

A REVIEW OF THE TAXONOMIC POSITION OF
TACHYSURUS SERRATUS (DAY) AND *TACHYSURUS THALASSINUS*
(RÜPPELL)

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ABSTRACT

The systematic position of *T. serratus* and *T. thalassinus* is established by a study of the morphometric, meristic, osteological and other characters of fishes of varying sizes belonging to both sexes.

INTRODUCTION

MUCH confusion prevails with regard to the identity and taxonomic position of *Tachysurus serratus* (Day), the largest growing marine catfish of the family Tachysuridae. This species was first described by Day (1878) as *Arius serratus* based on a single immature specimen measuring 114 mm in standard length from Sind, with the following specific characters: upper jaw longer, occipital process granulated with serrated ridged keel and three distinct villiform patches on each side of the palate; the vomerine patch being round, small with an interspace between the two. Chandy (1953) recognised *T. serratus* with the specific characters like serrated keel on the occipital crest, pre-maxillary band of teeth 4 times long as broad and palatine teeth in three distinct patches. Munro (1955) recognised it as *Netuma serratus* but expressed doubt that it is perhaps the young of *N. thalassinus* (= *T. thalassinus*). Based on a few characters of morphological and osteological interest Tilak (1965) recognised these two species and Misra (1962) included *T. serratus* under the genus *Tachysurus*. Jayaram and Dhanze (1978 a) after a study of 58 specimens of *T. thalassinus* from Indian waters, ranging from 90 to 370 mm and Day's single specimen of *A. serratus*, arrived at the conclusion that *T. serratus* (Day) represents only the juvenile of

T. thalassinus. In the FAO Species Identification Sheets for Western Indian Ocean (Fischer and Bianchi 1984) Jayaram considered only *A. thalassinus* (= *T. thalassinus*) and ascribed some of the specific characters of *T. serratus* as characters of the male of *T. thalassinus*. All the available literature gave only fragmentary information on the exact identity of this common species, occurring along both the coasts of India, which forms a substantial fishery in Kerala and Karnataka. This account is an attempt to clarify the systematic position of *T. serratus* and *T. thalassinus* based on several specimens, from juvenile to adult and of both sexes, collected from different parts of the country.

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SYSTEMATIC ACCOUNT

Tachysurus serratus (Day, 1878)

(Fig. 1 a; Plate I and II)

Arius serratus Day, 1878. *Fish. India*. p. 462 (type locality: Sind). Day, 1889. *Fauna British India* Fish. 1, p. 180.

Tachysurus serratus Chandy, 1953. *Rec. Indian Mus.*, 51, pl. 1, p. 12 (sind). Tilak, 1965. *J. Zool.*, 146, pl. 2, pp. 150-174.

Netuma serratus Murno, 1955. *Mar. Freshw. Fishes Ceylon*, p. 54.

Material: Several specimens (both sexes) from Pamban (Palk Bay) total length 170-390 mm; Mandapam (Palk Bay) 257-438 mm; Kilakkarai 128-427 mm; Tuticorin 179-460 mm; Cochin 300-1150 mm; Calicut 400-930 mm.

process. Median longitudinal groove short; supra-occipital process with a serrated keel, longer than wide at its base. Pre-dorsal plate crescentic and narrow. 7 vertebrae form pars sustentaculum. Maxillary barbels thick at base, reach the gill opening, outer mandibular shorter than maxillary. Length of dorsal spine equals the width of head, serrated on both edges with soft termination; pectoral spine stronger than dorsal, serrated in the outer half and denticulated

