MINISTRY OF COMMERCE AND INDUSTRY, EGYPT

HYDROBIOLOGY AND FISHERIES DIRECTORATE

NOTES AND MEMOIRS No. 25

THE FISHERY GROUNDS NEAR ALEXANDRIA

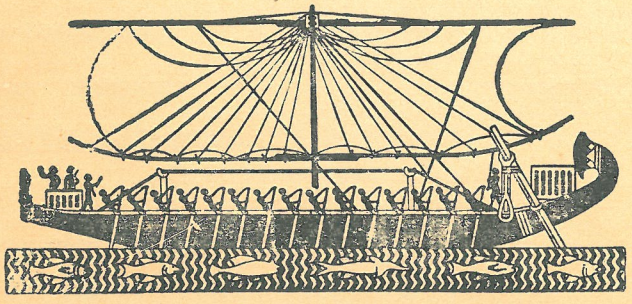
14.—Turbellaria

(with 8 figures)

BY

OTTO STEINBÖCK

Innsbruck



CAIRO

GOVERNMENT PRESS, BULÂC

1937

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The Turbellarians collected by Professor STEUER during his three month's stay in Alexandria contain, as is to be expected by the circumstances given, large forms only, all of them being *Polycladida* belonging to 5 species. Two of them could not be determined more closely as they were badly preserved and not yet mature. Two of the remaining three species belong to the suborder Acotylea and are both new species. The first of them *Stylochus alexandrinus n. sp.* ranges into the section *Craspedommata*, while the second, *Cirroposthia steueri*, a representative of a new genus is to be placed into the section *Schematommata*. The third species, belonging to the suborder *Cotylea* is a form widely spread in the Mediterranean, *Prosthiostomum siphunculus* (Chiaje).

Order : ***Polycladida.***

Suborder : ***Acotylea.***

Section : ***Craspedommata.***

Family : ***Stylochidae.***

Stylochus alexandrinus n. sp.

Locality : Eastern Harbour near the bath on Algae (Corallinaceae).

Material : 3 specimens, 30.VIII.1933. The three specimens of this genus which I had at first taken for *Stylochus neapolitanus* showed at more exact examination such essential differences from this species that a new species was to be established for it.

Habitus.— No sketch after life existed. The shape of the preserved animal corresponds with the description of *St. neapolitanus* (LANG 1888, p. 447, MEIXNER 1907, p. 423) "länglich oval, vorn etwas breiter als hinten (Fig. 1). The length of the preserved animal is 10·5-12 mm, so it reaches in life very likely not the length of 25 mm, which is given for St. neapolitanus.

Colour.—As we have no coloured sketch, the colour cannot be described; we may suppose however that it widely agrees with that of *St. neapolitanus*. Anyhow we can see in the animals cleared in xylol (Fig. 1) that the pigment is arranged as described by LANG (1884, p. 447), especially the branches rectangular to the margin of the body are distinctly visible (Fig. 1).

Tentacles.—The tentacles of *St. alexandrinus* are at the preserved animal at the end of the first eighth of the body, of *St. neapolitanus* (in life) at the end of the first sixth of the body. I find however a great difference between the two species in the situation of the tentacles to one another. At *St. neapolitanus* they are situated close one to another (LANG, p. 408 and pl. 1, Fig. 7), at *St. alexandrinus* however they are so far from one another that one cannot suppose the same situation as at *St. neapolitanus*, even if one takes into consideration the changes brought about by preservation (Fig. 1).

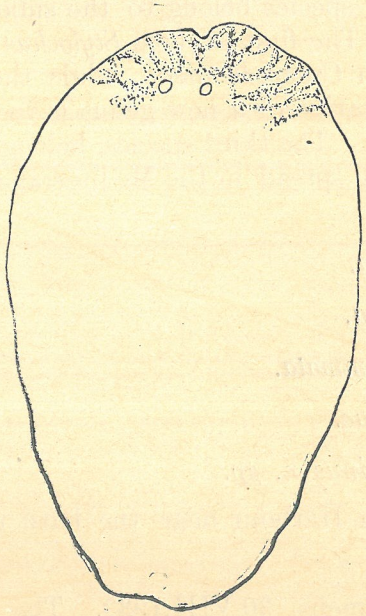

FIG. 1.—Stylochus alexandrinus n.sp. Outline of the animal with the tentacles and pigment branches. Pigment branches drawn out in the front part only. Specimen cleared in Xylol.

