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CAPSALA LAEVIS (VERRILL, 1874) ON *MAKAIRA TENUIROSTRATUS* (DERANIYAGALA, 1951) WITH A DISCUSSION ON HOST IDENTITY

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ABSTRACT

The monogenetic trematod *Capsala laevis* (Verrill) is recorded from the marlin *Makaira tenuirostratus* (Deraniyagala). A detailed description of *C. laevis* along with notes on the identification of the host are dealt with here.

INTRODUCTION

OF the twenty-five valid species of *Capsala* Bosc recognized by Yamaguti (1961), only *Capsala laevis* (Verrill, 1874), *Capsala ovalis* (Goto, 1894), *Capsala megacotyle* (Linstow, 1906) and *Capsala gouri* Chauhan, 1952 are reported from the Indian Ocean. The first three of the above four species, *Capsala poeyi* (Vigueras, 1935) and *Capsala pricei* Hidalgo, 1959 parasitize Istiophoridae and Xiphiidae, the families of marlins, spearfish, sailfish and swordfish.

Bell (1891) described *Tristomum histiophori* (=*Capsala laevis*) based on the material collected and labelled as ' Parasites from *Histiophorus brevirostris*, Madras ' by Dr. F. Day. Goto (1899) referred *T. histiophori* Bell to his *Tristomum ovale* var *armata*. According to Setti (1899) *T. histiophori* is a synonym of *Tristomum laevae*, Verrill (=*Capsala laevis*) and also of *Tristomum ovale* Goto (=*Capsala ovalis*). Price (1938), however, assigns specific status to *Tristomum ovale*, as the absence of dorsal marginal spines in this species, according to her, is to be given specific importance. Johnston (1929), Price (1938) and Sproston (1946) agree in regarding *T. histiophori* Bell, a synonym of *C. laevis* (Verrill, 1874). The present account is the second record of this species from the Indian region and incorporates a detailed description specially the reproductive system with a discussion on host identity.

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Capsala laevis (VERRILL, 1874) (Fig. 1 a - f)

Tristoma laeve Verrill, 1874, 40; 1885, pl. 43; *Tristomum laeval* var *armata* Goto, 1899, 271-273, pl. 20, figs. 10-12 ; *Tristomum histiophori* Bell, 1891, 534-535 ; *Capsala laevis* Johnston, 1929, 76, pl. 27, fig. 210 ; Price, 1938, 410-411, pl. 2, figs. 3-7 ; Price 1939, 78, as *C. laevis* (Goto)—*nec T. laeve* of Linton, 1898, *nec* of Linton, 1901 (=*C. lintoni*) ; Linton, 1940, 10-11, pl. 15, figs. 184-188 ; Sproston, 1946, 299, figs. 55-b-c ; Chauhan, 1951, 45-46, fig. Ia, b ; Yamaguti, 1961, 118, pl. 31, fig. 237 ; *Tristomella laevis* Guarti, 1938 ; Price, 1960.

