

Early juvenile stages of three jewfishes from the southeast coast of India

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ABSTRACT

Three stages each of *Johneiops vogleri*, *Johnius carouna* and *J. carutta*, all collected from bottom trawl catches off Tuticorin and Porto Novo have been described. An account of the changes undergone in the morphology and pigmentation is given. Certain notable differences between 2 younger stages of *J. carutta* described earlier are pointed out.

The jewfishes or croakers (Family Sciaenidae) constitute an important demersal resource of India. As per Fischer and Bianchi (1984), there are atleast 27 valid and commercially valuable species in the seas around the country. But our knowledge on the early developmental stages of most of them is meagre and limited to the publications of Bal and Pradhan (1945, 1946), Gopinath (1946), Pantulu and Jones (1951), John (1951), Karamchandani and Motiwani (1954) and Pillai *et al.* (1982). In this paper the juvenile stages of 3 species, viz. *Johneiops vogleri* (Bleeker), *Johnius carouna* (Cuvier) and *Johnius carutta* Bloch, are described.

MATERIALS AND METHODS

The juveniles were collected from bottom trawler catches during 1968-70 at Tuticorin (Lat 8° 48' N and Long 78° 11' E) and during 1977-79 at Porto Novo (Lat 11° 30' N and Long 70° 40' E). The collection details are presented in Table 1. The

specimens were studied under a microscope and the figures were drawn including the particulars on pigmentation, meristic counts and morphological characters used in current taxonomy. Length of each juvenile given is the standard length (SL) from the tip of the snout or the lower jaw, whichever is longer, to the middle level from which the caudal rays originate. Alizarin preparations were not made to determine the number of vertebrae and fin rays.