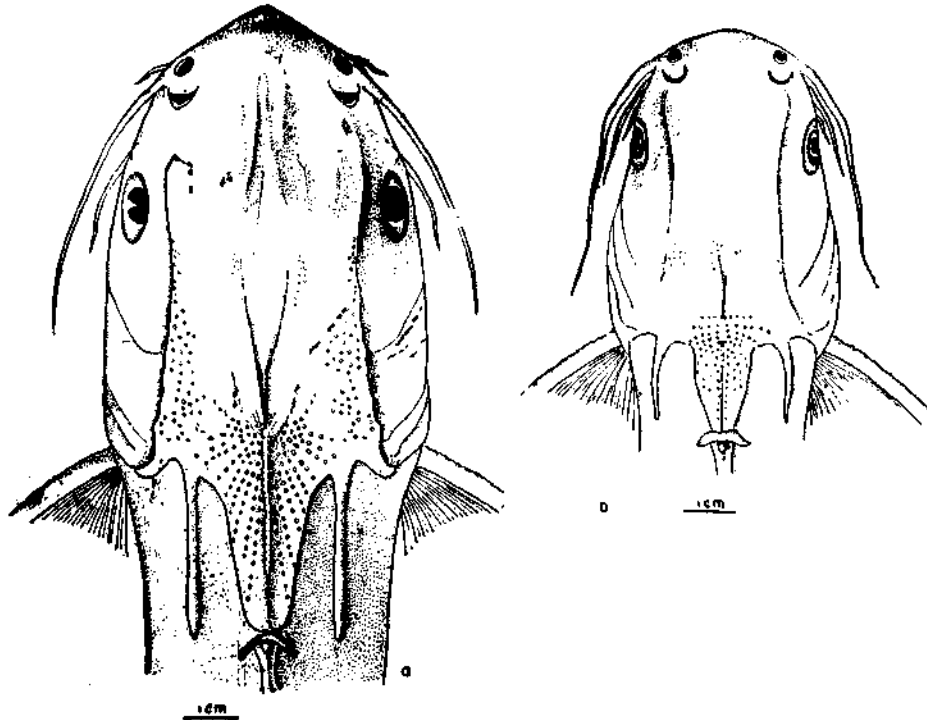


Fig. 1. a. Head of *Tachysurus serratus* (Female) and b. Head of *Tachysurus thalassinus* (Male).

Description: B.vi; D.1/7; P.1/10; V. 6; A.16-18; C. 17.

Length of head 20-24% in total length. Height of head at occiput 10-14.9% in total length; snout 9.2-10.9% in total length, acute, pointed, projects over the mouth. Upper jaw longer than the lower, exposing the premaxillary band of teeth; mouth sub-inferior. Head shield granulated with lines distinct on the occipital

internally. Upper lobe of the caudal fin longer than lower lobe. Premaxillary and mandibular band of teeth villiform. Premaxillary band 4 times long as broad. Teeth on palate villiform, three patches on each side. Prevomerine patches of both sides are separated by a clear mesial space. Ectopterygoid placed parallel to prevomerine patch, larger than the latter. Additional toothed plate is large, almost oval

with its broad base placed anteriorly touching the prevomerine and ectopterygoid tooth plates. Length of additional toothed plate is equal to the breadth of both prevomerine and ectopterygoid together. No interspace between the additional toothed plate, prevomerine and ectopterygoid plates.

Colour: Dark-red brown

Females develop modification of pelvic fin during late stage of maturity and regain original size and shape after spawning. Maximum size : 135 cm.

Distribution: Pakistan, West and East Coast of India, Sri Lanka, Bangladesh. Marine.

Tachysurus thalassinus (Ruppell, 1835)

(Fig. 1 b; Plate I and II)

Bagrus thalassinus Ruppell, 1835. *Neue wirbelth. Fische*, p. 75 pl. 20, fig. 2 (type locality; Massaua, Red Sea).

Netuma thalassina Bleeker, 1862. *Atlas Ichth. Ind. Neerland.*, 2: 28 (Java, Sumatra, Nias, Bintang, Celebes). Fowler, 1904. *Journ. Acad. Nat. Sci. Philadelphia*, 12 (2): 1-500 (Padang). Fowler, 1915. *Proc. Acad. Nat. Sci. Philadelphia*, p. 204 (Padang example). Ogilby, 1915. *Commercial Fish. Fisher. Queensland*, p. 47. Fowler, 1918. *Copeia*, 58, p. 62 (Philippines). McCullouch, 1927. *Fishes New South Wales*, ed. 2, p. 22, pl. 7, fig. 74a. Fowler, 1928. *Mem. Bishop mus.*, 10, p. 62 (compiled); 11, p. 318 (reference). Munro, 1967. *Fishes of New Guinea*, p. 85.

Netuma thalassinus Evermann and Seale, 1907. *Bull. Bur. Fisher.*, 26, p. 56 (San Fabian; Bulan; Philippines) Jordan and Richardson, 1908. *Bull. Bur. Fisher.*, 27, p. 242 (Philippines). Weber and Beaufort, 1913. *Fishes Indo Australian Archip.*, 2, p. 286, fig. 114 (upper teeth) (Batavia, Singapore, Sumbawa, Timor, Totti, New Guinea). Munro, 1955. *Mar. Freshw. Fishes Ceylon*, p. 53.