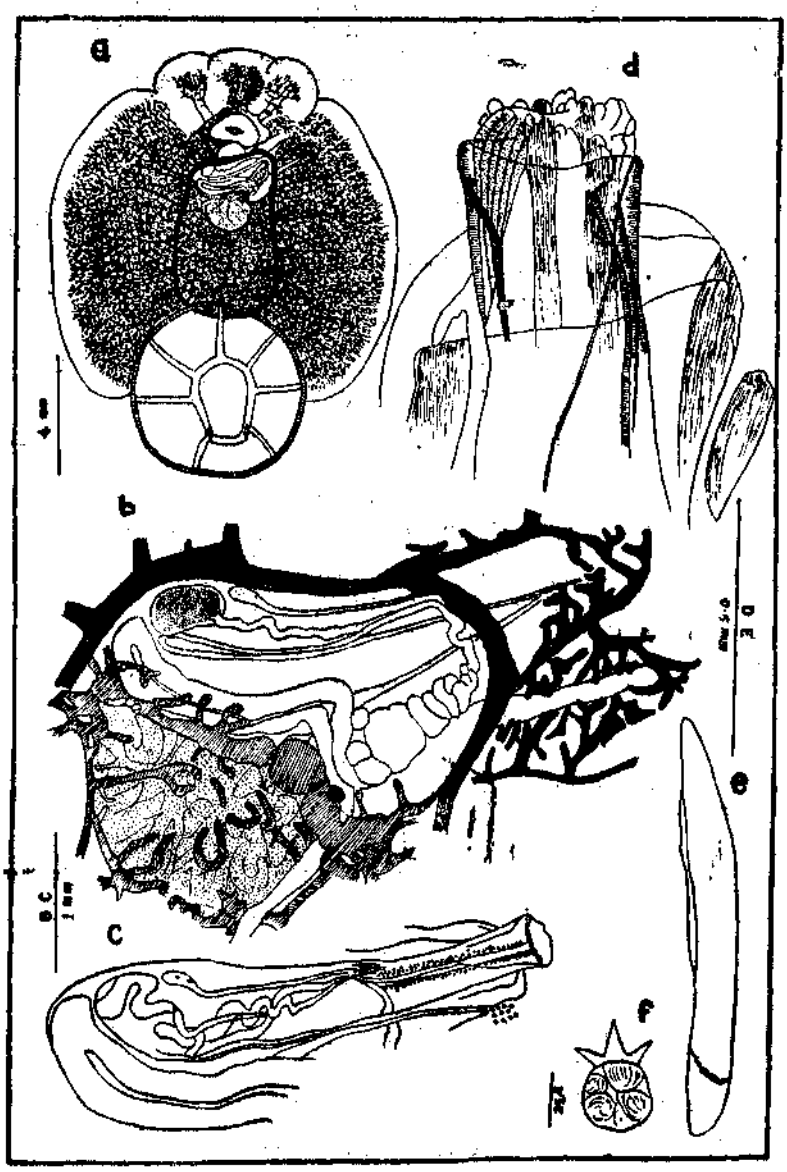

Fig. 1. *Capsala laevis*—a. ventral view ; b. reproductive structures ; c. sex atrium ; d. penis ; e. haptorsal spine ; and f. dorsal marginal hook.

Material

Eight specimens. Five of them on the body below the second dorsal fin—four on left side and one on right side—of *Makaira tenuirostratus* (Deraniyagala, 1951) landed at Theckkuvadi, Rameswaram Island from Gulf of Mannar on 3rd February 1971, two specimens from another host of the same species and locality, on the body just beneath the second dorsal fin on the left side, on 26th February, 1971 and on specimen on the body of the same host species landed at Cape Comorin (Southern extremity of Gulf of Mannar) on 5th January, 1971. Four specimens mounted in glycerine-gelatin and the rest preserved in 5 per cent formalin ; all deposited in the Reference Collection Museum of C.M.F.R.I., Mandapam Camp.

Distribution

On *Tetrapturus albidus* Poey from Block Island, N. America (Verrill, 1874); on *Histiophorus brevirostris* Day, 1878. (= *Makaira indica* (Cuvier) according to Nakamura *et al*, 1968) from Bay of Bengal, Madras (Bell, 1891) ; on *Histiophorus orientalis* Temminck and Schlegel (= *Istiophorus platypterus* Shaw and Nodder) and *Histiophorus* spp. from Misaki, Japan (Goto, 1894) ; on Dorado (*Coryphaena hippurus*) from San Paulo, Brazil, N. America (Price, 1938) and on *Xiphias gladius* from Atlantic Coast of N. America (Linton, 1940).

Identity of the host

Robins and de Sylva (1960 and 1963), Nakamura, Iwai and Matsubara (1968) and Strasburg (1970) recognize five species of *Tetrapturus* namely *angustirostris* Tanaka, *belone* Rafinesque, *albidus* Poey, *audax* (Philippi) and *pluegeri* Robins and de Sylva. While Nakamura, Iwai and Matsubara (1968) consider three species under *Makaira* namely *indica* (Cauvier), *nigricans* Lacépède and *mazara* (Jordan and Snyder), the other authors mentioned above recognize only the first two species. In the Indian Ocean, *T. audax*, *M. indica* and *M. nigricans* are met with and the possible second species of *Tetrapturus* is the shortbill spearfish, *T. angustirostris* (Jones and Silas, 1962 ; Morrow, 1962).

