

ON A NEW GENUS AND SOME NEW SPECIES OF OPISTHBRANCHIATE
GASTROPODS OF THE FAMILY EUBRANCHIDAE
FROM THE GULF OF MANNAR¹

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ABSTRACT

A new genus *Annulorhina* based on the type species *A. mandapamensis* and three new species namely *Eubbranchus mannarensis*, *Capellinia fuscannulata*, and *Eubbranchopsis indicus* of the family Eubbranchidae are described from the Indian Ocean. The present record of the genera *Capellinia* and *Eubbranchopsis* extend their distribution to the Indian Ocean.

The detailed structure and specific characters of each species have been given and their affinities discussed.

The family Eubbranchidae, according to Baba (1960), consists of six genera namely, *Eubbranchus* Forbes, 1838; *Capellinia* Trinchese, 1929; *Eubbranchopsis* Baba, 1929; *Galvinella* Eliot, 1907; *Egalvina* Odhner, 1929, and *Cumanotus* Odhner, 1907. During the course of study of the nudibranch fauna of Gulf of Mannar and Palk Bay around Mandapam from the intertidal region near the jetty of Central Marine Fisheries Research Institute, certain specimens representing three new species under the known genera *Eubbranchus*, *Capellinia*, and *Eubbranchopsis* and a fourth one under a genus not hitherto known have been collected and described in the present communication.

1. Genus *Eubbranchus* Forbes (1838)

Synonyms : *Amphorina* Quatrefages (1844), *Galvina* Alder and Hancock (1855)

Acteioproct Eolidacea with triseriate radula; a single row of denticles on the masticatory borders; anal opening about the middle of the body, in front of the right post-anal row; rhinophores smooth; cerata simple; foot corners round, angulate or tentaculiform; ptyaline glands present; penis unarmed with a separate preputial sac.

Eubbranchus mannarensis sp. nov.

Locality.—Gulf of Mannar, near the jetty of the Central Marine Fisheries Research Institute, Mandapam Camp.

Five specimens collected during December, 1963 to March, 1964. The type specimens are deposited in the Reference Collection Museum of the Central Marine Fisheries Research Institute, Mandapam Camp. Holotype registered No. CMFRI/82.

The largest specimen (Fig. 1, a) is about 5 mm. in length, slender and elongated in appearance. The specimens are translucent white, mottled with orange and grey patches all over the body except on the sole of the foot. The oral tentacles and rhinophores have dark brown bands with white, shining granules distributed all over the body.

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The head bears two pairs of smooth and bluntly pointed tentacles. There are five-paired rows of cerata, which are arched and situated opposite one another. The first row of each side is deeply arched with five to six cerata arranged in a line. There are four cerata in the second row, three in the third, two in the fourth, and one in the last. The largest cerata (Fig. 1, *b*) is about 1 mm. in length, fusiform and slender with a constriction below the tip. The hepatic diverticulum in the cerata (Fig. 1, *dg*) is yellowish-brown, but deep red at its base. Tail is long and tapering. The pericardial prominence is situated between the first and second rows of cerata.

The anus (Fig. 1, *an*) is behind the pericardial prominence, median in position, inclined to the right and situated on a low papilla in front of the right post-anal row. The renal opening is close to the anal opening. The genital openings (Fig. 1, *go*) are on the right lateral side below the first arch of the cerata. The foot is narrower than the back extending up to the tip of the tail. The anterolateral corners of the foot are produced into short horn-like processes. The eyes are black, situated below the rhinophores.

The jaws (Fig. 1, *c*) are colourless, with a row of pointed denticles (Fig. 1, *d*) along the delicate masticatory border. The radula is triseriate, with 56 to 62 teeth which gradually narrow down posteriorly. The young median tooth (Fig. 1, *e*) is 17μ in width, horseshoe-shaped with three denticles on either side of the median spine. The lateral teeth (Fig. 1, *h*) are thin, smooth, and plate-like with triangular spine. The ptyaline glands extend posteriorly up to the middle of the body.