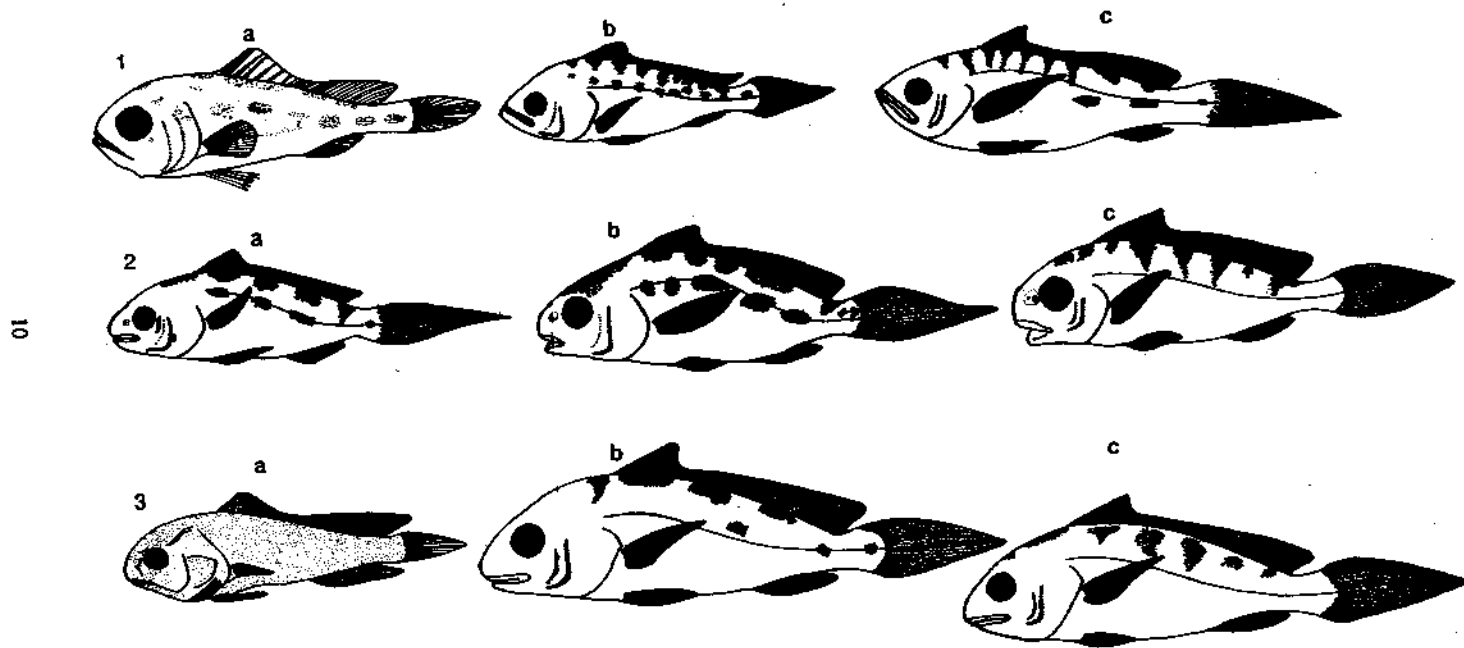
RESULTS

Johneiops vogleri (Bleeker)

20.9 mm (Fig. 1. a): It showed a typically juvenile sciaenid structure. Head was 3 of SL; eye was 3.2 of head; snout 1.4 of eye; caudal fin 5 and body depth 3.2 of SL. In the dorsal fin there were 8 spines and 25 rays; in the caudal about 12 rays; in the anal 2 spines and 7 rays; in the pelvic about 6; and in the pectoral there were about 15 rays. In the preopercular region 2 dorso-ventral series of minute spines were present.

Pigmentation consisted of a dorsolateral series of 6 groups and branching chromatophores from above the eye to behind the end of dorsal fin; a lateral series

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Figs 1-3. Early juvenile stages of three jewfishes. 1. *Johniops vogleri*: a, 20.9 mm; b, 21.05 mm; c, 26.9 mm. 2. *Johnius carouna*: a, 21.8 mm; b, 33.7 mm; c, 54.0 mm. 3. *J. carutta*: a, 17.4 mm; b, 33.4 mm; c, 41.9 mm.

between opercular and caudal regions; a group posteriodorsal to the eye and a smaller one posteroventrally; a group in front of the dorsal end of operculum; 2 series along upper and lower jaws; and a patch from behind pectoral fin to the third lateral group of pigments. Preanal and predorsal proportions were 65 and 36.7% of SL respectively.

21.05 mm (Fig. 1. b): The head was 2.6 of SL, eye 5.5 of head length, snout became longer than eye which was 1.2 of snout, caudal fin 3.5 and body depth 3.0 of SL. All the fins were pigmented with dusky black colour. Pigmentation along dorsolateral and lateral aspects increased, in the former comprising 9 groups and in the latter 10. A few pigments appeared in the posteroventral aspect of the caudal. Preoperculum showed serrations. There were 10 spines in anterior dorsal fin and 1 spine and about 30 rays in the posterior dorsal fin, about 15 rays in the caudal, 2 spines and about 7 rays in the anal, one spine and about 6 rays in the pelvic and about 16 rays in the pectoral fin. The preanal and predorsal proportions were 70.5 and 33% of SL, respectively; the former showing an increase and the latter a decrease over the previous stage.

26.9 mm (Fig. 1. c): The significant changes observed in this stage were in morphometric proportions and pigmentation. Head was 3.3 and caudal 2.75 of SL, eye 4.1 of head and 1.2 of snout and body depth 3.2 of SL. The lateral groups of pigments reduced to three, behind the middle level of dorsal and caudal fins. The dorsolateral series ranged from behind the level of eye to the end of the dorsal fin. The posterior half of the caudal fin with about 17 rays, showed black pigments. The preanal and predorsal proportions further reduced to 69 and 30% of SL respectively. Meristic counts remained the same as in the previous stage.

