

Helgoland, F. R. Germany for the supply of necessary literature, confirmation of illustrations and for her valuable criticism.

#### Material

The specimens were collected on P.N.S. 'Zulfiquar' at a deepsea station (sounding 3219 m) located at 24° 09' N and 64° 27' E on March 29, 1967. The International Indian Ocean Standard Net was employed to obtain vertical samples of zooplankton from a depth of 1500 m. This study material consists of two females (copepodite V) measuring 1.56 mm and 1.66 mm. Both the specimens examined were slightly damaged.

#### Remarks

Present specimens to much extent agree with *B. palliata* except that the sizes are distinctly smaller than those reported previously (Sars, 1909; Boxshall and Roe, 1980). Boxshall and Roe (1980) show that the size range for each stage is extremely wide. It is also noted

that the shape of spines on the outer margin of exopod of the 1st leg, and of base of the 5th leg, and the size of the setae on 6th leg differ slightly from those in *B. palliata* as previously described.

Boxshall and Roe (1980) studied the 3 species of *Misophria* and *Benthomesophria*.

Boxshall (1983) described 3 new genera in the order Misophrioida from deep water in the North Atlantic. All the known genera are monotypic except the *Benthomtsophria* which consists of two species: *B. palliata* Sars, 1909 and *B. cornuta* Hülsemann and Grice, 1964. Both of these species have been recorded from the Atlantic and the Pacific Oceans (Sars, 1909; Tanaka, 1966; Boxshall and Roe, 1980). Neither of the species of the genus *Benthomtsophria* has previously been recorded from any part of the Indian Ocean. This is the first record of *B. palliata* from the Indian Ocean (Arabian Sea) and the fifth in the world Oceans.

Centre of Excellence in Marine Biology,  
University of Karachi, Karachi, Pakistan.

SABAHAT ALI-KHAN

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### ON THE VALIDITY OF A PERCH *EPINEPHELUS ANGULARIS* (PISCES : SERRANIDAE)

#### ABSTRACT

Based on the descriptions and figures of earlier authors there is no basis for treating *Epinephelus angularis* as synonym of *areolata*. The present study suggests that *angularis* of Day (1875) with emarginate caudal, large and less number of spots on the body and maxillary extending to below middle of pupil is a valid species.

THE ANGULAR perch is represented intermittently in small numbers in the trawl catches from November to March and from May to August at Visakhapatnam (17°44' N; 83°23'E.)

It is also captured by handline. A total of 29 specimens measuring 57 mm to 304 mm TL were collected.

The author is thankful to Prof. S. Dutt for the encouragement. The author is indebted to UGC, New Delhi for financial assistance.

The present specimens agree with the description and figure 2, Pl. V given by Day (1857) of *Serranus* [*Epinephelus*] *angularis*. Later, Day (1888) noted that Klunzinger (1884) considered *Perca areolata* Forsskal to be identical with *Serranus angularis*.

There does not appear to be a basis for treating *angularis* as a synonym of *areolata*, as has been done by Boulenger (1895), Fowler and Bean (1930), Weber and de Beaufort (1931), Katayama (1960), Smith (1961) and Randall and Ben-Tuvia (1983). The figure of *areolatus* in Weber and de Beaufort, Katayama, Smith and Randall and Ben-Tuvia show more numerous spots on body than in the figure of *angularis* in Day and as are observed in the present specimens. The figure of *areolatus* in Fowler and Bean (1930) is rather stylised in that the spots on body are shown as arranged in vertical rows. Munro (1955) has given a brief description of *areolatus* placing *angularis*

in its synonymy and reproduced (Pl. 19, Fig 304) Day's figure of *angularis*. In this connection it may also be noted that in his original description of *Perca areolata* Forsskal (1775) states that the caudal is truncate, whereas in the present specimens and in Day's figure of *angularis* the caudal is emarginate.

Klausewitz and Nielsen (1965) state that the specimen in the zoological Museum at Copenhagen placed on a sheet of paper bearing No. 38, thus indicating that it refers to *Perca tauvina* in 'Descriptiones Animalium', is definitely not *tauvina*. They state that the specimen, of which they give a figure (P. 10, Fig. 23), is probably the type of *Perca areolatus* Forsskal, 1775. A comparison of the present specimens with their figure shows that the latter has definitely more numerous and relatively smaller spots on the body as in *areolatus*.

Another distinguishing character observed in *angularis* is that maxillary extending to below middle of pupil. In *areolatus* maxillary reaches a vertical through posterior margin of pupil (Katayama, 1960).

It suggests that *angularis* of Day (1875) is a valid species.

Department of Marine Living Resources,  
Andhra University, Visakhapatnam-530 003, India.

K. SUJATHA

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## SOME OBSERVATIONS ON GROWTH PATTERN IN NEWLY RECORDED *SOLETELLINA VIOLACEA*

### ABSTRACT

In the present work, an attempt has been made to obtain the generalised growth pattern of the *Soletellina violacea*. The growth of the juveniles was faster than that exhibited by the adults. The growth rates also show a direct relationship with the salinity of the environment.

THE GROWTH PATTERN is affected by several internal as well as external factors like food, space, seasons, tide, exposure, locations, age, salinity, etc. Local disturbances in the environment are known to temporarily inhibit molluscan growth. Walne (1958) has shown that oysters do not grow if tidal exposure exceeds 30‰. It has also been observed that generally growth is slower in the older specimens.

#### Material and methods

Random samples of *Soletellina violacea* were collected at fortnightly intervals for a period of 15 months in 1978-79. The animals were collected from 6 different locations in order to cover the entire area of the bed. The length was measured to 0.1 mm accuracy by a sliding calliper. The animals were then arranged in size groups with a class interval of 10 mm.

#### Results

In the collection obtained during March 1978, specimens of lengths varying from 70 mm to 110 mm formed the largest group. The small specimens of upto 40 mm were absent in this collection. In April '78, a distinct mode was observed at 95 mm, which shifted to 105 mm by May-June 1978. In July 1978 the largest specimens disappeared and in the absence of the juveniles the medium sized animals (40 to 80 mm) predominated. The juveniles made their appearance in August, 1978 with a mode at 25 mm, which remained stationary till

November, 1978 by which time the larger sized animals reappeared. In December, 1978, the distribution was quite uniform with 2 peaks at 25 mm and 85 mm. In January and February 1979, the juveniles were absent and a mode was observed at 80 mm. Thereafter the trend observed in the previous year was repeated.

#### Discussion

It is apparent from the study that in the case of *S. violacea* the growth of the juveniles was faster than that exhibited by the adults. Occurrence of similar differences in the growth rates of the juveniles and adults have been reported in *Mya aranaria* (New Comba, 1935) and *Meretrix casta* (Salih, 1973). It was suggested by Salih (1973) that these higher growth rates during the early juvenile stages coincide with periods of high salinity and that in fact the faster growth may be due to these high salinity conditions of the environment during the postmonsoon season. This was borne out by the present study within *S. violacea* showed high growth rates during November 1978-June 1979. These were the months of relatively high salinity which ranged from 30.1‰ to 32.4‰. But the growth rate during the monsoon, when the salinity of the water was low at 15‰-21‰ due to extensive inflow of rain water from the flooded river and also due to land drain, was comparatively very slow. Ranade (1964) has reported that at low salinity the clams close valves, thus reducing the extent

of water circulation. This would naturally result in a decrease in the filtration rate. Durve (1960) has pointed out that this rate was adversely affected by low salinity. It is

therefore suggested that under conditions of low salinity during the monsoon the food consumption was low due to low filtration with the result that growth was retarded.

Department of Zoology,  
Institute of Science, Bombay 400 032.

S. G. YERAGI\*

\* Present address: K. J. Somaiya, College of Science and Commerce, Vidyavihar, Bombay 400 077.

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### OTOLITH LENGTH—TOTAL LENGTH RELATIONSHIP IN TWO SPECIES OF SCIAENIDS

#### ABSTRACT

The relationship between otolith length and total length of two sciaenid fishes *Kathala axillaris* (Cuvier) and *Otolithes ruber* (Schneider), was studied statistically by the method of least squares and found that total length can be estimated from the otolith length in these fishes.

RELATIONSHIP between otolith length and total length of a fish is useful in archaeological studies and prey-predator dynamics. Obvious as this relation is, fish size can be extrapolated from length of otolith found at cooking sites of archaeological middens (Fitch, 1972), in coastal archaeological excavations (Fitch and Brownell, 1968) and in predator's stomach (Ainley *et al.*, 1981; Treacy and Crawford, 1981). Complete knowledge of prey species could be obtained with the aid of existing taxonomic keys of fish species based on otolith morphology. If the prey is a sciaenid it is extremely easy because the large sciaenid otolith is mainly used in the identification of species by taxonomists (Trewavas, 1977). Echeverria

(1987) worked out the relationship between otolith length and total length for 30 rockfish species of the genus *Sebastes*. The present study attempts to derive for the first time the relationship between total length and otolith length of the sciaenid species *Kathala axillaris* (Cuvier) and *Otolithes ruber* (Schneider).

The specimens were collected from commercial landings at Pondicherry during 1989. After re-establishing the identity of the species in the laboratory, they were measured with a scale in mm. The greatest length of the otolith was measured from the anterior to the posterior end to the nearest 0.1 mm with vernier calipers. The linear regressions on total length (y) versus

otolith length (x) were calculated by the method of least squares and expressed as

$$TL = a + b (OL)$$

where TL is the total length, OL is the otolith length, a is the intercept and b is the slope.

The relationship for *K. axillaris* could be expressed as

$$TL = -48.1262 + 20.8587 OL,$$

$r = 0.9706$ .  $N = 125$  and for *O. ruber* as

$$TL = -26.1173 + 27.0548 OL,$$

$r = 0.9810$ .  $N = 141$ .

Total length can be estimated from the otolith length. For instance an otolith of 10 mm size gives an estimated total length 160 mm for *K. axillaris* and 244 mm for *O. ruber*, respectively. The equation is species specific and also shows a potential to derive estimates of age from otolith length.