The hermaphrodite gland consists of two groups of follicles. The hermaphrodite duct dilates into a sausage-shaped ampulla. The male duct slender and muscular continuing into the muscular unarmed penis (Fig. 1, *i*). The preputial sac is fairly large and attached to the posterior end of the penis. The oviduct is short, passes through the female gland mass, and opens into the female atrium by nidamental duct. The vagina is short and leads into the club-shaped spermatheca.

The specific characters of *Eubbranchus mannarensis* sp. nov. are as follows: Body translucent white, mottled with orange and grey-coloured patches; cephalic tentacles with brown-coloured bands, smooth and bluntly pointed; cerata caducous, simple, fusiform with constriction below the tip; foot narrower than the dorsum with anterolateral corners produced into short horns; anus aedeoprotic median; masticatory border with a row of denticles; radula triseriate, median tooth with two to three lateral denticles on either side of the sharp median spine, lateral teeth thin plate-like with triangular spines; ptyaline glands present; penis unarmed with a separate preputial gland.

Discussion.—The genus *Eubbranchus* is so far known to include *E. productus* (Farran, 1905); *E. horii* Baba (1960); *E. masakiensis* Baba (1960) and *E. rubeolus* Burn (1964) all from the Indo-Pacific region. All the above species are characterised by the branching of the right and left livers. The genital openings are on the right and lateral side below the first arch in all the forms. Except that of *E. rubeolus* the descriptions of the morphological and anatomical characters of the other three species were incompletely reported.

Eubbranchus horii, reported by Baba (1960) from Sagami Bay, Japan, is typical of the genus *Eubbranchus*. It differs from *E. mannarensis* described above in (1) the general colouration of the body, (2) the arrangement of rows of cerata, (3) the nature of the foot, and (4) the shape and size of the teeth of radula.

Eubbranchus misakiensis, described by Baba (1960) from Sagami Bay, Japan, like *E. mannarensis* has produced foot corners, but differs from it in (1) the general colouration of the body, (2) in the absence of chocolate brown ring in the sub-apical region of the cerata, and (3) the presence of a large boss in the middle of the hepatic diverticulum of the cerata.

Eubbranchus rubeolus described by Burn (1964) from Victoria, Australia, is characterised by the dark red patches on the notum. In both *E. rubeolus* and *E. mannarensis* the posterior part of