The key characters used by Robins and de Sylva (1960) to delineate *Tetrapturus* and *Makaira* are :

> Anterior lobe of spinous dorsal fin higher than body depth at dorsal fin origin, the lobe portion often rounded ; 12 precaudal and 12 caudal vertebrae ; flesh red (except in *audax*) ; size small, usually much less than 300 lbs. .... *Tetrapturus*
>
> Anterior lobe of spinous dorsal fin low, pointed, less than body depth, considerably so in large individuals ; 11 precaudal and 13 caudal vertebrae ; flesh pale ; size large reaching 2000 lbs. ..... *Makaira*

19 specimens of the present host species examined from the Gulf of Mannar extending from Rameswaram Island to Cape Comorin, are found to conform to the characters of *Makaira* except in the size which ranged from 725 to 1750 mm in length measured from the anterior margin of orbit to the caudal fork. The weight of specimens 725 to 1241 mm in length ranged from 2 to 21 kg.

Species of *Makaira* are distinguished by Robins and de Sylva (1960) as follows :

> Pectoral fin rigid, nearly immobile ; lateral line simple ; chambers of gas bladder in several tiers ..... black marlin, *Makaira indica* Cuvier
>
> Pectoral fin depressible ; lateral line complex, forming hexagons on the body (difficult to see in large fish) ; chambers of gas bladder in one tier (except for a few isolated chambers) ..... blue marlin, *Makaira* (*Makaira*) *nigricans* Lacépède

Moreover, in the blue marlins, the body sides are round rather than flat and the anterior part of the body before the first anal fin nearly of cylindrical form (Morrow, 1962).

Several workers (Rivas, 1956 ; Royce, 1957) have considered the Atlantic and Indo-Pacific blue marlins to be identical, and indeed they cannot be distinguished on the basis of any external characters. However, Morrow (1957) showed, on osteological evidence, that they are distinct and regarded them as subspecies namely the Pacific blue marlin, *Makaira ampla mazara* and the Atlantic blue marlin, *Makaira ampla ampla*. But examination of more material by Morrow (1959) indicated that each form should be given full specific rank and hence felt appropriate to give suitable vernacular names. The Atlantic form, *Makaira nigricans* has long been known as the ' Atlantic blue marlin '. Since *Makaira mazara* has now been shown to occur in both the Pacific and Indian Ocean, the term ' Indo-Pacific blue marlin ' (Kurokajiki) is applied to it ; it has the same range as the black marlin and its presence in the Indian Ocean noted by American ichthyologists only very recently ; the occurrence of Sri Lanka, west of the Maldive Islands, at Mosambique and at Mauritius all first records for these area.

Therefore it seems uncertain that the *Makaira nigricans* of Jones and Silas (1962) in the Indian Ocean is in reality *M. nigricans* or *M. mazara*. The anatomy of the pectoral girdle alone could delineate them. It is probably this uncertainty that made Nakamura, Iwai and Matsubara (1968) to treat *M. nigricans* of Jones and Silas (1962), Morrow (1962), etc. in the Indian Ocean as synonyms of their *M. nigricans* and *M. mazara* as well.

Thus, in the present state of knowledge, we have the black marlin *Makaira indica* and the Indo-Pacific blue marlin *Makaira mazara* in the Indian Ocean.

The present host species differs from the black marlin and the Atlantic and Indo-Pacific blue marlins and combines the following diagnostic features :

> Pectoral fin flexible ; lateral line not visible externally ; chambers of gas bladder in several tiers ; body sides very much flattened ; anterior part of body before the first anal fin is very much compressed laterally.

