

Studies on Grey Mulletts Collected from Interu Swamp, at Krishna Estuarian region, Andhra Pradesh, India

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Abstract

The current study aimed to evaluate the taxonomic species identification of mulletts collected from Krishna estuarian region, east coast of Andhra Pradesh, India. The study area was extended over an area of 1079 hectares and joins Bay of Bengal by a channel which was 200m wide. The mulletts were captured by the traps. Based on the taxonomic description of the species collected from the Interu swamp, there were two species abundantly distributed along the Krishna estuarian region. The identified species were *Mugil cephalus* (Linnaeus, 1758) and *Rhinormugil corsula* (Hamilton – Buchanan, 1822). Present study suggests that there were two pyloric caecae recorded mulletts collected from the Interu swamp. This was the first report from India at Interu swamp in Grey mulletts.

Key words: *Mugil cephalus*, *Rhinormugil corsula*, Pyloric caecae, Estuary, Interu swamp.

Introduction

Grey mulletts (Mugiliformes: Mugilidae) are cosmopolitan in distribution and are present in coastal waters of tropical and sub-tropical zones¹. Mulletts form a fishery in Eastern and Western Atlantic Oceans, including Mediterranean Sea and the Eastern Pacific Ocean². Among the commercially important species of mulletts, *Mugil cephalus* grows to a fairly large-size (about 65 cm in length). Mulletts are euryhaline and also eurythermic³.

Mulletts belong to the family Mugilidae and are included in order Mugiliformes. Berg⁴ separated the Mugilidae from the Perciformes as the separate order Mugiliformes⁵. Greenwood *et al* included Mugilidae under the order Perciformes⁶. They are regarded as the most primitive among members of Perciformes. The Mugilidae has been recognized into two subfamilies Mugilinae and Agonostominae. The members of the family Mugilidae are worldwide in distribution and are present in all oceans excluding the polar region¹.

Mulletts are represented by 14 Genera and 64 species globally⁷. Recent taxonomic studies recorded five genera and 13 species as occurring in coastal waters in the Indian region. Some of these species inhabit the estuaries along the Indian coasts and lower regions of the rivers^{8,9}. They are known to migrate to the oceanic regions for the purpose of spawning. Along the east coast of India about 9 species are known to occur in the inshore areas and estuaries¹. Taxonomic status of mulletts has been reviewed earlier by different workers¹⁰⁻¹³.

Physiography of the interu mangrove swamp: River Krishna, a peninsular river flowing eastward opens in to Bay of Bengal in the state of Andhra Pradesh. Along the northern part of the estuarine region the Interu mangrove swamp is formed. The

Interu mangrove swamp is located between 16° 16' N latitude and 81° 14' E longitude. The swamp extends over an area of 1079 hectares and joins Bay of Bengal by a channel which is 200m wide, Sea water enters in to the swamp through this channel during high tides. This channel is present on the northern part of the swamp. It receives freshwater from the north eastern side through Pedalanka drain during a major part of the year except in summer. The Pedalanka drain receives water from agricultural lands in coastal areas of Krishna district. Freshwater enters the swamp over a period of 8 to 9 months in a year from August to March-April and maintain the estuarine conditions in the Mangrove swamp. A road is formed across the swamp for the movement of the people from Interu village to Bantumilli delimiting the small southern part from the extensive northern part. The road which connects the northern and southern parts of the swamp has number of vents shown Figure-1. Depth of the swamp 3 feet during low tide and 8 feet during high tide. The salinity of the swamp water varies between 8 and 25 ppt during different seasons. During monsoon period the salinities are low while in spring and summer the salinities are high.



Figure-1
Interu swamp

Along with the tidal waters many species of marine fish enter the swamp and are captured by operation of cast nets and bag nets. Seed of cultivable brackish water fish and shrimp are also captured in the swamp. On the northern and north eastern part of the swamp mangrove vegetation is spread over an area of 8 lakh sq m. In this part of swamp true estuarine conditions are maintained because of influx of both freshwater and sea water. The mangrove vegetation is represented by *Rhizophora* and *Avicennia* species. Many estuarine fish and shrimp seed of cultivable species is collected by fisher women manually using Dip nets. The seed is sold to the aqua farmers in this region. The seed collection activity is carried out nearly for 4 to 5 months by the fisher women. The mangrove swamp serves as a potential centre for brackish water fish and shrimp seed. The fish include mullets, *chanos*, *Lates* and shrimp.