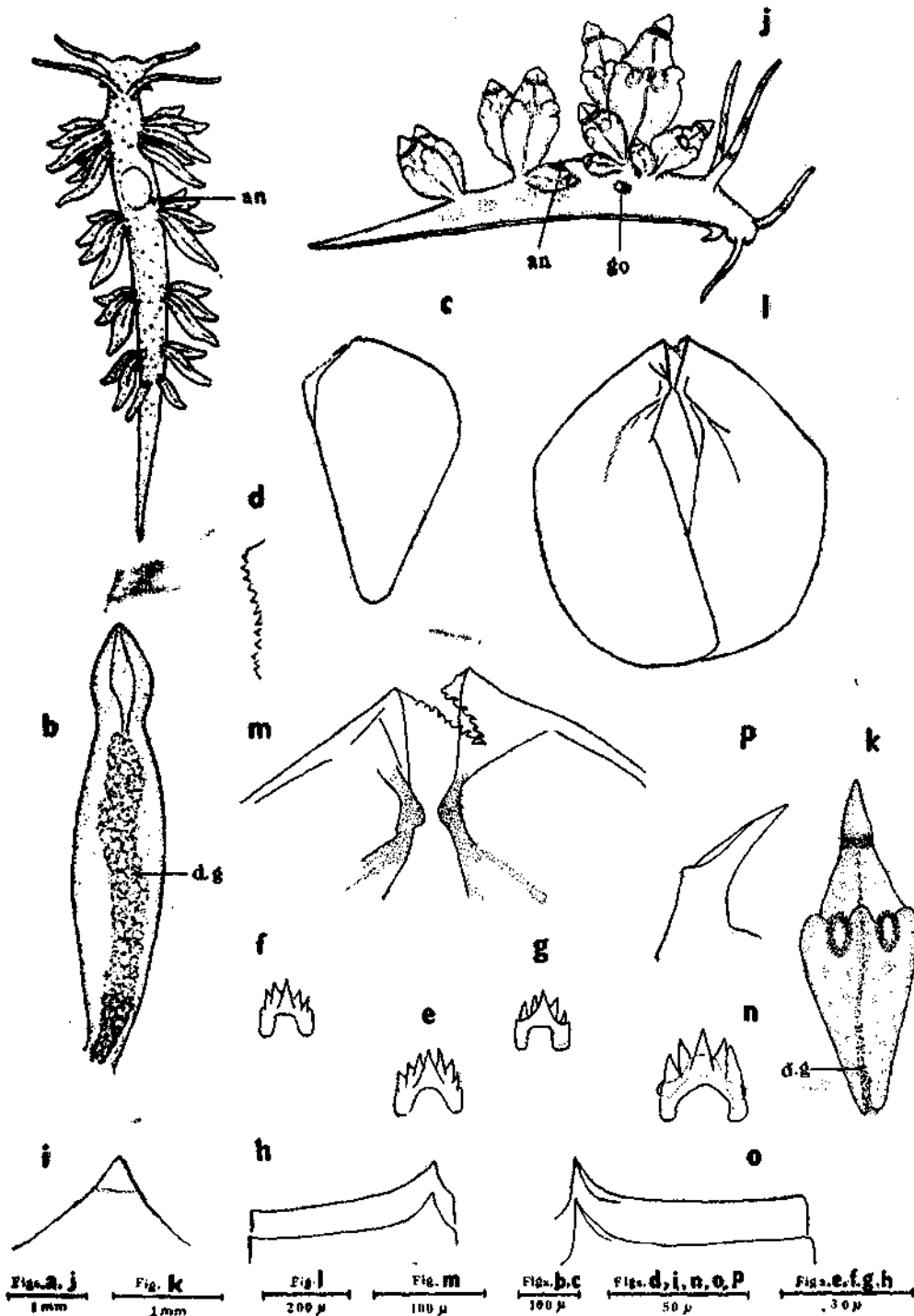


FIG. 1. (a-i) *Eubranchus mannarensis* sp. nov. (a) Dorsal view of the entire animal; (b) Cerata; (c) Jaw; (d) Masticatory border; (e) Median tooth; (f, g) Dorsal and ventral views of the older teeth; (h) Lateral teeth; (i) Tip of the penis. (j-p). *Capellinia fuscannulata* sp. nov. (j) Lateral view of the entire animal; (k) Cerata; (l) Jaws; (m) Masticatory border; (n) Median tooth; (o) Lateral teeth; (p) Penial stylet. an anus; dg digestive gland; go genital openings.

the hepatic diverticulum of the cerata is red in colour. The presence of (1) coloured patches on the notum, (2) rounded corners of the foot, (3) notch on the lateral tooth and the overlapping denticles on the masticatory border, distinguish *E. rubeolus* from *E. mannarensis*.

Eubranchus productus, described by Farran (1905) from the Gulf of Mannar, Ceylon, resembles *E. mannarensis* in (1) the general contour of the body, (2) the shape of the cerata, and (3) the nature of the foot.

In *E. productus* the radula has only nine teeth, the median teeth robust with short median spine and five to six lateral denticles. The lateral teeth are triangular in shape whereas in *E. mannarensis* the radula has a large number (56-62) of minute teeth, each with a large median spine with two to three lateral denticles. The lateral teeth are rectangular in shape.