Department of Zoology,  
Centre for P.G. Studies,  
Pondicherry-605 008, India.

A. PASSOUPATHY  
V. ANANDAN\*

\* Department of Zoology, Tagore Arts College  
Pondicherry 605 008.

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### UTILIZATION AND PROXIMATE COMPOSITION OF A CEPHALOPOD *SEPIELLA INERMIS* (FERUSSAC AND D'ORBIGNY)

#### ABSTRACT

The marine cephalopod *Sepiella inermis* from Porto Novo waters was investigated for utilization and proximate composition for one year. The protein, carbohydrate and lipid content of the dried edible part was estimated. The percentage of protein 60.85, 35.96%, carbohydrate 0.20, 0.45% and lipid 11.7, 5.55% were observed in males and females respectively.

THE VALUE of cephalopods is increasing in the world market due to their nutritive value and India is earning a good foreign exchange by exporting. While a lot of information is available on protein, carbohydrate and lipid of oysters and clams (Ansell, 1972, 1974 a, b, c, d, 1975; Wafer, 1974; John, 1980; Balasubrahmanyam, 1984; Jayabal, 1984), knowledge on these aspects of cephalopods parti-

cularly *Sepiella inermis* is scarce. Hence an attempt is made here to estimate the protein, carbohydrate and lipids of *S. inermis* from Porto Novo waters.

The authors are thankful to the Director, CAS in Marine Biology for providing facilities and encouragement.

### Utilization

Cephalopods are usually consumed in fresh condition by the local people. In some occasions when the catches are very large, they are sun dried and sold in market like other fishes in Porto Novo. Normally the catches are very poor in Porto Novo region. The mantle, the edible part was separated out and the meat

per kg is about Rs. 20/kg (10-15 pieces) and the smaller ones costs about Rs. 10-15/kg. In Visakhapatnam it is about Rs. 16-20/kg (Rayudu and Chandramohan, 1983). Smaller ones and the discarded portion of the bigger ones were used as bait for fishes as well as manure. The cuttlebones are collected by the peoples and purchased by the shell merchants in monthly intervals, Rs. 1.50-2.00 per kg in Porto Novo. The cuttlebones are used in the preparation of abrasives and dentrifices (Dees, 1961). It is used for cleaning glasses and the powder of the bone is used as medicine for some ear ailments and Romans used the bone powder as a cosmetic (Trivedi and Sarvaiya, 1976).

### Material and methods

The specimens of *S. inermis* was procured from the fish trawlers in fresh condition from the Porto Novo waters at monthly intervals for a period of one year, November to October and brought to the laboratory. They were first thoroughly washed with tap water and subsequently with distilled water. After this, the mantle was cut open, the males and females were separated out and the cuttle-bones were removed from the body. Then the whole mantle was dried in an oven at a constant temperature of 40°C. The dried material was powdered and sieved by a bolting silk cloth. The powdered meat was used to determine the proximate composition of the animal.

Protein was estimated by Biuret method as modified by Raymond *et al.* (1964). Carbohydrate was estimated using the phenol-sulphuric acid procedure of Dubois *et al.* (1956). The lipid was estimated by chloroform-methanol extraction procedure of Folch *et al.* (1956) was adopted.

### Results and discussion

The monthly variation of protein, carbohydrate and lipid in male and female *S. inermis* was shown in Fig. 1.

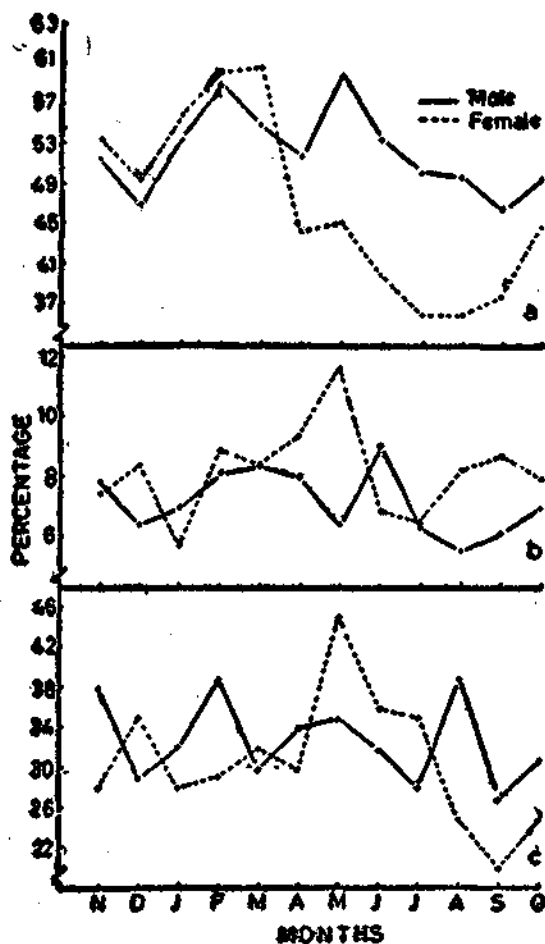


FIG. 1. Monthly variation of : a. protein, b. carbohydrate and c. lipid in *S. inermis*.

is cooked into curries, soup, cutlets and fried with chilly powder. In Porto Novo the mantle costs about Rs. 20/kg. In P. zhyar the cost of the flesh based on the number of pieces

Most of the cephalopods are edible because of its nutritive value next to fr-fishes and shell-fishes. The mantle constitute the major part of the animal. Present investigation shows the percentage of protein content varied from 60.85-46.50% and 60.48-35.96%, carbohydrate 0.39-0.27% and 0.45-0.20% and lipid 8.95-5.55% and 11.7-5.68% in males and females respectively. Males show high protein and females show high lipid content. Protein

shows a marked variation, carbohydrate and lipid does not show any marked variation, but only small monthly fluctuations were recorded in both sexes. Compared with the results and works of Ansell (1974 c, d, 1975); John (1980), Balasubrahmanyam (1984) and Jayabal (1984) on bivalve molluscs, *S. inermis* shows little low percentage of carbohydrate, protein and high in lipid.

CAS in Marine Biology, Annamalai University,  
Porto Novo-608 502.

S. R. J. DIOUS  
R. KASINATHAN

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**THE SPAWNING OF THE HOLOTHURIAN  
ACTINOPYGA MAURITIANA (QUOY AND GAIMARD)  
ON BOARD FORV SAGAR SAMPADA**

ABSTRACT

Four specimens of *Actinopyga mauritiana* collected on 27th September 1988 in Andaman waters south of Burmanalla near Port Blair, were left in the Aquarium on board FORV *Sagar Sampada* for observations. The surface temperature of the sea water was 25.0° C and the sea water in the Aquarium was 29.2° C. The higher temperature in the Aquarium triggered the male holothurians to spawn first followed by the female. The fertilized eggs developed only upto four-celled stage.

INFORMATION on the spawning of holothurians is sparse. Hyman (1955) summarised available information on the spawning of holothurian. Conard (1982) studied the reproductive cycle of closely allied species *Actinopyga echinites* from New Caledonia. James *et al.* (1988) succeeded for the first time to induce the commercially important holothurian *Holothuria (Metriatyla) scabra* to spawn in the laboratory by thermal stimulation. Lot of information is published in recent years on the spawning and rearing of the commercially important species *Apostichopus japonicus* from Japan and China.

Mortensen (1937) reported the spawning of *A. mauritiana* along with other species of holothurians on the Egyptian Coast of the Red Sea between April, 18 and June 27 in 1936. Conard (Per. comm.) informed that Dr. R. Richmond of the University of Guam succeeded in inducing *A. mauritiana* to spawn in the laboratory to study the development, but no other details are available.

During a cruise to Andamans on board FORV *Sagar Sampada* in September 1988 four specimens of *Actinopyga mauritiana* were collected from south of Burmanalla near Port Blair. Actually the specimens were collected

on 27th September 1988 between 1315 to 1445 hrs. At the time of collection it was heavily raining and the surface temperature of sea water was 25°C. The specimens were brought to the Aquarium on board FORV *Sagar Sampada* at 1830 hrs and stocked. The temperature of the sea water in the aquarium was 29.2°C. The specimens released were found to cling to the upper portion of the side wall of the aquarium tank. One male specimen began to spawn at 1915 hrs on the same day. The sperms were released as white streak from the gonopore situated on the dorsal side (Plate I). It soon mixed with sea water. The sperms in the sea water induced a female to spawn by 2200 hrs. The fertilized eggs proceeded in development only till the four-celled stage.

The obvious reason for spawning was that the sea water in the aquarium tank was 4.2°C higher than the sea water from which the specimens were collected. Hyman (1955) stated that holothurians brought in from nature and placed in the laboratory aquarium tend to spawn late afternoon or evening of the same day. The development could not proceed further than the four celled stage since the temperature in the aquarium tank was high.