Material and Methods

In the Interu mangrove swamp fish are captured by the fishermen living in the surrounding villages. There are about ten villages and nearly 200 fishermen families depend on exploitation of fish and shellfish in this mangrove swamp and in the near coastal waters. The types of gear used by the fishermen in this area to capture mullets along with other brackish water fish are traps and nets.

Traps: The fish are captured by operating the gear called 'fishing trap'. The traps are made of split bamboo screens and are of three types.

Square basket traps: Each basket traps is rectangular in shape and measures three feet in length, 2 feet in width and 2.5 feet in height. Each trap has two openings on one side through which the fish enters the trap. Marginal areas of the swamp are enclosed by using bamboo screens and at the outlet point these traps are placed in figure-2. When the water recedes during low tides, the fish get caught in the traps. The fish collected in the traps are removed everyday and the traps are replaced after removing the fish. It is called 'Pette mavu' in local language.



Figure-2
Square Basket trap

Another type of trap is also operated in the swamp. This trap has a circular mouth with a rectangular bottom and there is an opening near the rectangular bottom on one side to permit the entry of fish in to the trap. The mouth of the trap is kept above

the water level to facilitate the removal of the trapped fish. These are also operated along with the basket traps. This trap is called in local language as 'Ootha'.

The third type of trap is conical in shape with a large circular opening at the bottom shown in Figure-3 and a smaller circular opening at the top to remove the trapped fish. When the fish are noticed by the fishermen these traps are lowered in to the water so that the fish get trapped. This is an example of 'vertically falling gear'. It is locally called as 'garre'



Figure-3
Conical trap with circular opening

These three types of traps are operated during all seasons of the year in this swamp.

Nets: The vertically falling nets called the cast nets are also employed with in the swamp for catching fish. This net is operated either from the shore or wading through water. The fishermen also use small sized scoop nets, triangular in shape with smaller mesh size to catch the seed of the fish and shell fish with in the mangrove swamp. These are mainly operated by fisher women. They walk across the swamp in the shallow areas and collect live seed of milkfish, mullets, *Lates* and commercially important shrimp to supply to coastal aqua farmers. The fish captured in the Interu swamp by the fishermen are marketed at the fish market in Bantumilli village represented in figure-4.



Figure-4
Fish market at Bantumilli

Results and Discussion

Taxonomic descriptions of mullets collected from interu mangrove swamp: Super Order – Acanthopterygii, Series – Mugilomorpha, Order – Mugiliformes, Family – Mugilidae, *Mugil cephalus* Linnaeus, 1758 (figure- 5)

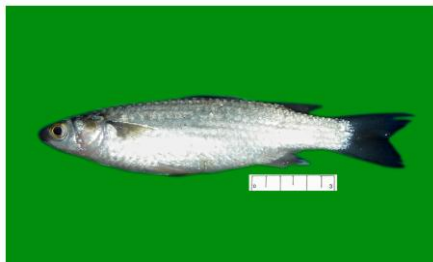


Figure-5
Mugil cephalus

Mugil cephalus Linnaeus, 1758, *Systema Naturae*, ed. 10, 1: 316 (type – locality: European Seas) *Mugil oeur* Forsskal ; Day, 1876, *Fishes of India* : 353, pl. 75, fig. 3; Day, 1889, *Fauna Br. India*, *Fishes*, 2 :348, fig. 114.

Mugil cephalus Linnaeus, 1758; Talwar and Jhingran, 1991; *Inland Fishes of India and Adjacent Countries* 2: 896

Material Examined: 110 nos, 36 to 370 mm TL, locality Interu mangrove swamp in the Krishna Estuarine region; (23 nos, 114-210 mm TL, 16 September, 2010; 39 nos, 87 – 168 mm TL, 13 October, 2010; 20 nos, 45 – 173 mm TL, 14 November, 2010; 28 nos, 62 – 300 mm TL, 7 December, 2010). 28 nos, 87-134 mm TL, Srikakulam, 13 October, 2010; 5 nos, 150 – 179 mm TL, Pulicat lake, 5 October; 4 nos, 215 – 221 mm TL, Muttukuru, 6 October, 2011.

Meristic data: D₁ IV D₂ I 8, P 15 - 16, V I 5, A III 8-9; scales in lateral series 35 – 42.