In view of the above, although *E. mannarensis* resembles other species known so far in certain characters, it is strikingly different from them in certain other characters. It is therefore described here as a new species after the place of its occurrence.

2. Genus *Capellinia* Trinchese (1874)

Acleioproct Eolidacea with triseriate radula; masticatory border with a single row of denticles; foot corners round or angulate; cerata with knobs or tubercles; ptyaline glands present; separate preputial sac exists; penis armed with obliquely cut stylet.

Capellinia fuscannulata sp. nov.

Locality.—Gulf of Mannar, near the jetty of the Central Marine Fisheries Research Institute, Mandapam Camp.

Five specimens collected during February and March, 1964. The type specimens are deposited in the Reference Collection Museum of the Central Marine Fisheries Research Institute, Mandapam Camp. Holotype registered No. CMFRI/83.

The specimens are long and slender and the largest of them (Fig. 1, *j*) is about 5 mm. in length. The body is translucent and milky-white in colour. The paired tentacles of the head are marked with deep brown bands. Prominent brown rings in between the tubercles of the cerata and deep brown bands in the sub-apical regions of the cerata are present.

The head bears two pairs of long slender and smooth tentacles, which are bluntly terminated. The dark-pigmented eyes are situated below the rhinophores. The dorsum has three paired rows of cerata.

The first row is deeply arched with three to five cerata arranged in a line. The second row has two and the third row a solitary cerata. The inner cerata of each row are larger than the others and inflated. The cerata (Fig. 1, *k*) are caducous with a row of tubercles in the anterior one-third of its length. The hepatic diverticulum (Fig. 1, *dg*) in the cerata is a simple stem, without any boss-like projections and terminates by a cnidosac. The pericardial prominence is situated in between the first and second rows of cerata. The foot is less wider than the dorsum, extending to the tip of the pointed tail. The anterolateral corners of the foot have short horn-like projections.

The anus (Fig. 1, *an*) is situated on a low papilla, median in position, in front of the right second row of cerata. The genital openings (Fig. 1, *go*) are on the right lateral side, just below the posterior end of the first arched row,

The jaws (Fig. 1, *l*) are straw-coloured with a row of pointed denticles (Fig. 1, *m*), on the masticatory borders. The radula is a long ribbon with 35 to 101 rows of teeth. The older teeth are in line with the younger ones. The median tooth (Fig. 1, *n*) is 34μ in height and 28μ in width, with two denticles on either side of the sharp median spine. The smooth, thin and plate-like lateral teeth (Fig. 1, *o*) are longer than broad with sharp triangular spines. The paired ptyaline glands extend up to the base of the first liver arch. The male follicles of the hermaphrodite gland are dark grey in colour. The club-shaped preputial sac is attached at the base of the penis. The muscular penis is armed with an obliquely cut stylet (Fig. 1, *p*). The spermatheca is club-shaped attached to the vagina by a short thick stalk.

The specific characters of *Capellinia fuscannulata* sp. nov. are as follows: Body translucent, milky white, with brown bands on the tentacles and on the cerata; cephalic tentacles smooth and bluntly pointed; cerata inflated with a single row of tubercle-like projections; hepatic diverticulum in the cerata simple, terminating by a cnidosac; foot narrow, anterolateral corners produced into short processes; anus median, radula triseriate, median tooth with two denticles on either side of the median spine, lateral teeth plate-like, longer than broad with spines; masticatory border with a row of denticles; ptyaline glands present; penis armed with an obliquely cut stylet and a separate preputial sac.

Discussion.—Marcus (1958) has discussed the value of the penial stylet in classifying the various species of the genus *Eubranchus* and provisionally included *Eubranchus*-like species with armed penis in the genus *Capellinia* Trinchese (1874).

Eubranchus montraveli (Risbec, 1937) is the only species from the Pacific Ocean with an armed penis. *E. montraveli* differs from *Capellinia fuscannulata*, in having the anus almost at the base of the cerata.