Arius thalassinus Gunther, 1864. *Cat. Fishes British Mus.*, 5, p. 139, fig. (teeth and occiput), (East Indies, Singapore, Red Sea, Java). Kner, 1865. *Reise Novara. Fische*, p. 310 (no locality). Gunther, 1866. *Fishes of Zanzibar*, p. 114 (Aden, Zanzibar). Ktunzinger, 1871. *Verh. Zool. bot. Ges. Wien.*, 21, p. 589 (Red Sea). Macleay, 1876. *Proc. Linn. Soc. New South Wales*, 1, p. 348 (off Katow, New Guinea). Day, 1878. *Fishes of India*, 3, p. 463, pl. 104, fig. 4, pl. 106, fig. 1 (Andamans). Alleyne and Macleay, 1877. *Proc. Linn. Soc. New South Wales*, 1, p. 348 (Torres Straits, New Guinea, Katow). Macleay, 1878. *Proc. Linn. Soc. New South Wales*, 2, p. 363 (Port Darwin). Schmeltz, 1879. *Cat. Mus. Godeffroy*,

7, p. 56 (Tonga Island). Kulzinger, 1880. *Sitzingerber Akad. Wiss. Wien. math.-nat. Cl.*, 80, p. 409 (Queensland). Macleay, 1881. *Proc. Linn. Soc. New South Wales*, 6, p. 212, (Torres Strait, Port Darwin). Meyer, 1885. *Anal. Soc. Espan. Hist. Nat. Madrid*, 14, p. 41 (Macassar; South Celebes; Kordo, Mysore). Boulenger, 1887. *Proc. Zool. Soc. London*, p. 665 (Muscat). Day, 1889. *Fauna British India*, 1, p. 181. Kent, 1893. *Great Barrier Reef*, p. 298 (Moreton Bay). Duncker, 1904. *Mitt. Naturhist. Mus. Hamburg*, 21, p. 174 (reference). Steindachner, 1907. *Denkschr. Akad. Wiss., Wien, math.-nat. Kl.*, 71, (1), p. 156 (Aden). Weber, 1913. *Nova Guinea*, 9, p. 536 (Ostbai). Zugmayer, 1913. *Abh. Bayer Akad. Wiss., math.-phys. Kl.*, 26, p. 9 (Mekran, Oman). Weber and Beaufort, 1913. *Fishes Indo-Australian Archip.*, 2, p. 286, fig. 114 (dentition) (Batavia, Singapore, Sumba, Timor, Rotti, New Guinea). Herre, 1926. *Philippine Journ. Sci.*, 31, p. 407, pl. 1, fig. 7 (dentition) (Manila Bay, Bulan, Laguna de Bay, Cullian). Roxas and Martin, 1937. *Dept. Agri. Comm. Manila. Tech. Bull.*, 6, p. 45 (reference). Herre, 1953. *Check list of Philippines fishes*, p. 131 (reference). Fischer and Whitehead (Ed) 1974. *FAO Species Identification Sheets for Fishery Purposes. Fishing area 57 and 71*. vol. 1. Fischer and Bianchi (Ed) 1984. *FAO Species Identification Sheets for Fishery Purposes. Fishing area 51*. Vol. 1.

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Bagrus Netuma Valenciennes, 1839. *Ibid.*, 14 p. 438, pl. 417 (type locality : Pondicherry).

Netuma netuma Day, 1865. *Fishes of Malabar*, p. 175, fig. (teeth and casque).

Arius nasutus Valenciennes, 1840. *Hist. Nat. Poiss.*, 15, p. 60, (type locality : Malabar; Red Sea).

Catostoma nasutum (Kuhl and van Hasselt) Valenciennes, 1840. *Ibid.*, 15, p. 60 (Java). Bleeker, 1862. *Atlas Ichth. Ind. Neerland.*, 2, p. 28 (name in synonymy).

Netuma nasuta Bleeker, 1862. *Ibid.*, pl. (13), 61. Jordan and Seale, 1907. *Bull. Bur. Fisher.*, 26, p. 8 (Cavite).

Bagrus rhodonotus Bleeker, 1846. *Nat. Geneesk. Arch. Nederl. -Indie*, 3 (3), p. 157 (Type locality: Batavia).

Bagrus carchariorhynchus Bleeker, 1846. *Ibid.*, 3(2) p. 291 (type locality: Batavia)

Sarcogenys rostratus (Kuhl and Van Hasselt) Bleeker 1862. *Atlas Ichth. Ind. Neerland.*, 2, p. 28 (name in synonymy).

Arius andamanensis Day, 1870. *Proc. Zool. Soc. London*, p. 699 (type locality: Andaman Islands).

Ariodes aeneus Sauvage, 1883. *Bull. Soc. Philomath. Paris*, 7 (7), p. 156, (type locality: "I le Raffles; voyage de la Zelee").

Netuma osakae Jordan and Hubbs, 1925. *Mem. Carnegie Mus.*, 10, p. 157, pl. 9, fig. 1 (type locality: Japan).

Material: Several specimens (both sexes) from Waltair 180-420 mm; Rameswaram 78-490 mm; Pamban 270-435 mm; Mandapam (Palk Bay) 183-430 mm; Kilakkarai 170-410 mm; Tuticorin 170-485 mm; Cochin 150-760 mm; Calicut 90-400 mm; Bombay 130-190 mm; Veraval 110-122 mm.

Description: B. vi; D. 1/7; P. 1/12; V. 6; A. 15-18; C. 19.

