are available during October to January. In the Mahanadi estuary the species forms nearly 8·6% of the total fish catch. Fish of 20–60 cm. with common size between 30 and 40 cm. are caught. Peak fishing season is between September–February. In the Pulicat Lake this species forms nearly 58% of the mullet catch, with a peak fishing season during August to February, sizes between 14–27 cm. being common. At Mandapam sizes in the catch range between 7 and 28 cm. with a common size between 11–17 cm. Fish with roe occur mainly during June to August. This is a common species in the Kayamkulam and the Vembanad Lakes, occurring in the size range of 7–61 cm. in the former, with the fishing season extending from July to April and fish with roe occurring during September–January. Fry of 10–12 mm. are common during December–February in the Chilka Lake, while fry and fingerlings are common at Mandapam during June to December.

L. parsia

This is a common mullet in the middle and lower zones of Hooghly-Matlah estuary and forms nearly 0·4–0·9% of the total fish catch, with a total size range of 2–24 cm. Fish with roe occur during October–February. In the Mahanadi estuary this species forms 6–9% of the total catch, fishing season being from September to December, and the total size range between 5 and 26 cm. with the common size at 13 cm. In the Pulicat Lake this species is common during August and November, with common size between 14–19 cm. At Mandapam it occurs in small quantities with common size between 12 and 17 cm. larger sizes with roe occurring during June to August. It is also a common species in the Kayamkulam and Vembanad Lakes with the common size between 13 and 23 cm. in the former during July to February. Fry and fingerlings occur from January to March/April in the Hooghly-Matlah estuary. On the Contai coast the fry of *M. dussumieri* (= *L. parsia*) occur during October–November. In the Mahanadi estuary, post-larvae 24 mm. occur in January.

L. tade

This species is common in the lower zones of the Hooghly–Matlah estuary, forming 0·1 to 0·2% of the total fish catch, the common size ranging from 4 to 30 cm. In the Mahanadi estuary, this fish forms about 0·7% of the total catch, and is abundant during September–November. It forms an important fishery in the Kayamkulam Lake from July to February. The size in the catches range from 13 to 46 cm. Fish with roe occur from September to March. Fry 2·5 cm. size occur in the Hooghly–Matlah estuary during March–May and July–August, and 3·5 to 3·6 cm. size during September to November. On the Contai coast fry occur during July–August.

M. cunnesius

This does not seem to contribute to any notable fishery anywhere in India. Small quantities are caught in the river Matlah and in the coastal waters off the Contai coast from May to October; in the outer channel of the Chilka Lake during summer and winter months. In the Mahanadi estuary, this fish sometimes contributes significantly to the catches during September to November/December forming about 6–8% of the total fish catch with the size ranging from 4 to 41 cm. and with the common size at 16 cm. At Mandapam 10 to 13 cm. fish occur during November–December/January and fish of 20 cm. size with roe during July–August. It is common in the Kayamkulam and the Vembanad Lakes, fish with roe being common in the former during December–March. Fry of *M. speigleri* (= *M. cunnesius*) occur on the Contai coast during July–August.

R. corsula

It occurs in small quantities in the river Ganga, the Hooghly–Matlah estuary, along the Coast off Midnapore, in Mahanadi estuary and in the Chilka Lake. Fry of about 25–45 mm. occur in the Hooghly–Matlah estuary during October–November; on the Contai coast during July–August; in the rivers Ganga and Jumna early fry are available during April–May and September–November. In the Chilka Lake, eggs and larvae are available during July–December and juveniles 23–122 mm. from July to August.

V. seheli

This is caught occasionally in the Chilka Lake. In the Palk Bay and the Gulf of Mannar fish ranging from 30 to 45 cm. are caught during June to August.

E. vaigiensis

This is common in the catches along the West Coast and on the East Coast up to Madras, contributing stray numbers. At Mandapam size up to 55 cm. are available. In the Vembanad Lake it is one of the four common species of mullets. Fry occur in the coastal and the adjacent areas of the Palk Bay and the Gulf of Mannar during November to February.

General Remarks

Besides serving as a delicious table fish, the grey mullets are important in that they are hardy fish and one of the best suited of fishes for fish farming. Thus the significance of mullet resources of our waters lies not so much in its existing capture fisheries as in its potential as culture fishes for extensive fish farming. Although mullets are generally employed in brackish-water fish farming, they have also been successfully employed in freshwater fish culture (Lin, 1940; Job and Chacko, 1947; Pillay, 1949). Experiments by Fishelson and Popper (1968) indicate that culturing o *M. cephalus* and *Tilapia* hybrids together may be of great economic value in that it enables exploitation of the numerous salt marshes and saline waters such as in the desert part of Israel and other arid regions of the world. Nair *et al.* (1967) have observed *M. cephalus* to survive at salinity of 65·55‰ and *L. macrolepis*, *L. parsia* and *Tilapia mossambica* to survive at salinity of 91·34‰. These species may be well suited for rearing in brackish-water environments.

Zarka and Fahmy (1968) have found that phosphate fertilizer was most effective among other fertilizers, *viz.*, Calcium ammonium nitrate either separately or in combination and organic manure (Cowdung), in the Mex Fish Farm in Egypt, showing an increased mullet production by 166·7 per cent. Pillai (1962) has observed that fertilizing the ponds in Hong Kong with organic manures like excreta of pigs, ducks and human beings, sometimes substituted by dung of herbivorous animals such as cattle, horses and goats, gave a general yield, from a well-maintained pond, of about one ton per acre per annum.

A study of the reported breeding periods of Indian mullets (Luther, 1967) together with the periods of occurrence of their fry as mentioned in this account suggets that mullet fry of one species or another would always be available in a broad region along the Indian coast in a year. Establishment of fry collection and acclimation centres in suitable areas and organization of fish fry trade would pave the way for proper utilization of this natural resource.

Besides the very fertile backwaters of the south-west coast of India and the salt-water areas adjoining river mouths and surrounding the salt-water lakes, there are other extensive but less productive salt-water lagoons spread over the east coast which altogether are estimated to cover about 3,000 hectares. It is to develop these areas and to take advantage of their potential that our attention will have to be immediately devoted (Tampi, 1967). Fish farming could also provide useful occupation to fisher folk particularly during unfavourable weather and during the offseason.

Tampi (*op. cit.*) has made several practical suggestions in order to develop an industry for increasing the fish production in the available areas. Fish farming could turn out to be a profitable line of business and as such private enterprisers and co-operative agencies may be encouraged to take up practical fish farming. The Government should provide them with suitable subsidy and lagoons on nominal lease, besides scientific advice and supervision. Extension education in practical fish farming may attract many to this occupation. Efforts on these lines are bound to boost production of mullets and other cultivable fishes to meet the increasing demand for fish.

Summary

The State-wise estimates of annual mullet production from the sea and the coastal brackish-waters in India are presented together with a brief description of the mullet resources, species-wise and area-wise and of the seasons of availability of the mullet fry. About 1,760 and 2,260 tonnes of mullet are caught annually from the sea and the coastal brackish-water areas respectively. However, the significance of mullet resources of our waters lies not so much in its existing capture fisheries as in its potential as culture fishes for extensive fish farming. Easy availability of mullet fry and the presence of vast brackish-water areas along the Indian coast call for greater efforts to utilize the mullet fry resource and to harness the extensive brackish-water coastal areas for increased mullet production, preferably by mixed fish farming. Some suggestions are made to develop a viable fish farming industry along these lines.

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