Capillinia conica described by Marcus (1958) from the Brazilian coast of South America resembles *C. fuscannulata* in certain characters. Both have ptyaline glands, preputial sac, and an obliquely cut stylet. However, *C. conica* differs from *C. fuscannulata* in having hollow bosses of hepatic diverticulum in the cerata, the presence of finest spines on the posterior rows of the denticles of the masticatory borders.

Marcus (1961) reported *Capellinia rustya* from Monterey Bay. It is white to translucent with pink colour. *C. fuscannulata* resembles *C. rustya* in the colour of the body, shape of the cerata, presence of ptyaline glands, preputial sac, and the penial stylet. *C. rustya* differs from *C. fuscannulata* in not having circular coloured patches on the cerata, the presence of rounded foot corners, in the nature of the masticatory border of the jaws, and in having four denticles on either side of the median spine of the median tooth.

The author, therefore, considers that *Capellinia fuscannulata* is a new species of the genus *Capellinia* and names it after the characteristic dominant brown rings on the cerata.

3. Genus *Eubranchopsis* Baba (1940)

Acleioproct Eolidacea with triseriate radula; cephalic tentacles smooth; foot corners tentaculiform; cerata in oblique rows, caducous and with acutely conical tubercles in about three circlets; genital orifice below the second row; anus median, above the inner corner of the third right branchial row; nephroproct in front of the anus; masticatory edge either smooth or denticulate; median teeth with three to six lateral denticles on either side of the median spine, lateral teeth broad, long, and plate-like; ptyaline glands present; penis unarmed; separate preputial sac absent.

Eubranchopsis indicus sp. nov.

Locality.—Gulf of Mannar near jetty of the Central Marine Fisheries Research Institute, Mandapam Camp.