*Actinopyga mauritiana* is highly priced species for *beche-de-mer* and it is distributed in the species can be sea ranched by inducing it to

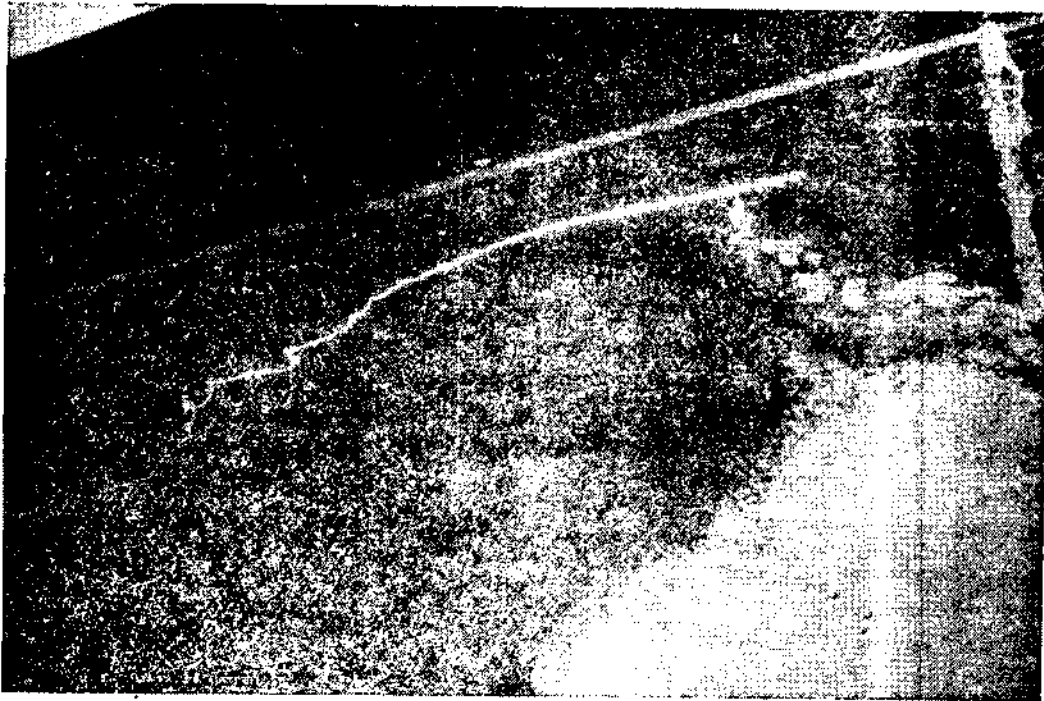


FIG. 1. A male *Actinopyga mauritiana* releasing the sperms in an aquarium tank.

Lakshadweep and the Andaman and Nicobar Islands in the Indian region (James 1989).

Central Marine Fisheries Research Institute,  
Cochin 682 014.

D. B. JAMES\*  
M. KATHIRVEL  
K. RAMDOSS  
A. CHELLAM

\* Present address: Tuticorin Research Centre of  
CMFRI, Tuticorin 628 001, Tamil Nadu.

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**ON A TWO-HEADED JUVENILE OF THE SPADE NOSE SHARK  
*SCOLIODON LATICAUDUS* MULLER AND HENLE**

ABSTRACT

A case of embryonic *duplicatus anterior* in the spade-nose shark *Scoliodon laticaudus* Muller and Henle collected from off Karwar is reported.

MONSTROSITIES and abnormal formations among sharks and rays have often been reported from different regions (Bigelow and Schroeder, 1953; Templeman, 1965; Meron, 1959; Luther, 1961; Chhappara, 1964; Bennet, 1964; Eswaran, 1967; Gopalan, 1971; Nair and Chellam, 1971). More than 35 cases of twin sharks have been reported during the last century (Anon., 1978). Occurrences of double headed shark and twin shark from Indian waters have earlier been reported by Gopalan (1971) in *Carcharias walbeehmi* and Devadoss (1983) in *Scoliodon laticaudus*. Recently Lazarus (1985) has reported an instance of two-headed 'embryo' of the Javanese cow-nose ray *Rhinoptera javanica* Muller and Henle.

During a routine weekly trawl landing observation at fish landing centre Baithkol, Karwar in January 1991, an unusual shark juvenile of the spade-nose shark *Scoliodon laticaudus* measuring 100 mm in length with two heads and a single trunk was noticed along with a catch of *Scoliodon laticaudus* and other demersal varieties of fishes, trawled from 10-15 m depth. The specimen is deposited at the Museum of the Department of Marine Biology, Karwar. A brief description of the abnormal juvenile is presented in this note, since the present observation is of interest for its significant morphological features different from the previously reported observations of this nature.

*Description*

The juvenile has two normally formed heads slanting left and right at the angles of about

50° and 60° respectively from linear direction, fusing laterally at the juncture of 5th gill opening of right and left heads. There is the normal complement of five gill openings on the outer sides of both the heads just above the origin of pectorals. On the inner sides of the two heads four gill openings are seen on each head and at the point of 5th gill opening the fusion has taken place (Pl. I A). There are two separate first dorsals placed parallel about 10 mm apart followed by two separate second dorsals closely situated at about 2 mm gap between them. While the point of origin of two first dorsals are in line, the origin of second dorsal on the left side is little towards the anterior side. Ventrally, just behind the fusion point a single umbilical cord is present (Pl. I B). On the ventral side behind the gill openings the common trunk has paired pectoral fins, pelvic fins, claspers and a single anal and caudal fins. All the fins are in normal shape. Various morphometric characters of the body in relation to both heads show close similarity in proportions, excepting the width of the mouth in the left head which is slightly more than that of the mouth in the right head. There are three ridges on the back, the two outer ones originate from respective first dorsal bases and run parallel towards left and right heads, the median ridge is in between them and runs towards the fusion point. Close to the fusion point, the ridge bifurcates and passes to left and right heads.

In fresh, the whole animal was pale white. Upper margins of pectorals, first dorsals,

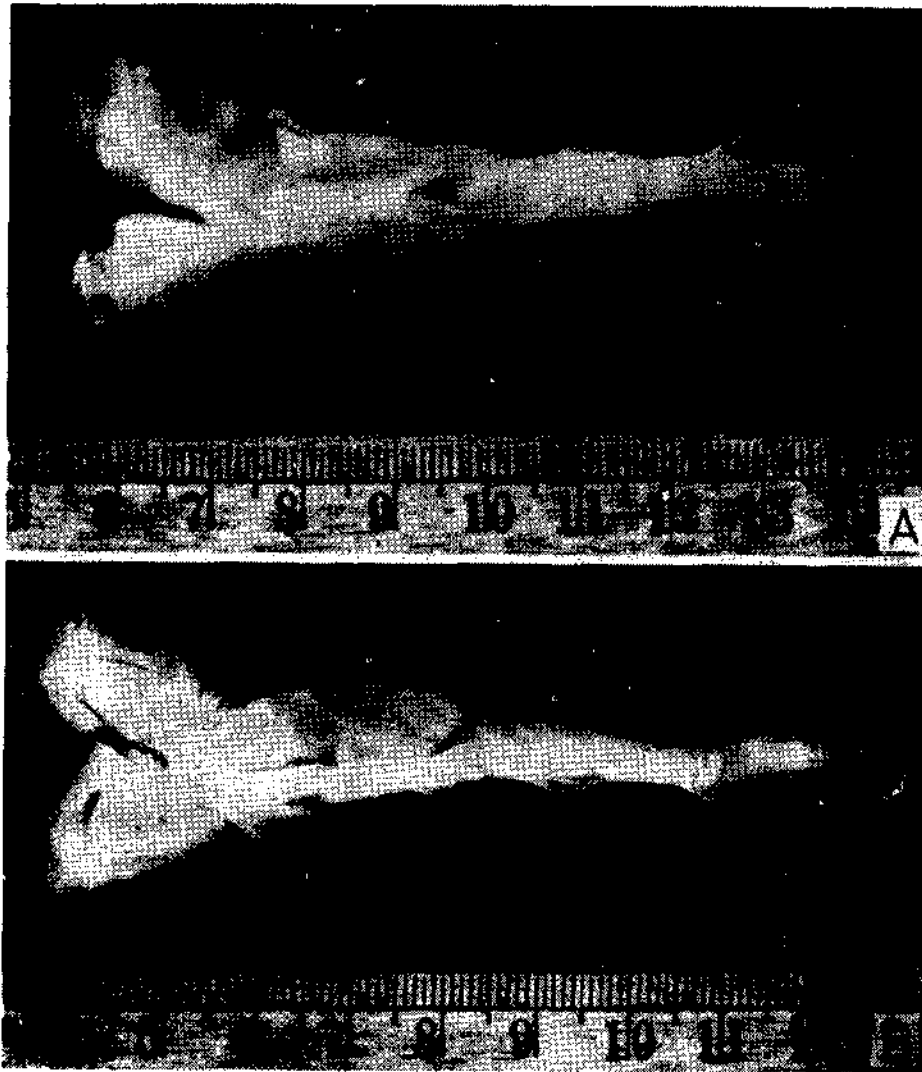


PLATE I. A juvenile spade-nose shark *Scoliodon laticaudus* : A. Dorsal view and  
B. Ventral view.

second dorsals, lower margin and terminal lobe of caudal were pink. Outer margins of pelvic and anal fins were brown.

#### Remarks

An unusual case of embryonic *duplicatus anterior* in a narrow-tooth shark *Carcharhinus remotus* was reported from Gulf of Nicoya on the Pacific Coast of Costa Rica (Anon., 1978). The specimen described had two separate heads fused just behind the eyes with well formed trunk. Devadoss (1983) has reported an instance of monozygotic twins of *Scoliodon laticaudus* from the Porto Novo Coast. They were both males, fused from pectoral region to cloaca and one of them is headless and severely malformed. Similar nature of deformity in a double headed specimen of *Carcharias walbeehmi* has been reported by Gopalan (1971). Most of the siamese twins of sharks reported in the literature were severely

malformed (Anon., 1978). However, in the present observation the specimen possesses two heads fused at the 5th gill opening and rest of the body is well formed with paired first and second dorsals.

Lazarus (1985) has reported the occurrence of two-headed 'embryo' of the Javanese cow-nose ray *Rhinoptera javanica* Muller and Henle. He has attributed the cause for the presence of two heads, four eyes, four spiracles, two mouths, four rows of gills and two caudal spines, to fusion of two embryos at the time of development inside the mother's uterus. The same cause can be attributed to the case of the present material also as its abnormality closely resembles that of the former. However, most teratologists attribute the cause for twinning to the process of early embryonic division initiated by environmental factors such as temperature extremes or physical trauma (Anon., 1978).

Department of Marine Biology,  
Karnataka University, Kodibag,  
Karwar 581 303.

KUSUMA NEELAKANTAN  
B. NEELAKANTAN  
C. MUTHIAH

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## BLOOM OF *ASTERIONELLA GLACIALIS* CASTRACANE IN NEARSHORE WATERS OF COVELONG (MADRAS), BAY OF BENGAL

### ABSTRACT

Monospecific bloom of *A. glacialis* in the nearshore waters of Covelong, Bay of Bengal, occurred on 30th May, 1989. Estimations of planktonic diatom populations, chlorophyll 'a' and physico-chemical parameters of waters were carried out before and after the bloom period in order to assess the causes for initiation and termination of the bloom.