Morphometric data: As percentage of standard length: Body depth 23.0 – 36.4 (\bar{x} : 27.6); head length 20.8 – 34.1 (\bar{x} : 26.3); pre first dorsal distance 49.6 – 62.1 (\bar{x} : 53.8); pre second dorsal distance 73.5 – 89.9 (\bar{x} : 79.2); pre-pectoral distance 26.0 – 39.5 (\bar{x} : 29.3); pre-ventral distance 28.2 – 49.6 (\bar{x} : 39.7); pre-anal distance 72.1 – 83.4 (\bar{x} : 75.8); length of pectoral fin 16.6 – 56.1 (\bar{x} : 24.7); length of ventral fin 15.5 – 54.3 (\bar{x} : 21.1); base of anal fin 10.6 – 16.2 (\bar{x} : 12.2); height of anal 11.6 – 18.6 (\bar{x} : 14.5); and least height of caudal peduncle 10.8 – 17.0 (\bar{x} : 13.0).

As percentage of head length: Snout length 10.8 – 41.6 (\bar{x} : 28.9); eye diameter 10.8 – 33.8 (\bar{x} : 25.7); interorbital distance 11.8 – 51 (\bar{x} : 28.0).

General Description: Body robust; head broad and much flattened dorsally, lips thin, lower lip with a distinct symphyseal knob; teeth 1 to 3 rows on upper lip, 2 to 4 rows on lower lip; outer rows unicuspid, inner rows usually bicuspid; hind tip of maxilla not curved, reaching to below the vertical from the anterior border of the eye. Eyes covered by broad anterior and posterior adipose lids, both of which reach the pupil; interorbital space flat and its width is equal to half length of the head; pre-

orbital slender, its lower and posterior edges serrated; maxilla visible as a narrow strip.

First dorsal is nearer to the tip of the snout. Dorsal view of the fish from the snout to the base of the first dorsal fin is horizontal; first dorsal fin spines are strong; base of second dorsal fin is covered by a row of scales; origin of second dorsal fin between a quarter and a half along anal fin base. Auxiliary scale of the pectoral short; caudal base covered by a row of scales; caudal fin slightly emarginate with pointed lobes. Scales round in shape, cycloid in young, becoming feebly ctenoid with growth.

Colour: Grayish along the back, becoming silvery on the sides and beneath, a dark line along each row of scales in the upper half of the body. A dark purple colored spot located at base of the pectoral fin, second dorsal and caudal grayish, anal yellowish, caudal fin with black edge. *Rhinomugil corsula* (Hamilton – Buchanan, 1822), figure- 6.



Figure-6
Rhinomugil corsula

Mugil corsula Hamilton – Buchanan, 1822, *Fishes of Ganges*: 221, 381, pl.9, fig.97 (type – locality: Ganges river); Day, 1876, *Fishes of India*: 354, pl. 71, fig. 6; Day, 1889, *Fauna Br. India*, *Fishes*, 2: 349. *Rhinomugil corsula* Talwar and Jhingran, 1991 ; *Inland fishes of India and adjacent countries* 2 : 897, fig. 269.

Material Examined: 6 nos; 144 to 233 mm TL, locality Interu mangrove swamp, Krishna Estuarine region, Bantumilli.

Meristic data: D₁ IV, D₂ I 8, P16, VI 5, A III 9, L.L 50-52, L. tr.15.

Morphometric data: As percentage of standard length: Body depth 12.5 – 22.0 (\bar{x} : 19.3); Head length 14.5 – 25.3 (\bar{x} : 22.7); pre first dorsal distance 31.6 – 53.9 (\bar{x} : 49); pre second dorsal distance 74.4 – 98.6 (\bar{x} : 79.3), pre-pectoral distance 24.8 – 27.3 (\bar{x} : 26.2); pre-ventral distance 39.3 – 43.3 (\bar{x} : 40.0); pre-anal distance 65.5 – 71.9 (\bar{x} : 68.7); height of anal 10.8 – 14.2 (\bar{x} : 11.8); base of anal 9.6 – 10.8 (\bar{x} : 10.1); length of pectoral 21.0 – 23.5 (\bar{x} : 22.4); length of ventral 6.3 – 15.0 (\bar{x} : 13.1); and least height of caudal peduncle 10.0 – 10.8 (\bar{x} : 10.5).

As percentage of head length: Eye diameter 12.8 – 17.2 (\bar{x} : 15.5); snout length 20.5 – 23.2 (\bar{x} : 21.9); interorbital distance 13.9 – 19.3 (\bar{x} : 19.3).