In the Museum of the Central Marine Fisheries Research Institute, Mandapam Camp, there is a stuffed specimen labelled as *Makaira tenuirostratus*, the body measurements of which tally with the data given for *Tetrapturus tenuirostratus* Deraniyagala, 1951, by Silas and Rajagopalan (1962) who invite reference to a taxonomic discussion of the same in Jones and Silas (1962) where it is treated as *Tetrapturus* sp. The latter authors in turn draw attention to the morphological features of this species dealt with by the former authors. However, in the

anterior height of the first dorsal fin, there is contradiction between these authors. Jones and Silas (1962) mention that the anterior height of the first dorsal fin is distinctly higher than the height of the body below it which justifies treatment of the specimen as a species of *Tetrapturus* based on the key of Robins and de Sylva (1960). But Silas and Rajagopalan (1962) referred it as *T. tenuirostratus*, where the depth of the anterior lobe of the first dorsal fin (174 mm) is given as much shorter than the depth of the body at origin of first dorsal (217 mm) as well as the maximum depth (235 mm) in a specimen 1231 mm in body length which is the same labelled as *M. tenuirostratus* in the Museum.

The morphometric data and visceral anatomy given by Silas and Rajagopalan for this species (locality : Tuticorin, Gulf of Mannar) compare well with the same observed in 19 specimens from Gulf of Mannar. Particulars given for *T. tenuirostratus* by Deraniyagala (1952) also tally with the present specimens except in the length of the ventral fin which is much longer than the pectoral in specimens below 1150 mm in length (anterior orbit to fork) ; but tends to become shorter than the pectoral in specimens above this size. Hence the present host is considered as *Makaira tenuirostratus* (Deraniyagala, 1951). A detailed taxonomic discussion based on statistical treatment of morphometric and meristic data would be published elsewhere. It is difficult to agree with Nakamura, Iwai and Matsubara (1968) who treat *T. tenuirostratus* Deraniyagala as a synonym of *T. audax*. A brief taxonomic discussion is given by Deraniyagala (1962) ; according to him this is the same species that Day erroneously assigned to *Histiophorus brevirostris* Playfair, this name being a synonymy for the short beaked *T. indicus* Cuvier (= *M. indica*). However Nakamura, Iwai and Matsubara treat Day's *H. brevirostris*, a synonym of *M. indica*.

It is interesting to note that the specimens of *Tristomum histiophori* (= *Capsala laevis*) which Bell (1891) described, were collected by Dr. F. Day from *Histiophorus brevirostris* at Madras, Bay of Bengal. In the present observation, *C. laevis* has been collected only from *M. tenuirostratus* and never found on the sailfish, *Istiophorus platypterus* Shaw and Nodder which is commonly landed along with the former. Its occurrence in other marlins and spearfishes from the Indian region is not known as they are very rarely caught in the inshore region. It may thus be possible to render support from parasitological evidence to Deraniyagala's (1962) claim that *H. brevirostris* of Day is a synonym of his *T. tenuirostratus* as *C. laevis* seems to be specific to this host in the Indian region, although recorded from others elsewhere.

Description of *C. laevis*

Body measurements of eight specimens are given in Table 1. Total length of body from origin of cephalic lobe to end of opisthohaptor ranges from 13.14 to 17.71 mm. Body broadly oval and leafy with slightly concave ventral side. Cephalic lobe in anterior summit flanked by circular prohaptors that are much bigger than those in *Capsala martinieri*. Diameter of prohaptor 0.309 to 0.454 times (average 0.399) in that of opisthohaptor. Opisthohaptor circular, project beyond body proper by 0.255 to 0.500 times (average 0.394) in its diameter and 0.482 to 0.611 times (average 0.548) in body length excluding projecting portion of opisthohaptor. Length of body proper and maximum width of body nearly equal. Ventral surface of opisthohaptor with a closed central loculus and extra locular field divided into areas by six main ridges ; a pair of long spindle shaped anteriorly tapering hooks present ; marginal booklets absent ; whole of ventral surface rough with minute

papillae ; periphery bordered around by marginal striated membrane. On each side, outside the field of intestinal branchings, a single longitudinal row of dorsal marginal hooks, tricuspid and with broad lobular base. Mouth in between and at the plane of hinder end of prohaptors. Pharynx divided by a constriction into anterior and posterior halves. Pharynx immediately confluent with the intestine and hence oesophagus does not seem to exist. Intestinal crura affluent with each other at a little posterior to the anterior margin of opisthohaptor. Eight main branches from each intestinal crus give rise to dentritic branchings throughout the extracaecal field except the margins and posterior half of opisthohaptor ; anterior most branch from each intestine supplies cephalic lobe and prohaptors ; nearly four branches from each crus supply intercaecal field. Intestinal branchings together