OCCURRENCE of phytoplankton blooms in nearshore waters of bays is an interesting biological event in different seas. In the east coast of India, phytoplankton blooms generally occur between February and May every year (Ganapathy and Subba Rao, 1958). Information on bloom forming planktonic diatoms is limited in the seas around India, but detailed investigations have been made on the bloom, of *Trichodesmium* (Qasim, 1970; Devassy *et al.*, 1978) and dinoflagellates (Sargumam *et al.*, 1989).

In the present investigation, an attempt has been made to study the physico-chemical and biological characteristics of the nearshore waters of Covelong (Madras) during the bloom of *A. glacialis*.

The authors are grateful to Dr. A. Subramanian, Centre of Advanced Study in Marine Biology, Annamalai University and the University authorities for the facilities and to Department of Ocean Development, New Delhi for financial assistance.

### Materials and methods

Surface water samples were collected before, during and after the bloom period from Covelong (Madras) (12°46' N; 80°15' E) near the shore in May and June 1989. Temperature was measured using a standard centigrade thermometer. Salinity measurement was made using laboratory salinometer. For the esti-

mation of dissolved oxygen, nutrients and chlorophyll pigment, methods described by Parsons *et al.* (1984) were adopted. Phytoplankton population density was derived using the Utermöhl's sedimentation technique (Vollenweider, 1974) followed by counting in a Sedgwick Rafter cell, scanned under an inverted microscope.

### Results and discussion

During the present period of study, temperature, pH and salinity remained more or less stable whereas DO concentration fluctuated between 4.9 and 9.5 ml l<sup>-1</sup>. Concentrations of nutrients *viz.* nitrate and silicate were high during the peak period of bloom, but phosphate concentration was low probably due to utilisation, while blooming phosphate and silicate concentrations decreased at the onset of termination of the bloom. Chlorophyll 'a' showed two-fold increase on the initial levels, during the peak period of bloom (Table 1).

During the period of bloom, surface waters appeared brown due to the high concentration of *A. glacialis* which contributed 75 to 85% of the total phytoplankton. Along with *A. glacialis*, diatoms such as *Bellerophon malleus*, *Pleurosigma elongatum*, *Rhizosolenia styliformis* and *Thalassiothrix frauenfeldii* were also present.

Bloom of *A. glacialis* off Waltair Coast was attributed to local upwelling in the Bay of Bengal associated with enrichment of nutrients

and lowering of surface water temperature (Subba Rao, 1969). Bloom of *A. glacialis* in the nearshore waters of Gopalpur, Orissa Coast, was due to limited variation in salinity and availability of nutrients and its reduction appearance and persistence of *A. glacialis* bloom were due to hydrographical stability especially of temperature and salinity and availability of nutrients. A rapid decrease in silicate concentration from the peak period of

TABLE 1. Physico-chemical and biological characteristics observed during *A. glacialis* bloom in May and June 1989

	2nd	May 20th	30th	June 17th	30th
Temperature (°C)	.. 29.0	29.0	30.0	31.0	32.5
pH	.. 8.04	8.09	8.00	8.30	8.30
Salinity (x 10 <sup>-3</sup> )	.. 34.40	34.45	35.15	33.29	32.39
Dissolved oxygen (ml l <sup>-1</sup> )	.. 4.90	6.12	5.55	5.90	9.50
Phosphate (µg at P l <sup>-1</sup> )	.. 0.43	0.35	0.33	0.29	0.16
Nitrate (µg at NO <sub>3</sub> l <sup>-1</sup> )	.. 10.25	10.00	13.25	18.77	0.86
Nitrite (µg at NO <sub>2</sub> l <sup>-1</sup> )	.. 1.52	0.01	6.11	10.71	0.47
Silicate (µg at Si l <sup>-1</sup> )	.. 56.09	160.92	199.99	36.58	17.07
Chlorophyll 'a' (mg m <sup>-3</sup> )	.. 1.09	2.41	2.49	0.21	0.04
Phytoplankton density (Cells l <sup>-1</sup> )	..				
<i>A. glacialis</i>	.. 2,000	200,000	300,000	150,000	100,000
Other diatoms	.. 15,000	5,000	3,000	13,000	14,000

was due to nutrient depletion and the grazing pressure exerted by the copepods in the surface layers (Choudhury and Panigrahy, 1989). Results of the present study reveal that the bloom (about 5-10 folds), amidst an increase in nitrate and nitrite concentrations, could have terminated the bloom, as suggested by Choudhury and Panigrahy (1989).

Centre of Advanced Study in Marine Biology,  
Annamalai University,  
Parangipettai-608 502.

K. RAJENDRAN  
L. KANNAN

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**LENGTH-WEIGHT RELATIONSHIP IN  
PARASTROMATEUS NIGER (BLOCH) (PISCES : PERCIFORMES)**

**ABSTRACT**

Length and weight relationship of about 100 specimens measuring 19 to 96 mm was calculated for juvenile specimens of *Parastromateus niger* which constitute a good fishery along the inshore waters of Tuticorin. The linear equation was fitted for the juveniles and the regression equation was  $\text{Log } W = 1.5047 + 3.0420 \text{ Log } L$ . The exponent value in juveniles of *P. niger* obeys the cube law relationship maintaining the shape without any change.

A STUDY of length-weight relationship in fishes is important to establish the mathematical relationship between the two variables, length and weight and to know the variations from the expected weight for various length groups (Le rai, 1951). Weight of a fish is a function of its length and it is observed that the length-weight relationship could be expressed by the hypothetical cube law  $W = CL^3$ , where 'W' represents weight, 'L' the length and 'C' a constant. The formula could be used only if density and form are constant. A general parabolic equation of the form  $W = aL^n$  (Which expresses the relation between two factors better than the cubic formula) where 'W' and 'L' represent weight and length of a fish respectively, 'a' a constant equivalent to 'c' and 'n' a constant to be determined empirically i.e. from the data.

In the present study an attempt has been made to study the length-weight relationship of juvenile specimens of *Parastromateus niger* which constitute a good fishery along the inshore waters of Tuticorin (08°04' N; 78°14' E) Coast from May to August. Except for the work of Basheerudin and Nayar (1962) for a brief account on the size frequency distribution and the description of juveniles by Pati (1977), information available on the study of length-weight relationship in juveniles is meagre.

The authors are grateful to Dr. G. Jegatheesan, Fisheries College, Tuticorin for his keen interest, support and encouragement.

*Materials and methods*

For this study 100 specimens ranging in length from 19.0 to 96.0 mm were utilised. Total length was measured from tip of snout to vertical through the tip of longest caudal fin lobe in mm; weight was recorded to the nearest 0.01 mg. Specimens where the tail are broken were rejected.

*Results and discussion*

The parabolic equation  $W = aL^n$  can be expressed in the logarithmic form as  $\text{Log } W = \log a + n \log L$  i.e.,  $Y = a + bx$ ; where  $a = \log a$ ;  $b = n$ ;  $Y = 10 \text{ gm}$  and  $X = \text{Log } L$  which is a linear relation between Y and X. This linear equation was fitted for the juveniles of *P. niger* and the estimates of parameters of 'a' and 'b' for each category was obtained by the method of least squares. The regression equation for the juveniles is given below.

$$\text{Log } W = 1.5047 + 3.0420 \text{ Log } L.$$

During fish growth, when it does not change form or density, the weight will be proportion to the cube of any linear dimension. According to Hile (1936) and Martin (1949) the value of the exponent 'n' in the parabolic equation

usually lies between 2.5 to 4.0. For an ideal fish which maintains the same shape without any change, the value of 'n' is equal to 3.0 (Allen, 1938). In the present study the exponent value was found to be 3.0420, thus *P. niger* in its juvenile stages obeys the cube law relationship maintaining the same shape without any change (Allen, 1938). In fishes 'b' value is usually '3' in the length-weight relationship, but during growth change in specific

gravity of body contour, morphological changes due to age may also cause the coefficient of regression of logarithm on logarithm of length, to depart substantially from 3.0 (Rounsefell and Everhart, 1953). It is also interesting to note that allometrical growth is common in this species (Pati, 1977) and probably the study on adult specimens of *P. niger* may through more light on the deviation of the exponent value from 3.0.

Fisheries College,  
Tamil Nadu Veterinary and Animal Sciences  
University,  
Tuticorin 628 003.

V. K. VENKATARAMANI  
P. GOPALAKRISHNAN

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**FIRST RECORD OF SPOTTED CHUB MACKEREL *SCOMBER AUSTRALASICUS* CUVIER (SCOMBRIDAE : PISCES) OFF VIZHINJAM, SOUTHWEST COAST OF INDIA**

## ABSTRACT

The occurrence of spotted chub mackerel *Scomber australasicus* Cuvier, 1831 off Vizhinjam, southwest coast of India is reported. This is the first record of the species from the Indian Coast. The diagnostic characters, description, distinguishing characters from the other closely related species and distribution of this species are briefly given.

ON JULY 24, 1993, a specimen of spotted chub mackerel *Scomber australasicus* Cuvier, 1831 which was described by Cuvier and Valenciennes (1831) was found in drift gill net (operated from motorised craft) catch off Vizhinjam (08°22'30" N 76°59'15" E) along with *Sarda orientalis*. The net was operated about 20 km off the coast at a depth of about 70 metres. The species is relatively rare in tropical waters and the present report is the first record from the Indian Coast. The fish specimen is deposited in the museum of the Vizhinjam Research Centre of Central Marine Fisheries Research Institute, Vizhinjam.



The authors express their thanks to Dr. P. P. Pillai and Shri A. A. Jayaprakash of the Pelagic Fisheries Division of CMFRI for critically going through the manuscript and to Shri V. Viswanathan for collecting the specimen from the landing centre.