General Description: Body stout and elongated, head compressed, long moderate, slightly depressed anteriorly; snout flat, short, overhanging the mouth, mouth ventral and protrusible; eyes prominent, bulging, placed in a line with the dorsal profile, not visible from ventral surface, concave between eyes, projecting above this level, without adipose lids, and elevated, maxilla reaches to below the middle of the eye, not curved, upper lip thick, symphyseal knob present, teeth fine, and are present in a single row in both jaws.

First dorsal fin commences above the 16-20 lateral line scale, nearer to the base of the caudal fin. The second dorsal fin arises above the 34th lateral scale, 29 rows of scales present between dorsal fin base and the snout. Pectoral fin does not reach the origin of 1st dorsal fin; pelvic fin with a soft spine. Anal fin with three spines, caudal fin is slightly emarginate. Scales ctenoid in adults, cycloid in young, scales with a slightly raised line along the center, scales in lateral series 50 to 52.

Colour: Grayish along the back, becoming silvery on the lateral and ventral sides; a dark line along each row of scales in the upper half of the body; anal fin yellowish in colour, caudal with dark margin along the outer edge.

Remarks: *R. corsula* was recorded from the estuaries of the River Ganga, Mahanandhi and Caveri¹⁷. *R. corsula* has been recorded from river Godavari recently by Sukumaran *et al.* as a new record¹⁸. The present material (n=6) from the Krishna estuarine region.

Discussion: Luther discussed the taxonomic position of grey mullets and presented five new characters for consideration as distinguishing the Mugilid genera¹². These five characters are i. parapophysial stay on the trunk vertebra, ii. Vertebral processes iii. shape of the Basioccipital processes, iv. post-zygapophysial hooks and v. visibility of end of the maxilla. These five characteristics were utilized in the generic appraisal. He pointed out that the genera *Liza* Jordan and Swain, *Valamugil* Smith, and *Ellochelon* Whitely could be separated based on these parameters. He erected a new genus *Osteomugil* to accommodate *M. cunnesius* Valenciennes.

Earlier Schultz regarded *Valamugil* Smith and *Ellochelon* Whitely as synonymous of *Liza* Jordan and Swain¹⁴. while Thomson considered only the genus *Ellochelon* Whitely as synonym of *Liza*¹⁰. Pillay synonymised *Liza*, *Valamugil* and *Ellochelon* as synonymes of *Mugil* Linnaeus¹¹.

Talwar and Jhingran has considered *Liza*, *Mugil*, *Rhinomugil*, *Sicamugil*, *Valamugil* as valid genera and considered *Osteomugil*⁸. Luther as a synonymy of *Valamugil* Smith¹². Jayaram considered the genera *Mugil* Linnaeus, *Liza* Jordan &

Swain, *Valamugil* Smith, *Sicamugil* Fowler and *Rhinomugil* Gill as valid genera while treating *Osteomugil* Luther a junior synonym of *Valamugil* Smith⁹.

The number and the structure of pyloric caeca is used for taxonomic separation of the genera of mullets by earlier workers^{7, 12}. The number is known to vary from 2 to 22 in the genus *Mugil*, while in the genus *Liza* it is between 2 and 17¹².

From the present status of knowledge, mullets in Indian waters are represented by five genera in the inland waters and two in the coastal marine environment⁸. However, earlier Gunther reported 2 pyloric caecae¹⁵. Rahimulla reported 5 caecae¹⁶. Thomson reported 2 caeca¹⁰ and Luther reported 2 caeca¹². This shows that considerable variation exists in the number of pyloric caeca in *M. cephalus*. The current study has shown that there were two species identified as *Mugil cephalus* (Linnaeus, 1758) and *Rhinormugil corsula* (Hamilton – Buchanan, 1822) at Krishan estuarine region, this was first report from India. Our findings suggest that there were two pyloric caecae recorded in observed species shown in Figure- 7a & b. Our study correlates with the three different workers^{15, 10 and 12}.



Figure-7(a)

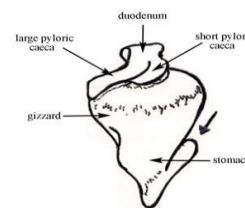


Figure-7 (b)

Figure-7a & b
Pyloric caecae of mullets

Conclusion

The current study find out two pyloric caecae by dissect and examined the mullets for taxonomic identification we found the correlation with earlier studies on mullets in terms pyloric caecae in India^{15, 10 and 12}. But as per Interu swamp was concerned this was the first report in two taxonomic species they were *Mugil cephalus* (Linnaeus, 1758) and *Rhinormugil corsula* (Hamilton – Buchanan, 1822)

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