Eyes.—The arrangement of tentacle — and cerebral eyes is to be seen on Fig. 2.

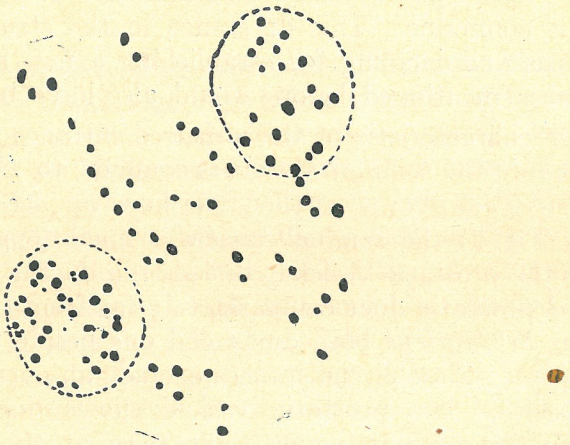

FIG. 2.—Stylochus alexandrinus n.sp. Cerebral and tentacular eyes. The circumference of the tentacles also drawn.

Mouth.—The mouth is situated in the middle at *St. neapolitanus* (MEIXNER, p. 423), at *St. alexandrinus* however it is situated before the end of the first third of the body, that is far more in front. This is the most cranial situation of the mouth among all *Stylochus* species known.

Genital apparatus.—Though the genital apparatus of the two species correspond with one another there is an essential difference in so far as at *St. neapolitanus* the vasa deferentia (Fig. 3) enter separately (MEIXNER, p. 424 and pl. 27, Fig. 4) while they unite at the new species (Fig. 3, vd, vvd) immediately before the seminal vesicle

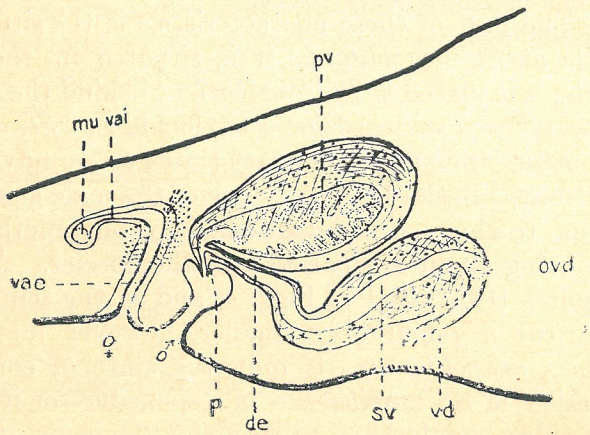

FIG. 3.—Stylochus alexandrinus n.sp. Sagittal section through the genital apparatus. de, ductus ejaculatorius; mu, entrance of the uterine canals into the unpaired uterine canal; ovd, outlet of vasa deferentia; p, penis; pv, prostatic vesicle; vd, vas deferens; vae, vagina externa; vai, vagina interna.

and enter unpaired. BOCK (1913, p. 37) calls this unpair duct which occurs only seldom (e.g. *St. tauricus* Jakubowa, *Leptoplana panamensis* Plehn, *Thysanoplana indica* Plehn and *Th. marginata* Plehn) vas deferens commune. This difference in the structure of the genital apparatus was deciding for establishing a new species, although the differences mentioned before would also have been sufficient for it.