**Diagnostic characters:** First dorsal fin with 10 spines; space between first dorsal fin groove and second dorsal fin approximately equal to length of groove; distance from the end of first dorsal fin to the origin of second dorsal fin clearly greater than the dorsal fin base; anal fin origin below the 4th ray of second dorsal; anal fin spine independent from anal fin.

adipose eyelid; teeth in upper and lower jaws small and conical, teeth also present on vomer and palatine bones; gill rakers shorter than gill filaments; two widely separated dorsal fins; entire body covered with small scales, scales behind the head and around pectoral fins larger and more conspicuous than those covering the rest of the body, but no well-defined corselet; two small keels on each side of the caudal peduncle, but no central keel between them (Fig. 1).

The relevant morphometric measurements in millimetres and meristic counts are as follows: fork length 314, standard length 306, head length 89, eye diameter 22, length of maxilla 37,



FIG. 1. Spotted Chub mackerel *Scomber australasicus* caught off Vizhinjam, southwest coast of India.

**Colour:** Dorsal side steel blue with oblique lines which zigzag and undulate; belly pearly white marked with numerous dusky, rounded blotches.

**Description:** The total length of the fish was 348 mm and it weighed 447 gm. Body elongate and rounded, snout pointed; anterior and posterior margins of eyes covered by an

preorbital length 28, postorbital length 39, predorsal length to first dorsal base 110, dorsal fin base 40, distance between the end of first dorsal to the beginning of second dorsal 56, second dorsal base 31, distance to the origin of anal 206, anal base 27 (anal origin below 4th ray of second dorsal), space from the end of first dorsal groove to origin of second dorsal 46, length of first dorsal fin groove 47, pectoral

fin length 40, length of pelvic fin 37, depth of body 75, number of detached finlets 10, first dorsal fin spines 10, second dorsal fin rays 11 and anal fin with one independent spine and 11 rays.

Ripe running ovaries were noticed in the fish.

*Remarks*: The species has close resemblance with *S. japonicus* and *S. scombrus*. In *S. japonicus*, the space between the first and second dorsal fin is less than the first dorsal fin base, anal fin origin opposite to that of

second dorsal fin. In *S. scombrus*, space between the first dorsal fin groove and second dorsal fin clearly greater (approximately 1.5 times) than length of groove; anal fin origin opposite to that of second dorsal fin.

It is distributed in Western Pacific Ocean from Australia to New Zealand, north to China and Japan and east to Hawaiian Islands and also at Socorro Island, off Mexico in the Eastern Pacific Ocean. This species constitutes important fishery in Japan, Australia and New Zealand (Collette and Nauen, 1983).

Central Marine Fisheries Research Institute,  
Cochin-682 014.

G. GOPAKUMAR\*  
P. S. SADASIVA SARMA  
K. T. THOMAS

\* Present address: Vizhinjam Research Centre of CMFRI, Vizhinjam, Trivandrum-695 521.

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### OPISTHOMONORCHEIDES YAMAGUTINSIS SP. NOV. FROM THE INTENSTINE OF POMFRET *STROMATEUS ARGENTEUS*

#### ABSTRACT

A new species of the family Monorchiidae (Odhner, 1911) Nicoll, 1955; Subfamily Opisthomonorchiinae Yamaguti, 1971 and Genus *Opisthomonorcheides* Parukhin, 1966 is reported from intestine of the marine fish *Stromateus argenteus* (Bloch). The account includes the morphological description of the new species and a detailed discussion justifying its recognition as a new species.

PARUKHIN (1966) created a new genus for the trematodes collected from the fishes *Decapterus* sp. and *Selarmate* and named it *Opisthomonorcheides* with *O. decapteri* as type species. Subsequently, some species are added to this genus. A new species is reported there from the intestine of the pomfret *Stromateus argenteus* (Bloch).

The author is deeply grateful to Dr. V. B. Mulay, Deogiri College, Aurangabad, Dr. P. P. Karyakarte, Reader in Department of Zoology, Marathwada University, Aurangabad, Dr. S. S. Bhagwat, Head of Department of Parasitology, P. K. V., Akola, Prof. Shastri, Head of Department of Parasitology and Prof. Lande of Marathwada Kriahi Vidyapeeth, Parbhani and

Dr. C. D. Lqvekar, Senior Research Executive (Para), IDPL Research Centre, Hyderabad, Prof. Chandge and Prof. Mahajan, Fishery College, Ratnagiri for their keen interest and encouragement during this study.

#### Material and methods

The flukes were collected from the intestine of the host and were studied in live condition and then fixed in 4% formalin. The specimens were stained in Delafield's haematoxylin and mounted in D.P.X. mountant. The drawing

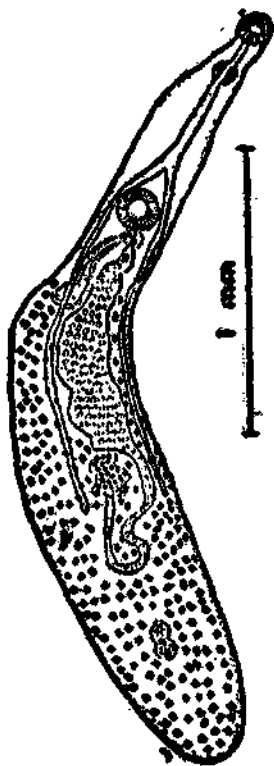


FIG. 1. *Ophisthomonorchelides yamagutinsis* sp. nov. — ventral view.

was made with the aid of a *camera lucida*. All the measurements are in millimeters, unless otherwise mentioned.

#### Description

*Ophisthomonorchelides yamagutinsis* sp. nov.

*Host* : *Stromateus argenteus* (Bloch)

*Habitat* : Intestine

*Locality* : Alibag, Maharashtra, India

The body of the parasite is slender, cylindrical, tapering at the anterior end and rounded at the posterior end. General surface of the body is smooth and the type specimen measures 2.72 (range in other specimens in parenthesis 2.12 to 3.32) in length and 0.48 (0.32 to 0.64) in width when measured in the mid region of the body. The oral sucker is located at the tip of the anterior end. It is terminal in position and measures 0.112 (0.09 to 0.13) in diameter. It is small as compared to ventral sucker. The acetabulum is large as compared to oral sucker. The ventral sucker is located in the anterior quarter of body and it measures 0.15 (0.11 to 0.19) in diameter. It is nearer to the anterior extremity at distance of 0.72. The ratio between oral and ventral sucker is 1.1 : 1.5.

The mouth leads into a long prepharynx which measures 0.10 in length. The prepharynx opens into a globular pharynx measuring 0.064 (0.054 to 0.074) in dimension. The oesophagus is tubular, longer than the pharynx and it measures 0.36 (0.32 to 0.40) in length. The oesophagus bifurcates at a distance of 0.58 from the anterior end of the body. The ratio of length of prepharynx and oesophagus is 1 : 3.6. The caeca run posteriorly upto the mid-region of the body and measure 1.3 (1.1 to 1.4) in length.

There is a single testis which is located in the last part of the body. Its posterior tip is at a distance of 0.34 from the posterior tip of the body. The testis is almost oval and measures 0.14 (0.11 to 0.17) in length and 0.64 (0.052 to 0.076) in width. The cirrus pouch is short and

having limited spines and measures 0.32 by 0.112. It encloses the three components, namely seminal vesicles, pars prostratica and cirrus. The seminal vesicles is in the form of a sac. It measures 0.20 (0.18 to 0.22) by 0.018 (0.07 to 0.15). The pars prostatica is tubular and it measures 0.12 (0.09 to 0.15) by 0.032 (0.025 to 0.035) in dimension. The cirrus has limited spines and opens into genital atrium. The genital atrium is located just posterior and close to the acetabulum on the central region of the body.

The ovary is pretesticular and it is situated far away from the testis and it measures 0.144 (0.114 to 0.174) in length and 0.12 (0.10 to 0.14) in width. The ovary assumes various shapes i.e. from slightly bilobed to irregular in shape. The seminal receptacle is small. It measures 0.032 (0.028 to 0.036) in dimension. The vitelline follicles are rounded bodies and extend below from the mid level of seminal vesicle to the posterior end of the body. The uterus occupies the entire pretesticular region, then ascends up to the anterior margin of the ventral sucker. The eggs are numerous, small and measures 0.017 (0.015 to 0.019) by 0.015 (0.011 to 0.019).

The excretory vesicle is saccular and the excretory pore is terminal.

#### Remarks

The present form differs from *O. decapteri* Parukhin, 1966 and *O. aspinosus* Khan, 1978 in the following characters.

The oral sucker is comparatively very small than acetabulum in *O. aspinosus*. The present form also has a small oral sucker, but not so small as compared to known species. The ratio of the oral sucker and ventral sucker is 1.1 : 1.5 in new species.

The ventral sucker is located nearer to mid-body than to the anterior extremity in *O. decapteri* the ventral sucker is nearer to the

anterior extremity than to the mid-body in the *O. aspinosus*, where as it is inbetween the mid region of oral sucker and mid-body. It is located at a distance of 0.72 from anterior extremity in the present form.

The prepharynx is longer than oesophagus in the *O. aspinosus* and it is shorter than oesophagus in the *O. decapteri* whereas it is also shorter than oesophagus and having the ratio 1 : 3.6 in the present form.

The genital pore is very nearer to acetabulum in the *O. aspinosus* and it is away from the acetabulum in the *O. decapteri* whereas it is close to the acetabulum in *O. yamagutinsis*.

The ovary is oval in *O. decapteri* and lobed of varying shapes in the *O. aspinosus* whereas it is bilobed in the new present form.

The eggs measurement also differ in the three *O. decapteri* 22 $\mu$  by 12  $\mu$  and *O. aspinosus* 16 $\mu$  by 9  $\mu$  and in new form 17  $\mu$  to 15  $\mu$ .

In addition to above, the present species differs from *Opisthomonorchelides indicus* Karyakarte and Yadav, 1976 and *O. aspinosus* Khan 1978 in the following characters.