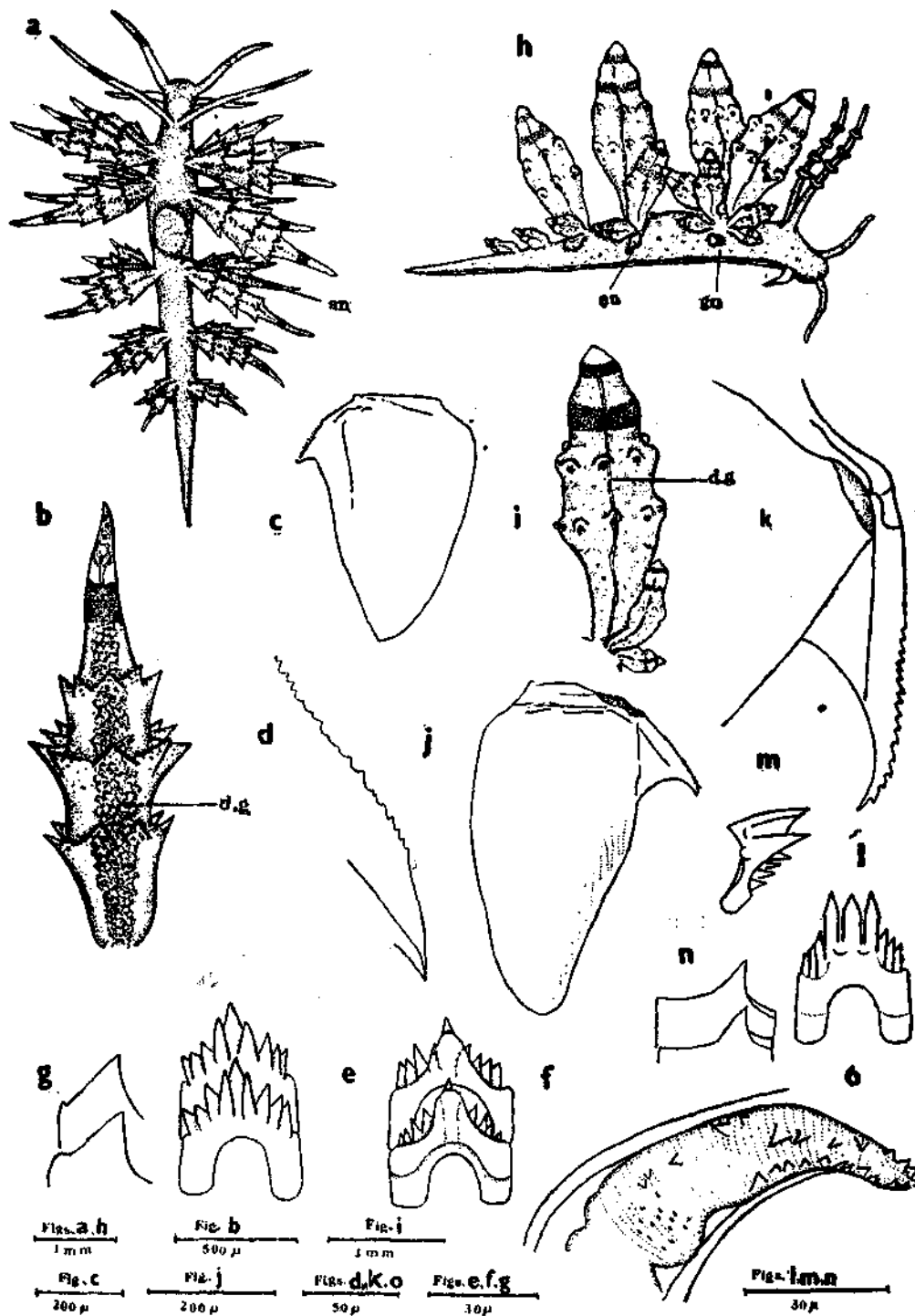


FIG. 2. (a-g) *Eubranchopsis indicus* sp. nov. (a) Dorsal view of the entire animal; (b) Corata; (c) Jaws; (d) Masticatory border; (e, g) Median teeth, dorsal and ventral views; (f) Lateral teeth. (h-o). *Annulorhina mandapamensis* gen. nov. sp. et (h) Lateral view of the entire animal; (i) Corata; (j) Jaw; (k) Masticatory border; (l, m) Dorsal and lateral views of the median teeth; (n) Lateral teeth; (o) Penis showing the spines, an anus; dg digestive gland; go genital openings.

Seven specimens were collected from April, 1963 to March, 1964.

The type specimens are deposited in the Reference Collection Museum of the Central Marine Fisheries Research Institute, Mandapam Camp. Holotype registered No. CMFRI/84.

The largest specimen (Fig. 2, *a*) is about 6 mm. in length, speckled light brown. Deep violet or blue-coloured bands are present on the cephalic tentacles and on the sub-apical region of the cerata. The extremities of the cephalic tentacles, foot prolongations, and conical tubercles of the cerata are covered with white shining granules.

The head is somewhat narrower than the body with paired tentacles, which are long, smooth and bluntly pointed. The cerata are arranged in vertical rows on either side of the body. The inner cerata (Fig. 2, *b*) has three circlets of eight to ten conical tubercles. The hepatic diverticulum (Fig. 2, *dg*) in the cerata is a single stem, yellowish-brown in colour, terminating by a cnidosac. The arrangement of the cerata is as follows: First row three, second row three or four, third row four, fourth row three, and the last row two. The tail is long and tapers to a fine point. The foot is narrower than the body with the anterolateral corners produced into tentacular processes.

The jaws (Fig. 2, *c*) are well developed with a denticulate masticatory border (Fig. 2, *d*). The radula is triseriate with 50 to 60 teeth arranged in a row. The median teeth (Fig. 2, *e, f*) are horseshoe-shaped about 35μ wide and 38μ long with four denticles on either side of the median spines. The lateral teeth (Fig. 2, *g*) are thin more or less triangular in shape with sharp conical spines. The ptyaline glands are paired and fairly big in size. Penis is simple without armature. Preputial sac absent and a portion of the vas deferens modified into a thick prostate. Spermatheca is short and club-shaped.