Length of head 19.9-24.1% in total length; height of head at occiput 11.1-12.2% in the total length; Snout 6.6-7.9% in total length, round, upper and lower jaws equal, premaxillary band of teeth not visible outside. Mouth widely crescentic, sub-terminal, lips with folds at mouth corners; upper surface of the head granulated, median longitudinal groove narrow posteriorly, reaches base of occipital process; the occipital process granulated, keeled and longer than wide at its base and extends to the small crescentic basal bone of the dorsal fin. Eight vertebrae form pars sustentaculum; maxillary barbels thin, reach the outer boarder of operculum, outer mandibular behind eye and inner still shorter. Length of Dorsal spine almost equals the width of head, granulated anteriorly and serrated posteriorly. Pectoral spine strong and shorter than dorsal, feebly serrated internally, upper lobe of the caudal fin longer than lower lobe. Premaxillary band of teeth 6 times long as broad. Teeth on palate villiform, three patches on each side. Prevomerine patches of both sides are placed close

together without any space in between. Ectopterygoid is almost double the size of prevomerine band. Additional toothed plate is almost triangular and more conical with its broad base touching mostly the ectopterygoid.

Colour: Silvery grey; adipose fin with a blackish brown blotch. Females show an enlargement of the pelvic fin due to the thickening of the muscular part forming a triangular flap during the advanced stage of maturity and the fins regain natural size and shape after spawning.

Size: Maximum 82 cm.

Distribution: East coast of Africa, Red Sea, Gulf of Aden, Gulf of Oman, Pakistan, West and East coast of India, Sri Lanka, Bangladesh, Thailand, Singapore, China, Philippines, Japan, North Australia, Queensland and Indonesia Marine, enter estuaries.

DISCUSSION

The first description of *T. serratus* given by Day (1878), covers almost all important distinguishing characters and is sufficient to justify its validity; though some of the morphometric and osteological characters (Table 1) in various size-groups from Juvenile to adult, give further insight into the identity of this species. Till recently *T. serratus* was considered as a separate species under the genus *Tachysurus*. However, some taxonomists considered that it had greater affinity to *T. thalassinus*. Jayaram and Dhanze (1978a) in their note on the systematic position of *T. serratus* (Day) concluded that *T. serratus* represents only the juvenile *T. thalassinus*. They opined that the characters such as length of pectoral fin and maxillary barbels are undependable for distinguishing *T. serratus* from *T. thalassinus*. They further stated that the shape and disposition of palatine patches are less stable and change with size and age of the fish, and they observed that "Juveniles tend to