The oesophagus is globular in *O. indicus* and it is elongated in the *O. aspinosus* whereas it is elongated and tubular in the new species and it measures 0.36.

The distribution and shape of the vitelline follicles also differ in the three species. In the known species (*O. indicus*) the follicles start at the posterior margin of the cirrus sac in *O. aspinosus* they start at the mid-level of cirrus sac, whereas the follicles start slightly below mid-level of cirrus sac in the new species.

The cirrus has numerous spines in *O. indicus* whereas spines are limited in number in the present form.

In addition to this the present species differs from *O. nigeri* Gupta and Puri (1981) and

*O. indicus* Ahmad (1977) in the following characters. The testis elongated, the ovary trilobed in having smaller eggs in *O. nigeri* and the ovary is large, four lobed in *O. indicus* whereas the ovary is not larger and elongated having a length 0.14 and 0.12 width, and it is appearing just slightly bilobed. The eggs are 0.0112 to 0.019 in the present species. The present species differs from all the above known species, therefore, this new species is established to accommodate the present form and named as *Optisthomonorchelides yamagutinsis* n. sp.

Department of Zoology,  
R. L-T Science College,  
Akola, Maharashtra.

L. U. LOKHANDE

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## ANNUAL REPORTS

### ANNUAL REPORT OF THE SECRETARY FOR THE YEAR 1992

President Dr. P. S. B. R. James and members of the Association,

I am very happy to welcome the members to the 34th Annual General Body Meeting of the Marine Biological Association of India and to present the Annual Report for the year 1992.

The membership position as on today is given below :

	<i>Life members</i>	<i>Individual members</i>	<i>Institution members</i>	<i>Total</i>
Indian ..	203	113	50	366
Foreign ..	36	6	26	68
Total ..	239	119	76	434

Regarding the publication of the Journal, I am happy to report that we are up-to-date with Vol. 34 for the year 1992 and the volume is already distributed to members. Editor's report will give further details regarding the publications. The financial position is also good compared to last year. The details will be given by the Treasurer in his report.

As decided in the last General Body Meeting, we had initiated action to conduct the Quiz Programme for college students this year also. However, since the announcement was made in April the response was not adequate and we felt that it will be better to conduct the competition when the colleges re-open after the examinations. So the Programme stands postpone and it will be conducted by the end of July, 1993.

Similarly, there was a suggestion that the Association may request its members who are experts in their field of specialisation to come forward and volunteer to talk to students in various Schools so that the students will be benefited as well as an awareness can be created about the Association and its activities. Accordingly, letters were issued to members in Cochin a few months ago. Out of 65 members contacted in Cochin, so far 20 members have responded favourably. A Panel of those who have agreed has been prepared. The same will be circulated to Schools shortly. There is already a lot of demand from school authorities and I hope the proposed programme will be very successful.

I am happy to inform the members that for the year 1992 the ICAR has sanctioned a grant of Rs. 40,000 towards printing the Journal. On behalf of the Association I would like to record our sincere gratitude to the Indian Council of Agricultural Research for the kindes gure.

I wish to express my sincere thanks to the President Dr. P. S. B. R. James, the Editor Dr. K. Rengarajan and the Treasurer Dr. K. Alagaraja for their kind help and co-operation in the smooth functioning of the Association. I am thankful to Dr. N. G. K. Pillai, Associate Secretary for his co-operation and assistance in the day to day working of the Association. I also would like to thank Miss Mallika for the Secretarial assistance rendered during the period.

Thank you all,

*Cochin 682 014,  
4th June 1993.*

Sd.  
V. K. PILLAI  
*Secretary*

### ANNUAL REPORT OF THE EDITOR FOR THE YEAR 1992

Respected President Dr. James, Distinguished Members and friends,

The year 1992 was yet another successful year in the publication of the Journal of our Association, in the sense that the publication was expedited and issued in October 1992 instead of December *i.e.* three months in advance compared to previous years.

#### *What we did in 1992*

Volume 34 for 1992 containing 43 papers and notes, was published of which 17 full papers were from the 'Symposium on Tropical Marine Living Resources' and 14 papers and 12 notes received for the regular Journal.

#### *What we propose to do in 1993*

Printing of Volume 35 for 1993 has been taken up and the first batch of 15 full papers *i.e.* 12 from Symposium lot and 3 of the Regular Journal, has been sent to press at Madras. We propose to include papers from the Symposium as much as possible in this Volume and the rest in Volume 36 meant for 1994.

#### *What we have in hand*

We have 110 papers and notes received for publication from 1989 onwards and 32 papers from the Symposium lot totalling 142.

#### *What we need*

The above 32 papers of the Symposium from 1988 and 110 papers some of them from 1989 are waiting for publication resulting the delay of over 5 years. We need considerable amount of money and efforts to clear these papers and reduce the shelflife of these papers to the minimum possible. Hence we need an all out efforts to mobilise fund and to restrict other expenses to the minimum possible till the papers are cleared.

We also need constructive suggestions from the distinguished members to build up and improve our financial position and to expedite the publication of the pending papers, which is one of the prime objectives of our Association.

*Acknowledgements*

I personally feel heartened that the support and help extended by all members have enabled me to bring out our Journal on time and I am thankful to you all. I wish to place on record my sincere thanks to the President Dr. P. B. S. R. James for his support and encouragement. I am immensely grateful to Shri P. T. Meenakshisundaram, Joint Secretary at Madras and Dr. C. P. Gopinathan, Associate Editor at Cochin for their timely and whole hearted co-operation and help extended to me. I thank the Secretary and Treasurer for their co-operation. I warmly appreciate and thank Shri A. D. Thomas Stephen and his staff at the C.L.S. Press, Madras for their support in expediting the publication of our Journal. I extend my sincere thanks to all Members of the Executive Council of the Association, who are always extending their co-operation.

I gratefully acknowledge the Grant-in-aid of Rs. 40,000 received from the ICAR, New Delhi for the publication of the Journal.

Thank you all,

Sd.

K. RENGARAJAN  
Editor

Cochin 682 014,  
4th June, 1993.

**ANNUAL REPORT OF THE TREASURER FOR THE YEAR 1992**

Dear President, Members of the Association and guests,

I have the honour to present the audited statement of accounts for the year ended, 31st December 1992. During the year under report Rs. 57,786.77 has been received under the membership subscription and entrance fee against Rs. 38,577.98 in the previous year showing an increase of Rs. 19,208.79. The realised amounts through sales of Journals, reprints and memoirs in 1991 and 1992 were Rs. 26,580.50 and Rs. 31,231.50 respectively indicating a rise of Rs. 4,651.00. However, a decline of Rs. 12,769.50 was noted during this period in the sales of special publications and symposia proceedings as compared to the previous years total realisation of Rs. 25,345.75. Under the Bank interest the amounts realised in 1991 and 1992 were Rs. 15,885.95 and Rs. 21,685.65 respectively thus showing an increase of Rs. 5,799.70 during 1992.

This year, the overall receipts stood at Rs. 2,47,189.48 against payments of Rs. 2,36,012.91 the income excess being Rs. 11,176.57. During 1991 the overall receipts amounted to Rs. 1,36,323.43 with excess income of Rs. 31,763.27.

We are grateful to I.C.A.R. for the grant of Rs. 40,000 for the publication of the Journal during this year. Members are requested to enlist new members and to help increase the sale of publications of the Association to improve its income so as to meet the mounting expense in the coming years towards printing the Journal and other publications. Any suggestions to improve the finances of the Association are, of course, welcome.



I am grateful to the President and all other Office Bearers of the Association for their valuable advice and co-operation. I am thankful to M/s. Shenoy and Shenoy, Chartered Accountants for having audited the accounts and sending their report in time to enable me to present the annexed audited statement of accounts for the year 1992. Help rendered by Shri G. Subbaraman of C.M.F.R.I. is gratefully acknowledged.

Thanking you,

Sd.

Cochin 682 014,  
4th June 1993.

M. SRINATH  
Associate Treasurer

**REPORT OF THE AUDITOR TO THE MEMBERS OF  
THE MARINE BIOLOGICAL ASSOCIATION OF INDIA,  
ERNAKULAM, COCHIN**

We have audited the attached Statement of Affairs of THE MARINE BIOLOGICAL ASSOCIATION OF INDIA as at December, 1992 and also the annexed Income and Expenditure account for the year ended 31st December, 1992 and report that :

1. We have obtained all the information and explanation which, to the best of our knowledge and belief, were necessary for the purpose of the audit.
2. The books of account are maintained on cash basis.
3. The Statement of Affairs and the Income and Expenditure account referred to in this Report are in agreement with the Books of Account.

In our opinion and to the best of our information, and according to the explanation given to us, the said accounts give a true and fair view :

(a) In the case of the Statement of Affairs, the state of affairs of the MARINE BIOLOGICAL ASSOCIATION OF INDIA, ERNAKULAM as at 31st December, 1992 and

(b) In the case of the Income and Expenditure Account, the Excess of Income over Expenditure for the year ended on 31st December, 1992.

Sd.

Cochin-35,  
22-5-1993.