The identification of the above 3 juvenile stages as those of *J. vogleri* was based, apart from the coincident occurrences of the postspawners and recovering stages as well as of the juveniles in trawl catches,

upon the progressive development of the morphometric, meristic and pigmentation characters of the latter. In this material, the head showed an initial increase in size in relation to length, but followed by a decrease. This is a feature observed in the early development of many sciaenids such as *Pama pama* (Pantulu and Jones 1951), *Nibea albiflora* (Takita 1974) and *Genyonemus lineatus* (Watson 1982). In the adults of *J. vogleri*, the head is about 2.8 of SL and this condition is closest to the 26.9 mm stage in which the head was 3.3 of SL. With regard to caudal fin length a steady increase was observed from 5 to 2.75 of SL, similar to the increase recorded in *P. pama* and *N. albiflora*. In the adult of *J. vogleri*, however, the caudal fin became much smaller, amounting to only about 3.7 of SL, revealing a further reduction as development progressed. This was due to the fact that in the earlier stages the caudal fin was long and pointed, with a tapering end; but as growth progressed the caudal fin became bluntly rhomboid, as observed by Takita

Table 1. Particulars of the collection of juvenile specimens of jewfishes from bottom trawl catches

Name of the species/ Date of collection	Standard length (mm)	Place
<i>Johnnieops vogleri</i>		
9-11-1977	20.9	Porto Novo
7-6-1969	21.05	Tuticorin
-do-	26.9	-do-
<i>Johnius carouna</i>		
12-10-1968	21.8	Tuticorin
-do-	33.7	-do-
-do-	54	-do-
<i>Johnius carutta</i>		
10-11-1977	17.4	Porto Novo
9-10-1969	33.4	Tuticorin
-do-	41.9	-do-

(1974) in *N. albiflora*. The gradual decrease in pigmentation during juvenile development is in agreement with the absence of distinctive colouration in the adults (Fischer and Bianchi 1984).

Johnius carouna (Cuvier)

21.8 mm (Fig. 2. a): The specimen showed the characteristic sciaenid structure, with the postcephalic region the deepest. Head was 2.9 and caudal fin 2.1 of SL; eye 4 of head and body depth 3 of SL. There were 10 spines in anterior dorsal fin, 1 spine and about 25 rays in posterior dorsal fin, about 13 rays in caudal, 2 spines and about 7 rays in anal, one spine and about 6 rays in pelvic and about 16 rays in pectoral fin. Pigmentation consisted of dusky black colouration in all the fins, 4 dorsolateral bands of spots along the base of the dorsal, another 4 along the lateral line and scattered spots in caudal and anal fins. Preanal and predorsal proportions were 64 and 32% of SL respectively.

33.7 mm (Fig. 2. b): Head was 2.9, caudal 2.4 and body depth 3 of SL; eye 3.7 of head. There was an increase in pigmentation by way of appearance of a diffuse group in the predorsal region; and increase in the number of dorsolateral groups to 5 and that of lateral group to 6 and an increase on the pelvic fin. Preanal and predorsal proportions became 66.3 and 31.3% of SL. Meristic counts of the fins in this stage as well as in the following one were the same as in the previous one except for about 16 rays in the caudal.

54.0 mm (Fig. 2. c): Head was 3.5 and caudal 3.1 of SL; eye 3.1 of head; body depth 3 of SL. Pigmentation reduced and was in the form of 7 faint dorsolateral bands, the lateral groups of the previous stages either disappeared or merged with the dorsolateral ones. Preanal and predorsal proportions became 63 and 25% of SL respectively. The anterior dorsal fin developed a faint black pigmentation at the tip.

The changes in morphometric features

observed in the above juveniles pointed out that the principal developmental features were the decrease in the length of the head and the caudal, in relation to SL. In the 54 mm stage the proportion of head was close to the adult condition of 3.65 of SL. Also, as development progressed the caudal fin became rhomboidal from the long and pointed condition in the juveniles. A decrease in body depth and pigmentation was the other notable features observed.