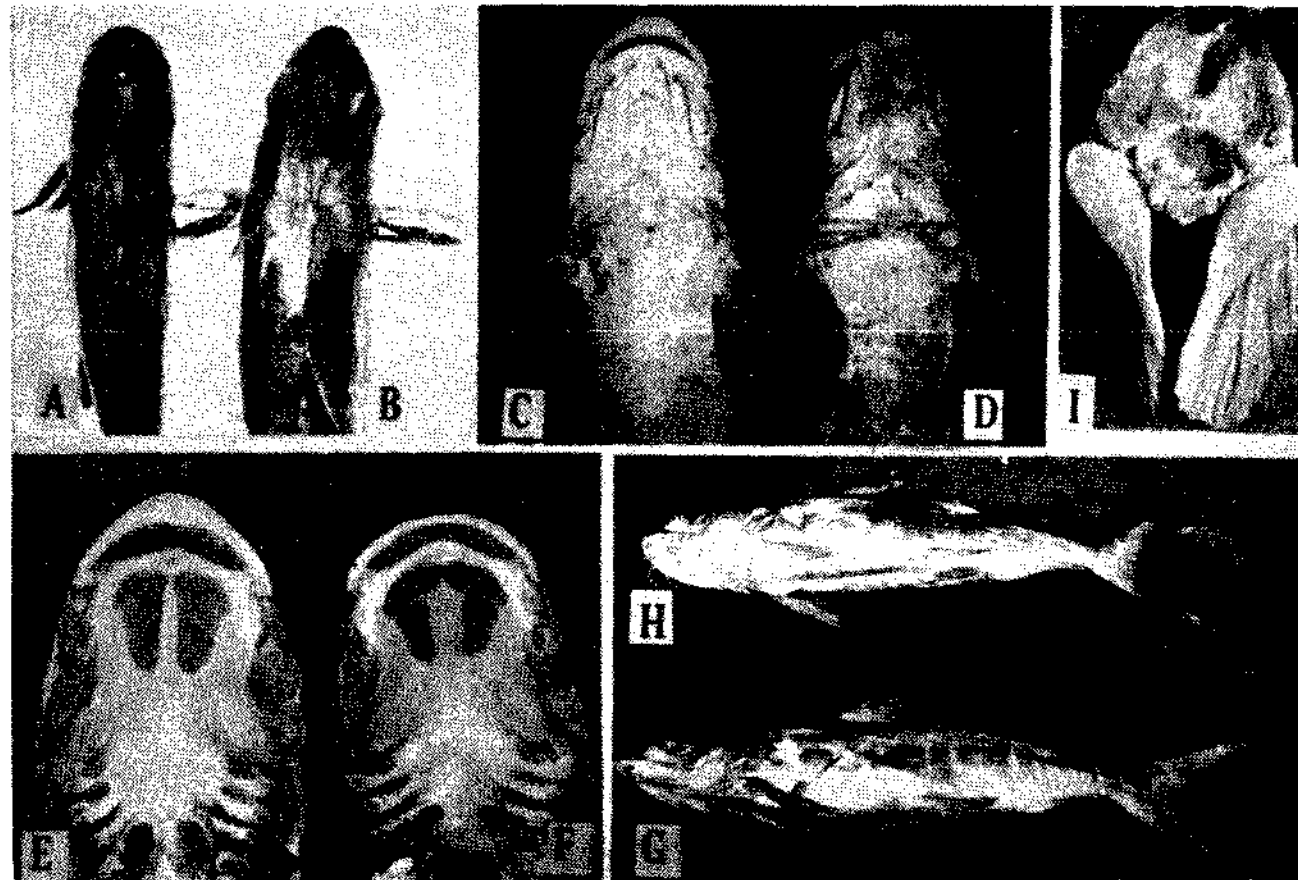


PLATE I A. Dorsal view of the head region of *Tachysurus serratus* (Male, TL 615 mm), B. *Tachysurus thalassinus* (Male, TL 435 mm); C. Ventral view of the head region of *Tachysurus serratus* (Male, TL 615 mm); D. *Tachysurus thalassinus* (Male, TL 435 mm); E. Dentition in *Tachysurus serratus* (Female, TL 510 mm); F. *Tachysurus thalassinus* (Female, TL 490 mm); G. Lateral view of *Tachysurus serratus*, H. *Tachysurus thalassinus* and I. Enlarged pelvic fin in ripe female of *Tachysurus thalassinus*.