V. G. K. SHENOY  
Chartered Accountant

THE MARINE BIOLOGICAL ASSOCIATION OF INDIA, ERNAKULAM, COCHIN

Receipts and Payments Account for the year ended 31st December, 1992

RECEIPTS	Rs.	P.	Rs.	P.	PAYMENTS	Rs.	P.	Rs.	P.
<i>Opening Balance</i>									
Fixed Deposit with Indian Bank, Ekm. ..	1,50,000.00				Printing and Stationery ..			1,441.86	
Short term deposit with Indian Bank ..	38,810.36				Postage ..			8,994.45	
Cash at Indian Bank, Ernakulam ..	22,805.73				Printing charges for Journals ..			1,27,074.90	
Cash at United Commercial Bank, Ekm.	193.94				Salary of Clerks ..			9,350.00	
Advance with Office Bearers for Postage	238.09				Loan paid to the Bank with interest ..			83,311.00	
Cash with the Treasurer ..	2,658.40				Miscellaneous including Audit Fee ..			5,840.70	
			2,14,706.52						
Entrance fee ..			497.50		<i>Closing Balance</i>				
Membership Subscription ..			57,289.27		Fixed Deposits:				
Bank Interest on STD & FDR ..			21,494.71		With Indian Bank Ekm (3 years) ..	1,50,000.00			
Sale of Journals, Reprints and Memoirs ..			31,231.50		With Indian Bank, Ekm. (Short Term				
Sale of Special Publications ..			12,576.25		Deposits) ..	50,000.00		2,00,000.00	
Grants-in-aid from I.C.A.R. for Journals ..			40,000.00						
Loan taken from Bank ..			80,000.00		<i>Cash at Banks</i>				
Miscellaneous Receipts ..			4,100.25		With Indian Bank, Ernakulam ..	24,522.36		24,876.00	
					Advance with Office Bearers on Postage ..	353.64		1,007.09	
					Cash with the Treasurer ..				
<b>Total</b>			<b>4,61,896.00</b>		<b>Total</b>			<b>4,61,896.00</b>	

ANNUAL REPORTS

As per our Report annexed of even date

	Sd.	Sd.	Sd.
Cochin, 21-05-1993.	V. K. PILLAI Secretary	P. S. B. R. JAMES President	V. G. K. SHENOY 200/22071 Partner

**THE MARINE BIOLOGICAL ASSOCIATION OF INDIA, ERNAKULAM, COCHIN**

*Income and Expenditure Account for the year ended 31st December 1992*

Rs.	P.	EXPENDITURE	Rs.	P.	INCOME	Rs.	P.
10,600.00		To Salary to staff ..	9,350.00	931.00	By Entrance fee ..	497.50	
2,459.40		,, Printing and Stationery ..	1,441.86	37,646.98	,, Subscription ..	57,289.27	
9,466.05		,, Postage expenses ..	8,994.45	15,885.95	,, Interest from Bank ..	21,685.60	
74,250.95		,, Printing charges for Journals ..	1,27,074.90	26,580.50	,, Sale of Journals reprints & memoirs ..	31,231.55	
—		,, Interest to Bank (loan of F.D.) ..	3,311.00	427.50	,, Sale of Special Publications ..	12,576.25	
3,792.85		,, Miscellaneous expenses including Audit Fee ..	6,031.64	20,000.00	,, Grant-in-aid from I.C.A.R. for Journals ..	40,000.00	
864.00		,, Cost of bi-cycle written off ..	—	9,933.25	,, Miscellaneous receipts ..	4,100.25	
9,971.93		,, Excess of income over Expenditure ..	11,176.57				
<u>1,11,405.18</u>		<b>Total</b> ..	<u>1,67,380.42</u>	<u>1,11,405.18</u>	<b>Total</b> ..	<u>1,67,380.42</u>	

NOTE : No depreciation is provided on typewriter and furniture.

As per our Report annexed of even date.

Cochin,  
21-05-1993.

Sd.  
V. K. PILLAI  
Secretary

Sd.  
P. S. B. R. JAMES  
President

Sd.  
V. G. K. SHENOY 200/22071  
Partner

THE MARINE BIOLOGICAL ASSOCIATION OF INDIA, ERNAKULAM, COCHIN

Statement of Affairs as on 31st December, 1992

Rs. P.	LIABILITIES	Rs. P.	Rs. P.	Rs. P.	Assets	Rs. P.	Rs. P.
<i>General Fund</i>							
2,02,975.14	Balance as per last year ..	2,37,865.32		2,658.40	Cash with Treasurer ..	1,007.09	
	<i>Add : Excess of Income over</i>			238.09	Cash with Office Bearers for		
9,971.93	Expenditure ..	11,176.57			postage ..	353.64	1,360.73
24,918.25	Symposia receipts ..	—			<i>Cash at Banks</i>		
			2,49,041.89	22,909.73	Indian Bank, Ernakulam ..	24,522.36	
				193.94	United Com. Bank, Ekm.	—	
				1,50,000.00	Fixed Deposit with Indian		
					Bank ..	1,50,000.00	
				38,810.36	Short Term Deposit		
					with Indian Bank ..	50,000.00	2,24,522.36
				8,254.30	Typewriter ..		8,254.30
				14,904.50	Furniture ..		14,904.50
<u>2,37,865.32</u>			<u>2,49,041.89</u>	<u>2,37,869.32</u>			<u>2,49,041.89</u>

ANNUAL REPORTS

As per our Report annexed of even date.

For SHENOY & SHENOY  
Chartered Accountants

Sd.

V. G. K. SHENOY 200/22071  
Partner

Sd.

V. K. PILLAI  
Secretary

Sd.

P. S. B. R. JAMES  
President

Cochin,  
21-05-1993.

**REGISTRATION OF NEWSPAPERS (CENTRAL) RULES 1958**  
*Statement about ownership and other particulars about newspaper*  
**JOURNAL OF THE MARINE BIOLOGICAL ASSOCIATION OF INDIA**

**FORM IV**  
**(SEE RULE 8)**

1. *Place of Publication* — Cochin.
2. *Periodicity of its publication* — Half-yearly.
3. *Printer's Name* — Mr. A. D. Thomas Stephen.  
*Nationality* — Indian.  
*Address* — The C. L. S. Press, 10 Vepery Church Road, Vepery,  
Madras-600 007.
4. *Publisher's Name* — Dr. K. Rengarajan, for the Marine Biological Association of India .  
*Nationality* — Indian.  
*Address* — C.M.F.R.I. Campus, Dr. Salim Ali Road, Cochin-682 014.
5. *Editor's Name* — Dr. K. Rengarajan.  
*Nationality* — Indian.  
*Address* — C.M.F.R.I. Campus, Dr. Salim Ali Road, Cochin-682 014.
6. *Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital* — Marine Biological Association of India, C.M.F.R.I. Campus, Dr. Salim Ali Road, Cochin-682 014.

*I, K. Rengarajan, hereby declare that the particulars given above are true to the best of my knowledge and belief.*

Cochin-682 014,  
Dated: 31-10-1993.

Sd.  
K. RENGARAJAN  
*Signature of Publisher*

## INSTRUCTIONS TO AUTHORS

**Manuscript Requirements:** Only manuscripts solely intended for publication in the *Journal of the Marine Biological Association of India* may be sent in final form for consideration to the Editor. Manuscripts should be type-written on one side in double space throughout on foolscap paper leaving 4 cm margin and submitted in duplicate consisting of the original and one neat carbon or xerox copy. About one and a half manuscript foolscap pages in elite type will normally reduce to one printed page and manuscripts should not exceed twenty type-written pages including Tables and Figures which should be less than 15 per cent of the entire paper. Major papers are those longer than six pages of double spaced (elite type) manuscript. If the manuscript is from a thesis, it should be revised and made suitable strictly following the format and instructions given here, for publication in the Journal. Before submitting the manuscript, the authors should check whether there are inconsistencies between the Tables and Figures and the text or within the text. Both Tables and graphs illustrating the same point will not be accepted. As a rule, footnotes should be avoided except when they are used to credit institution contribution series number and unpublished material. In Tables superscript numerals should denote footnotes which should be explained below the concerned Table, with the first line indented.

**Manuscript Details:** Acknowledgement should be made preferably in the 'Introduction' in a separate paragraph. Indent the first line of each paragraph except the first line under 'Introduction.' Underscore only where *italics* are intended as in the address under the author(s) name(s), scientific names and source of publication in literature citation at the end of the paper. Both in zoological and botanical names only the initial letter of the genus is capitalised. The specific and sub-specific names always begin with a small letter even if they refer to a person or place. Author's names after species, sub-species, varieties, forms and notations such as sp. nov. and so on associated with scientific names should not be underscored.

Material and Methods when given should be limited to what scientists need in understanding the design of the study and in judging whether the data obtained is adequate. The relative importance of the headings in the MS should be shown by their position on the page and by proper use of the capitals and lower case as given below :

First order — CENTRE HEADING, ALL CAPITALS.

Second order — Centre Heading, Capitals and Small Capitals.

Side heading — Capitals and lower case underscored, not indented.

Run-in-heading — Capitals and lower case, underscored and indented.

Names of all simple chemical compounds other than their formulae should be used in the text. When Greek symbols or unusual signs which normally cannot be typed are used, they should be written out quite legibly and made easy to differentiate as between: 'K' upper case and 'k' lower case. Similarly, complex mathematical equations should also be clearly written out if they cannot be typed fully. Double space should be left above and below the lines that have equations and formulae with superscript and subscript. All measurements should be given in the metric system only.

**Title Page:** The title of the manuscript should be brief, but should encompass the content of the paper and should be typed wholly in capitals. This is followed by the author(s) name(s) with the initials preceding the surname. No periods follow the title or the author(s) name(s). The address of the author(s) given below the name(s) should be underscored with no period at the end.

On a separate slip, a condensed title for running head of less than 45 letters inclusive of spaces should be provided. Titles with scientific names must contain a common identifying term, e.g. '... the Fish *Hoplostethus frolicinctus* (Gunther) ...'

**Abstract:** All articles and notes should have an abstract in the form acceptable to all abstracting journals. For articles, this should not exceed 5 per cent of the length of the manuscript and should be typed in double space starting on the title page leaving 5 cm margin. The abstract should not be a summary of the work done, but should highlight the salient points and recapitulate the findings and conclusions.

**Notes:** Notes are those papers with fewer than six pages of double spaced (elite type) manuscript and will have no centred headings. The title will be followed by an abstract and the name(s) of the author(s) will be given at the end of the article on the right hand side of the page with the address on the left hand side before 'References.' The 'References' cited at the end of the note will be in the same way as full papers, but will not have the titles of papers.

**References:** Citation of literature should have author, year, title, name of journal, volume number and inclusive pages.

## INSTRUCTIONS TO AUTHORS

Abbreviations of the names of the Journals should be according to the 'World List of Scientific Periodicals' (4th edition, 1964-65) or to recognised forms only. Examples:

FOGG, G. E. 1952. The production of extracellular nitrogenous substances by a blue green alga. *Proc. Roy. Soc.*, B 139 : 372-397.