TABLE 1. *Body measurements (in mm) of* Capsala laevis *from the body surface of* Makaira tenuirostratus

Date	Length of host (anterior orbit to fork & weight)	Locality	Total length of body from origin of cephalic lobe to end of opis-thohaptor	Length of body proper excluding projecting portion of opis-thohaptor	Maximum breadth of body	Diameter of opis-thohaptor	Diameter of prohaptor
6-1-1971	.. 1050	Cape Comorin (Gulf of Mannar)	14.00	11.00	11.14	6.43	2.57
5-2-1971	.. 1150 18 kg.	Theckuvadi Rameswaram	15.43	12.71	12.57	6.14	2.57
		Is. (Gulf M.)	13.14	11.00	11.85	5.30	2.30
			16.30	13.57	13.14	7.43	2.71
			15.43	13.57	13.14	7.30	3.14
			14.28	12.14	12.30	6.71	2.57
26-2-1971	.. 1241 28 kg.	do.	17.71	13.57	14.30	8.30	2.57
			16.43	13.30	14.71	7.86	3.57

with vitellaria present a violet blue tinge to the animal except along the periphery and the posterior half of the opisthohaptor that are of ash colour. Testes, multiple, in the form of a follicular mass, extend laterally beyond intestinal crura, their extreme lateral zone form a convex border clearly visible due to differential intensity in colouration of testicular and extratesticulor fields, the former being lighter than the latter. Sperm duct or seminal duct (*vas deferens*) proceeds anteriorly along left intestine, enlarges into a spermiducal vesicle that crosses anterior to vitelline duct, folds back at the point of right intestine and turn to left where it coils many times to form the exterior seminal vesicle (*vesicula seminalis externa*). From this leads the minute *seminal ejaculatory canal* or *ductus ejaculatorius* into the common sex atrium into which it runs from left to right and *vice versa* and reach the tip of sex atrium. Prostate and granule forming glands and their ducts well developed ; they occupy the right corner of sex atrium and the ducts join the *ductus ejaculatorius*.

Penis, in the form of a tiny muscular portion in continuation with the sex atrium, supported by longitudinal and transverse muscles and slightly demarcated from surrounding tissues by a special fold. Terminal portion of penis provided with a few knob like projections that probably help in anchoring the mates firmly. Ovary hemispherical and multilobular inside. According to Bychovsky (1957), among Capsalidae and related forms, a special chamber from which the oviduct emerges, is isolated within the ovary which apparently serves for the accumulation of a certain number of ripened egg cells before the beginning of accelerated egg laying and at the same time it may also serve as a *receptaculum seminis* inside the ovary. No such chamber is discernible in the present specimens. Oviduct leads into vitelline bursa and then enters ootype. Uterus opens a little behind penis. Vagina well developed, opens ventrally at about midway between middle and left lateral extremity of body, a little posterior to opening of sex atrium ; proximal portion of vagina widens in the shape of the bottom of a round-bottomed flask and in close contact with the left vitelline duct. This widening in vaginal tract may act as *receptaculum seminis*. Among Capsalidae, the vagina is termed *ductus vaginalis* as per Odhner's terminology which means that it opens into vitelline duct as against the true vagina that opens into oviduct (Bychovsky, 1957). Vitellaria as extensive as intestinal branchings including cephalic lobe, but not prohaptors or opisthohaptor ; vitelline follicles more concentrated in extratesticular field ; main vitelline ducts open into the spherical vitelline bursa.

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