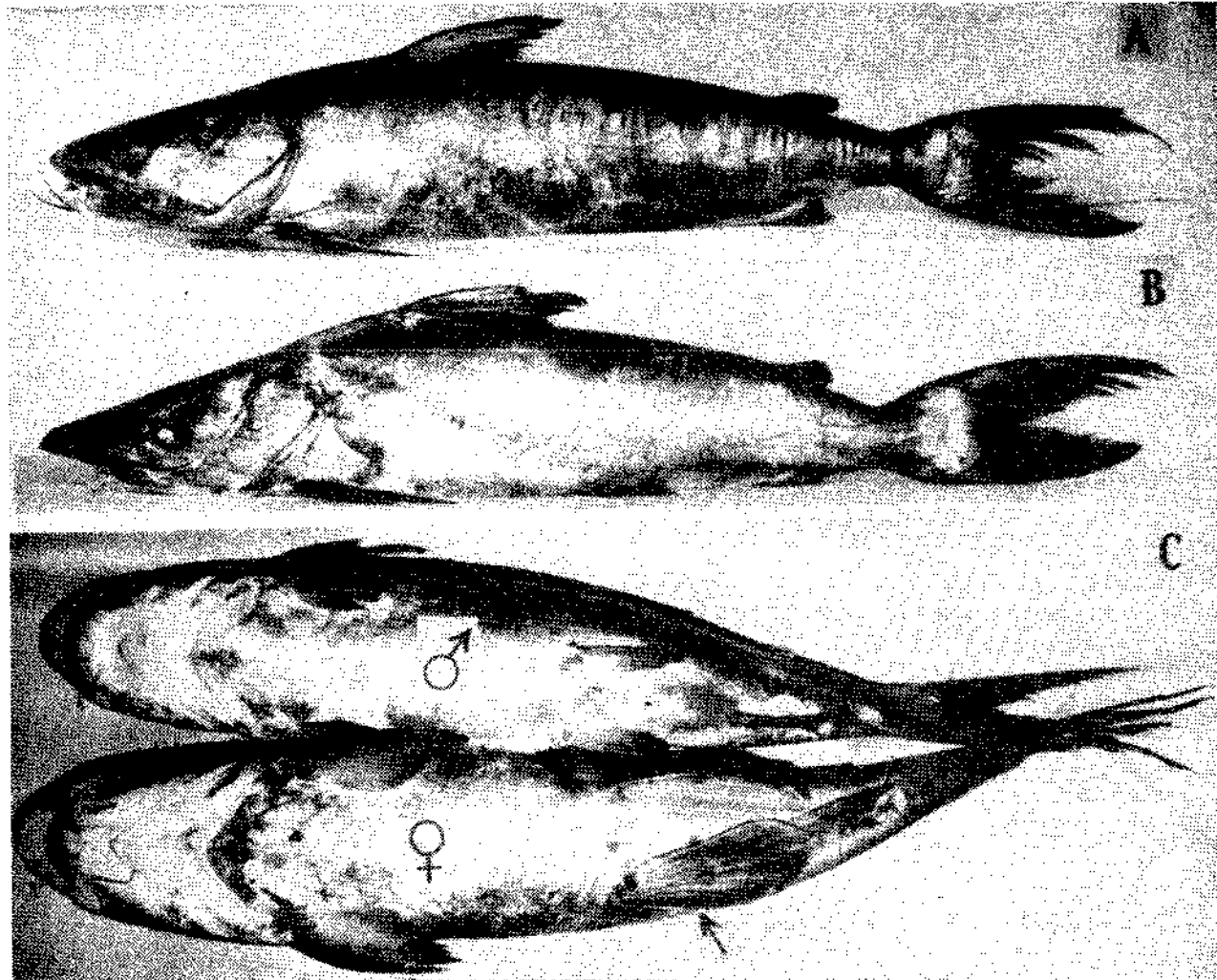


PLATE II A. Lateral view of *Tachysurus thalassinus* male (TL 728 mm); B. Lateral view of *Tachysurus serratus* male (TL 850 mm) and C. Ventral view of male (TL 850 mm) and female (TL 922 mm) *Tachysurus serratus*, arrow indicates the enlarged pelvic fin of female.

have patches (Palatine) with some interspace and with growth the intervening areas between the patches become crowded with teeth and no interspace is seen". This argument may not hold good since they have not examined larger specimen (those above 370 mm in standard length) of both species. The present study does demonstrate a remote resemblance between the juveniles of *T. serratus* and *T. thalassinus*

T. serratus the mesial space between the inner vomerine patches is maintained throughout its life in both sexes. Similarly, specimens of *T. thalassinus* belonging to all size-groups, irrespective of sexes, showed consistency in the shape and disposition of toothed palatine patches (Fig.3 a-c) with the inner vomerine patches placed closely without any interspace between the two.

TABLE 1. Distinguishing characters of *T. serratus* and *T. thalassinus*

Characters	<i>T. serratus</i>	<i>T. thalassinus</i>
Body proportions (% in total length)		
a. Standard length	80.2	78.0
b. Length of head	22.6	21.4
c. Height of head at occiput	10.7	11.5
d. Length of snout (pre-orbital length)	10.0	7.3
e. Length of dorsal spine	14.6	15.6
f. Maxillary barbel length	16.0	12.1
Jaws	Jaws unequal, Upper jaw acute projects over the mouth	Jaws equal, Upper jaw rounded.
Premaxillary band of teeth	Exposed, 4 times long as broad	Not exposed, 6 times-long as broad.
Occipital crest	Serrated	Crenulated
Palatine teeth	3 distinct patches on each side; inner vomerine patches of both sides separated by a clear mesial space.	3 distinct patches on each side, inner vomerine patches of both sides placed close together.
Colour	Dark-red-brown	Silvery-dark grey.
Osteological characters		
a. Vertebrae	Seven vertebrae form pars sustentaculum	Eight vertebrae form pars sustentaculum
b. First vertebra-ventral process	Widely separated	Close together
c. Condylar process of Scaphium	Not demarcated	Well demarcated
d. Branchiostegal rays		
1. on ceratohyal	3	4
2. on epihyal	2	1
e. Angle of the inferior border of operculum.	25°	21°
f. Ethmoid bone	Anterior face with conical protuberance	Anterior face round

only in the colour and the longer upper caudal lobe, and not in any other characters. A closer examination of the juveniles and sub-adults of *T. serratus* clearly shows the conical and pointed snout and differences in palatine patches. As *T. serratus* grows to a very large size, upto 135 cm, specimens of all size-groups belonging to both sexes were examined to establish the identity of *T. serratus*. It was observed that the toothed palatine patches of young ones do not show any change either in shape or disposition from that of the adult fish (Fig. 2 a-c), other than the growth of individual plates. In

Jayaram, in the FAO Species Identification Sheets for Western Indian Ocean (Fischer and Bianchi, 1984) considered only *Arius thalassinus* as the valid species. The most distinctive characters utilised for identification of *A. thalassinus* were size and shape of snout and palatine patches. He described the snout of *A. thalassinus* in varying shape "in males acute, pointed with upper jaw longer than the lower and premaxillary band of teeth exposed, in females rounded, jaws more or less equal, premaxillary band of teeth not so prominently visible". The

palatine teeth of *A. thalassinus* were described as "villiform, in three patches on each side, forming a triangle, posterior patch longest, patches usually fused (May be slightly separated in

juveniles)". It was also given that "the outer pelvic fin rays sometime thickened in females". Again, the colour of *male* is described as dark-red-brown to bluish-grey with numerous narrow