The characteristic of the unpaired entrance of the ductus ejaculatorius into the seminal vesicle is common to *St. Alexandrinus* and *St. tauricus* Jakubowa; at the latter however, according to JAKUBOWA (1909, Fig. 2) the seminal vesicle is much longer, almost twice as long as the prostatic vesicle; besides the ductus ejaculatorius unites with the prostatic duct comparatively far from the end of the penis, while at *St. tauricus* both ducts end one beside the other at the tip of the penis; these circumstances exclude an eventual identity of the two species. The prostatic vesicle shows dorsally and cranially distinctly stronger muscular walls than at the ventral side. The short, conical penis (p) is turned with its tip vertically downward, even a little in the direction towards the head. The genital pores (♂,♀) are situated one close behind the other, the ovaries as at *St. neapolitanus* ventrally from the branches of the intestine.

LAIDLAW described (1903) a new *Stylochus* species, *Stylochus zanzibaricus*, based on outward characteristics; A. MEIXNER (1907, p. 425, T. 27, Fig. 5) undertook an exact revision of this species with the result that there was hardly any difference between the two species, even if the localities are ever so distant from one another. I yet believe that we have to do with two different species. MEIXNER had not noticed two characteristics which to my opinion, especially together with the differences cited before are perfectly sufficient to establish a new species. The first of these characteristics is the situation of the mouth. While at *St. neapolitanus* it is situated in the middle of the ventral side, it is placed at *St. zanzibaricus* behind the second third of the body, very far backward for a Stylochid; at *St. alexandrinus* however it is before the end of the first third, as we have heard unusually far in front. Besides the structure of the male genital apparatus seems to me to show such deviations from one another that one has a right to bring about a separation of the species. According to MEIXNER'S figures (1907, T. 27, Figg. 4 and 5) the seminal vesicle, of *St. zanzibaricus* is remarkably smaller, however more muscular than that of *St. neapolitanus*. If only the state of contraction of the seminal vesicle of *St. zanzibaricus* is responsible for its smallness, the number of tubes should have to be about the same; this number is however also much smaller. Besides in this case the Vasa efferentia enter much nearer to the proximal end into the seminal vesicle by which fact this animal approaches *St. alexandrinus*. At this latter

species those ducts unite before their entrance into the seminal vesicle, a characteristic that is sufficient to separate *St. alexandrinus* from the two other groups.

PALOMBI (1928, p. 582, Figg. 169 and 170) lately identifies a polyclad taken by the Cambridge expedition to the Suez Canal near Suez and in the Gulf of Suez with *St. suezensis* which had been described imperfectly by EHRENBERG in 1831 after outward characteristics. It is possible, to my opinion however not quite sure that the identification is right. As it is desirable to meet as few synonims as possible PALOMBI's opinion is to be agreed with. A comparison of *St. alexandrinus* and *St. suesensis* which latter must be regarded as type of the species shows at once the difference of the two species. Above all it is again the communication of the vasa eferentia before their entrance into the seminal vesicle at *St. alexandrinus* which gives a separate position to this species and *St. tauricus* apart from the rest of the *Stylochus*-species.

Geographical distribution of the genus *Stylochus*.—The 25 species known as yet principally inhabit the warmer oceans (eastern coast of the United States, Mediterranean, coast of eastern Africa, Gulf of Siam, Malayan Archipelago, Japan), though they are not missing in the more temperated oceans (Zuidersea, *St. flavensis* Hofker). In MEIXNER's compilation (ibid. p. 446) the southern Polar Sea is excluded, *Stylochus albus* Hallez, now *Stylochoides albus*, belonging according to HALLEZ 1907 to the *Cotylea*. Three species live in the western Mediterranean, Gulf of Naples viz. *St. neapolitanus* Lang, *pilidium* (Gœtte) and *plessisi* Lang, out of which *St. pilidium* also occurs in the Adriatic near Rovigno, and two species live in the Black Sea, *St. vesiculatus* and *tauricus* Jakubowa ; of the eastern Mediterranean *St. alexandrinus* is the first species known.