HARVEY, H. W. 1931. *Biological Chemistry and Physics of Sea Water*. Cambridge Univ. Press, London, 194 pp.

MOTT, J. C. 1957. The Cardiovascular system. In: M.E. Brown (Ed.) *The Physiology of Fishes*. Academic Press, Inc., New York, N. Y., Vol. 1, pp. 103-109.

SCHAEFER, M. B. AND J. C. MARR 1948. Spawning of yellowfin tuna (*Neothunnus macropterus*) and skipjack (*Katsuwonus pelamis*) in the Pacific Ocean off Central America, with description of juveniles. *Fishery Bull. Fish. Wildl. Serv., U. S.*, 51 (44) : 187-196.

In the text, the references should be cited thus: Fogg (1952), Schaefer and Marr (1948) with the author(s) name(s) followed by the year of publication in parenthesis.

**Tables:** Tables should be avoided if the matter could be covered by the text. Tables when given should not contain bulky data and should be given on separate sheets and their position in the text indicated suitably. They should be neatly typed without any overlapping of the columns and without vertical rules. Each Table should be numbered with Arabic numerals (e. g. Table 3) and should have a brief heading which is underscored. Both Tables and graphs illustrating the same point will not be accepted.

**Illustrations:** Drawings or illustrations should be made in Indian ink on white Bristol board or good quality tracing paper or on co-ordinate paper with blue grids and normally to twice that of the final printed size. The size of the printed area of the Journal is 18 x 12.5 cm and this will be the maximum size for full page Figure with legend. Figures should be numbered in Arabic numerals and indicated in the text thus: Fig. 1 and should have the Fig. number, legend, author and abbreviated title of the paper or note on the back. All lines, symbols, letters and numerals must be neat and legible and letterings at least 1 mm high when reduced to appropriate size. Xerox copies of drawings or illustrations will not be accepted.

Photographs or photomicrographs for reproduction must be clear and show good contrast and must be free of clip markings and cracks. Prints must be in glossy glazed paper

and of a size not smaller than 8.0 x 5.5 cm. When photographs are grouped as one Plate, then should be trimmed and mounted with no space between those in the group as intended for final reproduction. Each photo of such a group should be lettered with a block letter (A, B, C, etc.) at the right bottom corner and in the text indicated thus: Plate I A. Such notations on Text-figures should be given as (a, b, c, etc.). Type-written lettering on Figures is not acceptable.

Legends for figures should be written on a separate sheet headed 'Captions for illustrations' at the end of the manuscript.

Scale of magnification of *camera lucida* drawings should be indicated besides the drawing itself.

**Proofs and Reprints:** A galley proof will be furnished to the author along with an order blank for reprints. The corrected proof along with the order for the reprints should be promptly returned to the Editor within 10 days of the date of despatch (15 days from abroad) failing which it will be the responsibility of the author if mistakes appear in the paper. Authors may be charged for any changes other than the printer's errors. Authors are also requested to keep the Editor informed of any change of their address.

The Association will not give any gratis reprints of the article(s) published in the Journal, to the author(s). However orders from the authors and from their Institutes/ Departments will be undertaken on payments. The payments (cost of reprints, Packing and Postal charges by surface mail, Bank commission when the payment is made by cheque/ Demand Draft, etc.) have to be effected immediately by the authors Institutes on receiving the Invoice from the Association's Office. On receipt of the payments, the reprints will be despatched to the authors/ Institutes. The reprints should be ordered in multiples of 25 and will be supplied without covers.

Institutional orders for reprints must also accompany the galley proof with full instructions about invoicing.

All manuscripts, books for review and correspondence concerning the editorial matters should be addressed to:

### THE EDITOR,

Marine Biological Association of India,  
Post Box No. 1604, Dr. Salim Ali Road,  
Tatapuram—P.O., Ernakulam,  
Cochin - 682 014, Kerala, India.

**JOURNAL OF THE MARINE BIOLOGICAL ASSOCIATION OF INDIA**

*(J. mar. biol. Ass. India)*

The Journal is the official organ of the Marine Biological Association of India and is issued twice in a year. The available volumes are :

Vol. 1. Nos. 1 & 2 (1959) to Vol. 13. Nos. 1& 2 (1971)	Rs. 75* Each
Vol. 14. „ (1972)	Rs. 150*
Vol. 15. „ (1973)	Rs. 200
Vol. 16. Nos. 1 to 3 (1974) to Vol. 18. Nos. 1 to 3 (1976)	Rs. 300 Each
Vol. 19. Nos. 1 & 2 (1977) „ Vol. 24. Nos. 1 & 2 (1982)	Rs. 150 Each
Vol. 25. Nos. 1 & 2 (1983) „ Vol. 32. Nos. 1 & 2 (1990)	Rs. 200 Each
Vol. 33. (1991) „ Vol. 35. „ (1993)	Rs. 250 Each

\* Limited numbers are available.



**THE MARINE BIOLOGICAL ASSOCIATION OF INDIA**

Official organ : **Journal of the Marine Biological Association of India**  
(Free to the Members)

**PROPOSAL FORM FOR MEMBERSHIP (INDIAN/FOREIGN)**

To be completed and sent to the Secretary, Marine Biological Association of India,  
C. M. F. R. I. Campus, P. B. No. 1604, Tatapuram — P.O., Ernakulam, Cochin-682 014

**For Individual Membership**

Full Name with academic qualifications, etc. (in BLOCK letters) :  
  
Nationality :  
  
Date of birth/age :  
  
Occupation/Designation :  
  
Type of Membership required : Life Membership/Annual Membership  
  
Mailing address :  
  
Permanent address :

**For Institutional Membership**

Name of Institution (in BLOCK letters) :  
and mailing address

I/We wish to be enrolled as Individual/Institutional Member of the Marine Biological Association of India from the year ..... The entrance fee Rs. .... and membership subscription\* Rs. .... are/is remitted in cash/by cheque/by M. O. to the Treasurer, Marine Biological Association of India, C. M. F. R. I. Campus, P. B. No. 1604, Tatapuram — P.O., Ernakulam, Cochin-682 014.

Dated.....

.....  
*Signature of the Individual / Head of the Institution*

Cheques should include an additional amount of Rs. 10.00 towards bank commission and handling charges.

\* For Membership Subscription, please see next page

## THE MARINE BIOLOGICAL ASSOCIATION OF INDIA

*Official organ* : Journal of the Marine Biological Association of India

### TERMS OF MEMBERSHIP

	<i>India</i>	<i>Foreign</i>
Life Member	.. Rs. 600 (+ Rs. 25 entrance fee)	\$ 100 (+ \$ 5 entrance fee)
Individual (annual)	.. Rs. 50 (+ Rs. 25 entrance fee)	\$ 15 (+ \$ 5 entrance fee)
Institutional (annual)..	Rs. 200 (no entrance fee)	\$ 30 (no entrance fee)

(Cheques should include Rs. 10.00 towards Bank commission and handling charges)

Subscriptions may also be paid in Dollars, Pound Sterling or equivalent in any other currency.

Members have the right and privilege to elect the Members of the Executive Council and receive the Journal of the Association free.

Remittances of subscription, etc. by Cheque/Money Order may be made in the name of the Treasurer, Marine Biological Association of India and the correspondences may be addressed to :

THE SECRETARY,  
Marine Biological Association of India,  
Dr. Salim Ali Road,  
P. B. No. 1604,  
Tataparam — P. O.,  
Ernakulam, Cochin-682 014, Kerala,  
India.



**THE MARINE BIOLOGICAL ASSOCIATION OF INDIA**

ERNAKULAM, COCHIN-682 014, INDIA

**PROCEEDINGS OF THE SYMPOSIUM  
ON ENDANGERED MARINE ANIMALS AND MARINE PARKS**

The Proceedings of the Symposium on Endangered Marine Animals and Marine Parks contain 65 papers and 1 Abstract presented at the Symposium held by the Marine Biological Association of India, in January 1985 at Cochin, India. These 66 papers and abstract have been classified in 4 major Sections as given below :

**SECTION 1 : Marine Mammals**

**SECTION 2 : Estuarine and Marine Reptiles**

**SECTION 3 : Other Marine Vertebrates and Invertebrates**

**SECTION 4 : Marine Parks, Sanctuaries, Reserves, Zoos and Oceanaria.**

The Symposium was attended by 160 participants including 30 foreign experts representing 16 countries. The papers presented in 6 Technical Sessions were discussed and published in 505 pages in a single Volume with full rexin hard board binding. Realising the importance of the subject matter, the urgent need of management and conservation of the endangered and or vulnerable animals and the preservation of their environments, the Symposium identified 15 important recommendations on the priority areas and 7 general recommendations which have also been included in this Volume.

This Volume meticulously edited by the eminent scientist Dr. E. G. Silas, is a wealth of informations on the subject and priced reasonably for Rs. 500.

An Order Form is appended on the reverse for use.

**THE MARINE BIOLOGICAL ASSOCIATION OF INDIA**

**COCHIN - 682 014, INDIA**

**ORDER FORM**

Ref. : Vol. 35 (1 & 2)

To

The Secretary,  
The Marine Biological Association of India,  
P. B. No. 1604,  
Tatapuram — P. O., Ernakulam,  
Cochin-682 014, India.

Sir,

Please register an order for ..... copy/copies of the 'Proceedings of the SYMPOSIUM ON ENDANGERED MARINE ANIMALS AND MARINE PARKS '.

A Crossed Bank draft/Cheque\* for Rs./US \$.....towards the cost, packing and postage\*\* is enclosed.

Please send us an Invoice for arranging payments.

Signature .....

Name .....

Address .....

Place.....

Date.....

Please strike whichever is not applicable.

\* The Cheque/Draft may be drawn in the name of the Treasurer, Marine Biological Association of India, P. B. No. 1604, Tatapuram — P.O., Ernakulam, Cochin-682 014, India.

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