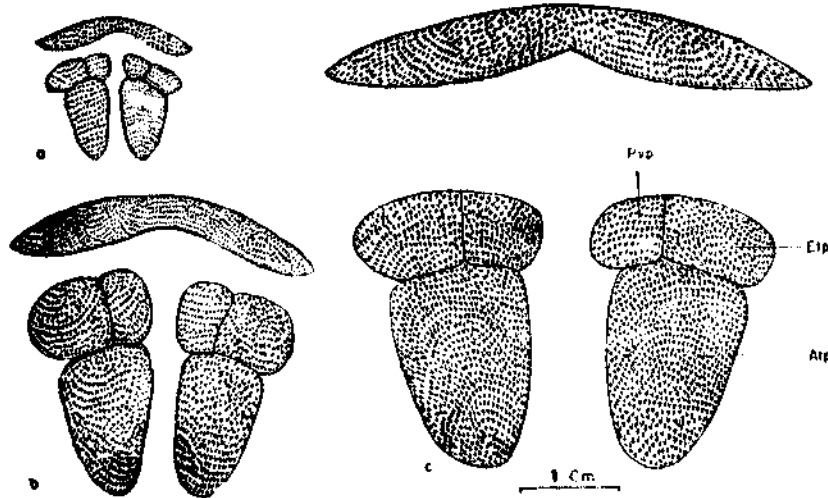


Fig. 2. Dentition in *Tachysurus serratus*: a. Female (TL 206 mm); b. Male (TL 305 mm) and c. Female (TL 905 mm).

TABLE 2. Morphometric proportions (in % of total length), based on measurements of 55 specimens of *Tachysurus serratus* of total length range 257-935mm

Morphometric measurements	Range (% TL)	Mean (% TL)
Standard length	77.8-83.4	80.2
Length of head	20.1-24.2	22.6
Height of head at occiput	10.0-14.9	10.7
Width of head	14.0-14.9	14.4
Pre-orbital length	9.2-10.9	10.0
Diameter of eye	3.8-4.7	4.1
Inter-orbital width	10.3-16.5	11.0
Depth of body	14.3-16.5	15.2
Length of caudal peduncle	15.3-17.5	16.2
Least height of caudal peduncle	5.0-5.4	5.1
Longest ray of dorsal	15.9-17.5	16.3
Length of dorsal spine	14.3-14.9	14.6
Length of pectoral	14.2-14.9	14.5
Length of pectoral spine	13.1-14.6	13.9
Length of ventral	10.0-10.6	10.2
Longest ray of anal	8.4-9.5	9.1
Length of base of anal	8.5-9.8	9.0
Length of base of adipose dorsal	2.5-2.9	2.7
Post-orbital length	86.1-87.2	86.7
Depth at anal
Pre-dorsal length	29.1-31.7	31.1
Pre-ventral length	41.6-47.0	45.0
Maxillary barbel length	14.1-18.0	16.0

TABLE 3. Morphometric proportions (in % of total length) based on measurements of 35 specimens of *Tachysurus thalassinus* of total length range 183-430 mm

Morphometric measurements	Range (% TL)	Mean (% TL)
Standard length	76.4-79.3	78.0
Length of head	19.9-24.1	21.4
Height of head at occiput	11.1-12.2	11.5
Width of head	14.7-15.5	15.0
Pre-orbital length	6.6-7.9	7.3
Diameter of eye	3.9-4.9	4.1
Inter-orbital width	10.9-12.5	11.4
Depth of body	15.2-17.9	16.6
Length of caudal peduncle	15.3-16.4	15.4
Least height of caudal peduncle	5.1-6.0	5.6
Longest ray of dorsal	16.3-19.1	17.4
Length of dorsal spine	14.7-16.7	15.6
Length of pectoral	14.1-16.4	15.0
Length of pectoral spine	13.7-15.2	14.4
Length of ventral	11.1-12.1	11.5
Longest ray of anal	8.3-10.2	9.2
Length of base of anal	9.7-11.4	10.7
Length of base of adipose dorsal	2.7-3.8	3.3
Post-orbital length	88.3-90.7	89.4
Depth at anal	12.8-14.0	13.4
Pre-dorsal length	28.4-31.6	30.2
Pre-ventral length	42.1-44.4	43.2
Maxillary barbel length	10.2-13.5	12.1

parallel transverse bands and in *female* uniformly dark or grey.