Contemplations about the relations of morphology and geographical distribution of the three species *St. neapolitanus*, *alexandrinus* and *zanzibaricus* are of no use as long as we do not know the *Stylochus*-species of the whole African coast.

Cirroposthia steueri nov. gen. nov. spec.

Locality.—Eastern Harbour near the bath, algae (Corallinaceae).

Material.—1 specimen collected August 30th 1933, preserved in alcohol.

Habitus.—Body of the only specimen preserved in alcohol long and slender (Fig. 4), the proportion of length to breadth almost 4 : 1, the length being 26 mm, the breadth 6·6 mm. The tip of the body is wedge-shaped, pointed, the end broadly rounded, the margins are slightly waved. The outer oral aperture is situated a little before the middle of the body and in the center of the pharyngeal pocket which is about 2.5 mm long ; the genital aperture is situated 4.5 mm behind the oral aperture.

FIG. 4.—Cirroposthia steueri n.g.n.sp. Outline of the animal. Specimen cleared in Xylol.

Colour.—Yellowish-brown.

Arrangement of eyes.—Marginal eyes are missing as well as tentacle-eyes, the cerebral eyes are arranged in two rather long groups (Fig. 5).

FIG. 5.—Cirroposthia steueri n.g.n.sp. Arrangement of cerebral eyes.

Male genital organs (Fig. 6).—The testes are situated ventrally from the branches of the intestine, they however penetrate dorsally between those branches where they meet with the ovaries.

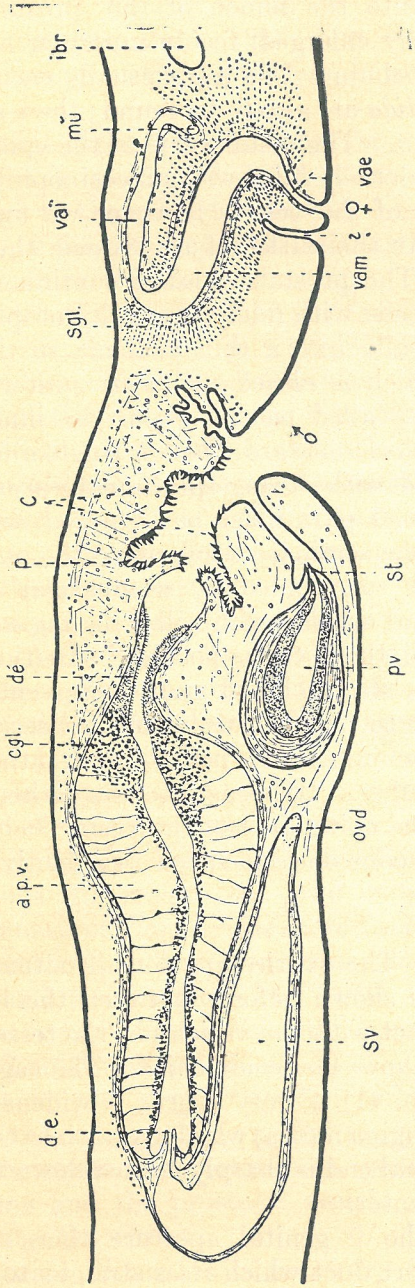

FIG. 6.—Cirroposthia steueri n.g.n.sp. Diagrammatic medio-sagittal section through the copulatory organs. apv, accessory prostatic vesicle; c, cirrus; cgl, cyanophile glands; de, de, ductus ejaculatorius. ibr, intestinal branch; mu, entrance of the uterine canals into the unpaired uterine canal; ovd, outlet of vasa deferentia; p, penis; pv, prostatic vesicle; ?, questionable organ; sgl, shell gland; st, stilet; sv, seminal vesicle; vae, vam, vai, vagina externa, media, interna.