Johnius carutta Bloch

17.4 mm (Fig. 3. a) : This stage was characterized by a prominent anterior region and a pointed protocerebral caudal fin. Head was 2.6, body depth 3.3 and caudal 4.7 of SL; eye 4.5 of head. Mouth was inferior in position and snout fairly prominent and almost equal to eye diameter. All fins were fairly well formed. Anterior dorsal fin had 10 spines; posterior dorsal had one spine and about 22 rays and caudal fin had about 12 rays. There were 2 spines and 8 rays in the anal. Pectoral fin had about 16 rays and 1 spine, and pelvic fins 5 rays. The stage was well pigmented with black chromatophores all along the body and in the membranes connecting the spines and rays of dorsal and anal fins. Slightly larger pigment spots were present as a dorsoventral series behind the eye and a lateral line series from operculum to caudal peduncle. Preanal and predorsal proportions were 65.6 and 32.2% of SL respectively.

33.4 mm (Fig. 3. b): In this stage the head was 3 and caudal 3.4 of SL; eye 4.3 of head; snout was a little longer than eye; and body depth 3.3 of SL. Pigmentation was in the form of dusky black colouration on all the fins; 5 groups along the dorsal side of the body from above operculum to the end of dorsal fin; a series of 3 groups along mid-lateral region, 1 below the middle of posterior dorsal fin, another below its end, a third at the caudal peduncle; and a group in the posterior two third of the caudal fin. Preoperculum had a series of minute serrations. There were 10 spines in anterior

dorsal, 1 spine and about 27 rays in posterior dorsal, about 17 rays in caudal, 2 spines and 7 rays in anal, 1 spine and about 7 rays in pelvic and about 16 rays in pectoral fins. Lateral line became distinct. The preanal and predorsal proportions were 65.4 and 35.3% of SL respectively.

41.9 mm (Fig. 3. c): This stage showed some morphological changes. Head was 3 of SL, almost approaching the adult condition. Eye was 4.3 of head and snout was only slightly longer than eye diameter. Caudal fin was 2.9 and body depth 3.2 of SL. The pigment groups along the dorso-lateral region increased to 7. The lateral groups disappeared and a few pigments were present in the caudal, pelvic and anal fins. Predorsal proportion became slightly more to 30% of SL. There were no distinct changes in meristic counts of the fins.

The identification of the material as that of *J. carutta* was based on the spawning of the adults off Tuticorin and Porto Novo as well as on the morphological features and meristic counts. Length of the head underwent a gradual reduction in relation to SL. The caudal fin underwent an increase in length in the beginning, followed by a secondary reduction in later development. Pigmentation underwent changes from the diffused condition to one of localization and then a secondary decrease. However, the meristic counts appeared to have been stabilized by 33.4 mm stage.

DISCUSSION

The juveniles of *J. carutta* described here were longer than the 16 and 19 mm stages of the same species described by Pillai *et al.* (1982). In the 16 mm stage, the mouth was rather oblique as in the case of the genera *Chryochir*, *Johnieops*, *Kathala*, etc but in the 19 mm stage it was rather inferior, as in the case of the genera *Johnius*, *Dendrophysa*, etc. A meagre difference in TL of 3 mm between these 2 stages cannot account for so much of difference in the disposition of the mouth from each other. Besides, the proportions of head and caudal

fin in relation to the SL in the above 2 stages were 2.8 and 2.4 for the former and 3.0 and 2.4 for the latter respectively. The wide difference of proportion in the head between the above 2 stages also is not in agreement with the slight difference of only 3 mm in TL between the 2 stages. Hence, it appeared that the 16 and 19 mm stages described by Pillai *et al.* (1982) belong to two different species and/or genera.

The collection of these juveniles as well as many other unidentifiable ones of sciaenids from the trawling grounds off Tuticorin and Porto Novo revealed that at least the nursery grounds for the juveniles of this group were in and around those localities which are trawled commercially. Since removal of such juveniles from the nursery grounds by repeated ground trawling would lead to recruitment-overfishing, it is essential to control trawling operations in these areas by enforcing closed seasons and/or mesh regulations to prevent the capture of the juvenile stock.

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