It appears from the above description of *A. thalassinus* that there is sexual dimorphism in this species. As regards sexual dimorphism almost all species of tachysurids do demonstrate sexual differences during spawning season. The females are distinct, when ripe, with well developed enlarged, specially modified pelvic fins (Plate II) and distended abdomen, and the males with widened buccal cavity, although the sexes are similar throughout the rest of the period. After spawning, pelvic fins in female, and after buccal incubation, the buccal cavity

in male regain original size and shape. In no other morphometric and meristic characters there are any significant differences between sexes at any stage in life, other than those described above. Hence, the sexual differences described by Jayaram for *A. thalassinus* are nothing but an overlap of characters of *T. serratus* and *T. thalassinus*. It seems that Jayaram has mixed some of the characters of *T. serratus* with those of *T. thalassinus* and presented them as sex-linked variations. *The acute, pointed snout with upper jaw longer*, described by Jayaram for male *T. thalassinus*, is an important external character to identify *T. serratus*, which is constant in both sexes (Pl. II) and in all size-groups.

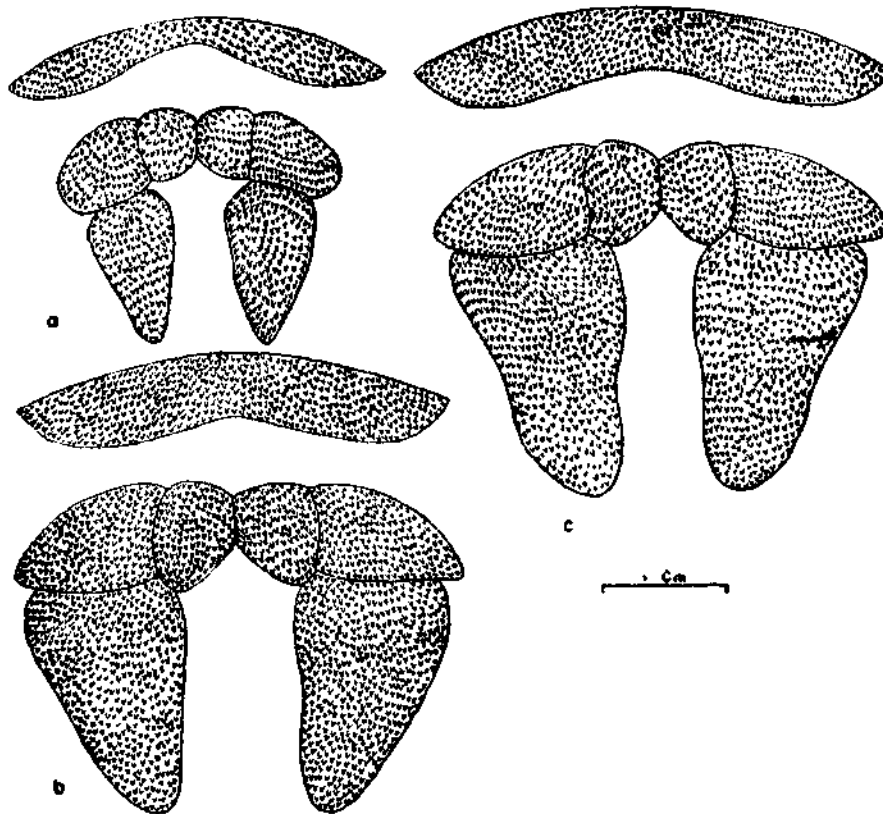


Fig. 3. Dentition of *Tachysurus thalassinus*: a. Male (TL 290 mm); b. Male (TL 400 mm) and c. Female (TL 460 mm). (Pvp - prevomerine patch; Etp Ectopterygoid patch and Atp - Additional toothed plate)

What Jayaram described as *Jaws more or less equal in female*, is in fact an important external character by which *T. thalassinus* can be distinguished from *T. serratus* (Pl. I A, H). Further, the colour of male *A. thalassinus* given as dark red-brown to bluish-grey with numerous narrow parallel bands is a character of *T. serratus* and the uniform dark or grey described for female *A. thalassinus* is the colour of *T. thalassinus* irrespective of sex or size.

Tilak (1965) noticed some differences in the osteological characters of these two species and they are further established in the present study. It was noticed that the ethmoid bone of *T. serratus* and *T. thalassinus* are different in shape, the former with a conical anterior face and the latter with round face. In addition to the

characters mentioned above, the analysis of 23 morphometric characters of *T. serratus* (Table 2) and *T. thalassinus* (Table 3) showed significant differences between the two species, at least in a few of the characters.

Jayaram and Dhanze (1978a) have not considered many of the morphometric and osteological characters and have fully relied on external characters of fishes of smaller size-groups for their study. Though Jayaram considered that the snout in catfish family is "somewhat of a classificatory help" he has treated this as a secondary sexual character. Finally, it can be safely concluded that *T. serratus* is a valid species quite distinct from *T. thalassinus* in both external and internal characters.

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