The specific characters of *Eubbranchopsis indicus* sp. nov. are as follows: Body light brown with deep violet or blue bands on the cephalic tentacles and cerata; cephalic tentacles smooth; foot corners tentaculiform; cerata long with acutely conical tubercles arranged in three circlets; hepatic diverticulum in the cerata simple, terminating by a cnidosac; anus located in the inner corner of the third right branchial row; nephroproct close and in front of the anal opening; masticatory edge of the jaw denticulated; radula triseriate, median teeth horseshoe-shaped with four lateral denticles on either side of the median cusp; lateral teeth triangular, higher than broad with a triangular spine; ptyaline glands present, preputial sac absent, vas deferens modified into glandular prostate; penis unarmed.

Remarks.—*Eubbranchopsis virginalis* described by Baba (1940) from Sagami Bay was 12 mm. long, olive-yellow in colour, ornamented with deep blue spots. *E. indicus* differs from it in the general colour of the body and in having a row of denticles on the masticatory border.

The author, therefore, considers *Eubbranchopsis indicus* a new species under the genus and it is named after the region of its occurrence.

4. Genus *Annulorhina*

Acleioproct Eolidacea with triseriate radula; single row of denticles on the masticatory border; rhinophores cylindrical, annulate; foot corners angulate or tentaculiform; cerata inflated and with two circlets of tubercles on the surface; ptyaline glands present; penis covered with triangular spines; without preputial sac, vas deferens with a thick prostatic portion.

Annulorhina mandapamensis gen. et sp. nov.

Locality.—Gulf of Mannar, near the jetty of the Central Marine Fisheries Research Institute, Mandapam Camp,

Five specimens were collected from June, 1963 to February, 1964. The type specimens are deposited in the Reference Collection Museum of the Central Marine Fisheries Research Institute, Mandapam Camp. Holotype registered No. CMFRI/85.

The specimen is yellowish-brown with grey spots all over the body and with orange-coloured patches on the cerata. A bright yellowish orange band is present on the sub-apical region of the cerata, and another pink or purple-coloured band just below the sub-apical region. Prominent dark patches are visible through the integument at the bases of the first circlet of tubercles. The apex and the tubercles of the cerata are covered with white shining granules.

The largest specimen (Fig. 2, *h*) is 7 mm. in length and 1.5 mm. in width near the widest part of the body. The head bears two pairs of tentacles. The first pair, or the oral tentacles, is smooth, directed forwards and backwards. The posterior pair, or rhinophores, is longer than the oral tentacles placed close to one another. Each rhinophore has three to five annulations at equal distance. The dark pigmented eyes seen through the integument are at the base of the rhinophores. The cerata are arranged in three to five paired rows on either side of the dorsum. The first row is deeply arched with three to five cerata arranged in a row. The second and third rows have three cerata each and the last two rows have a single cerata in each. The inner cerata (Fig. 2, *i*) of each row is about three to four times larger than the outer cerata, inflated in the middle with two circlets of tubercle-like projections. The hepatic diverticulum (Fig. 2, *dg*) in the cerata is brown in colour, and it is narrow without any lateral projections and terminates by a cnidosac. The pericardial prominence is in between the first two anterior rows of cerata. The anal opening is on a low papilla, median in position, in front of the

TABLE I

Distinguishing characters of the seven genera of the family Eubranchidae

S. No	Characters	<i>Eubranchus</i>	<i>Capellinia</i>	<i>Galvinella</i>	<i>Cumanotus</i>	<i>Egalotwa</i>	<i>Eubranchopsis</i>	<i>Annulerhina</i> gen. nov.
1	Rhinophores ..	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Annulated
2	Liver branching	Retained by the anterior liver	Retained by the anterior liver	Retained by the anterior liver	Retained by the anterior liver	Retained by the anterior and posterior livers, papillae multiplying laterally	Retained in the anterior liver	Retained in the anterior liver
3	Cerata ..	Smooth and simple	Inflated with row of knobs or tubercles	Inflated at the tips	Simple, situated on elevate pedaments	Simple	With circlet of acute projections	Inflated with rows of tubercles
4	Preputial sac ..	Present	Present	Present	Not known	Absent	Absent	Absent
5	Vas deferens ..	Simple	Simple	Simple	..	With a thick prostatic part	With a thick prostatic part	With a thick prostatic part
6	Penis ..	Simple un-armed	Armed with a stylet	Simple un-armed	..	Simple un-armed	Simple un-armed	Armed with short spines
7	Female aperture	Not known	Not known	Not known	Armed with hooks	Simple	Simple	Simple

right second row of the cerata. The genital openings are on the right lateral side below the posterior end of the first arch. The foot is narrower than the dorsum extending to the tip of the tail. The anterolateral corners of the foot are produced into short tentacular prolongations.

The jaws (Fig. 2, *j*) are straw-coloured. The masticatory border (Fig. 2, *k*) of it has a row of pointed denticles. The radula is triseriate with 49 rows of teeth arranged in a long ribbon. The median tooth (Fig. 2, *l*) is horseshoe-shaped, 34μ in height and 27μ in width. The median spine is sharply pointed with four to five lateral denticles. The first pair of lateral denticles of both sides is slightly longer than the median spine. The other lateral denticles are smaller than the first laterals and are of uniform size. The lateral teeth (Fig. 2, *n*) are thin and plate-like, elongated and with a single spine. The paired ptyaline glands extend to the anterior half-length of the animal. The pedal glands are densely distributed over the foot. The renopericardial syrx is a pyriform body without any longitudinal muscular bands. Its inner layer is lined by long cilia. The renal opening is close to and in front of the anal opening. The hermaphrodite follicles are well differentiated into male and female acini. The hermaphrodite duct dilates into the sausage-shaped ampulla.

The posterior part of the vas deferens is thick and corresponds to the prostate part. Separate preputial sac is absent. The penis (Fig. 2, *o*) is cylindrical, muscular, and covered with short triangular spines all over its surface. The oviduct is short, and is continued through the mucoalbumen gland complex and opens into the female atrium by nidamental openings. The vagina is short and leads into the voluminous spermatheca by a thick duct.

The specific characters of *Annulorhina mandapamensis* sp. nov. are as follows: Body yellowish-brown mottled with grey; cerata with yellowish-orange and purple-coloured bands; rhinophores annulated; radula triseriate; masticatory border denticulate; ptyaline glands present; preputial sac absent; vas deferens with glandular prostate, penis armed with short triangular spines.

The distinguishing features of the seven genera including *Annulorhina* are given in Table I.

CONCLUSIONS

The author's observations on the family Eubranchidae comprising four genera and four species indicate that besides the common characters like the variations in the number of branchial rows of the right liver, the nature of the cerata, the position of the genital openings, the presence or absence of salivary glands or ptyaline glands, the presence of preputial sac, and the nature of the penis recognised by the earlier workers (Odhner, 1939; Baba, 1949; Pruvot-Fol, 1954; Marcus, 1958), the following characters are noteworthy in distinguishing the members of this group: (1) presence or absence of annulations on the rhinophores and (2) armed or unarmed nature of the penis and if armed, whether with a single stylet or with a number of small spines.

While the seven known genera including the new genus *Annulorhina* resemble each other in (1) having smooth oral tentacles, (2) triseriate radula, (3) rounded, angulate or tentaculiform foot corners, (4) in the positions of the anal and genital openings, and (5) in having denticulated masticatory borders and (6) ptyaline glands, they differ from one another in several other characters as shown in Table I. It may be seen from this that the new genus can easily be distinguished externally by its annulated rhinophores.

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