The vasa deferentia enter a little before the accessory prostatic vesicle into the long, tube-shaped seminal vesicle which consists of a relatively feeble muscular coat with ring-shaped, longitudinal and

diagonal fibrills. The greater part of the seminal vesicle is situated beneath the prostatic vesicle, only its frontal, distal and ascending part lies before it. It tapers into a short muscular ductus ejaculatorius which projects billshaped into the lumen of the prostatic vesicle. The latter is a large, distally enlarged, feebly muscular vesicle with a very high glandular epithelium. The septs usually occuring in the prostatic vesicles of *Polycladida* are also to be found; there are however no chambers formed in them. The distal parts of the epithelium and the lumen of the vesicle are densely filled with an eosinophile secretion. Towards the posterior end of the vesicle however we find a ring of cyanophile glands (cgl). At the outlet of the vesicle there is again an eosinophile secretion. The prostatic vesicle continues in a duct of low, ciliated epithelial cells with finely grained protoplasma (de'). Its epithelium flattens distally into a thin pellicula so that it forms a vesicle-shaped cavity which is closed up at its posterior end by a projecting, ring-like fold, called penis. From the inner aperture of the penis to a further, more outward, thicker ringlike fold the epithelium is densely provided with strong spines in form of pallisades and rose-thorns. This spined part must be regarded as cirrus (*c*). From the posterior end of the seminal vesicle up to the outer ringlike fold the masculine duct is surrounded by a muscular coat which contains also mesenchym and consists of fibrills crossing each other in all directions and forming the "cirrus-pocket." In this muscular coat the prostatic vesicle is also included and enters ventrally of the penis perfectly isolated from the male porus behind the second ringshaped fold into the atrium masculinum. It is pear-shaped, rather muscular and provided with a few tubes. It opens into the rather large duct with a projecting cone. The epithelium of the vesicle being cuticularized towards the tip of the cone one can speak of a badly developed stilet (st.).

Female genital organs,—The ovaries are dorsally situated, protruding however ventrally, as shown before, between the branches of the intestine where they meet with the vesicles of the testes.

The female apparatus shows no peculiarities. The vagina externa (according to Bock 1913, p. 41) is very short; it widens into an S-shaped, folded shell-duct (vagina media) which passes into the narrower vagina interna. Its proximal end is sharply turned down to the place where the uterine canals enter.

Immediately before the ♀ genital aperture there is another porus (?) leading into a short duct which rises straight to the vagina media and ends blindly. As this duct is considerably widened in oblique direction one might speak of an oblique pocket. The epidermis continues with its ciliæ into this pocket, surrounded by the muscles of the muscular coat. In its innermost part the epithelium seems to

have gland-cells. It is not certain to say with what organ we have to do in this case. As to its shape we might compare it with the sucker of *Leptoplana tremellaris* (O.F. Müller), serving according to LANG (1884, p. 316, T. 30, Fig. 9, su) as "Hilfsorgan zur Begattung und Eiablage" (compare BOCK, 1913, text fig. 33, sug). May be that it serves for fixation at the copulation, in any case it is no exact sucker.

Discussion of the systematic position.—A sucker behind the female genital porus is missing, therefore *Cirroposthia steueri nov. gen. nov. spec.* belongs to the suborder *Acotylea* Lang, to the *sectio Schematommata* Bock, as marginal eyes are missing and the brain-eyes are very far distant from the anterior margin. Within the *Schematommata* the new genus ranges well into the family *Planoceridae* sensu BOCK (1913). BRESSLAU (1933, p. 289) divides the family *Planoceridae* into two subfamilies: *Planctoplanidae*: "*Planoceridae*, deren männlicher Kopulationsapparat eine Kombination von Penis und Cirrus darstellt. Körnerdrüsenblase eingeschaltet oder (?) fehlend. Mit echter Samenblase und grosser Langscher Blase" und *Planocerinae*: "*Planoceridae* ohne Penis, nur mit bestacheltem Cirrus. Körnerdrüsenblase frei, nur bei *Echinoplana* eingeschaltet. Mit echten oder falschen (*Paraplanocera*) Samenblasen. Lang'sche Blase vorhanden oder rudimentär. Vereinzelt (*Paraplanocera*) mit einer Bursa copulatrix." According to the definition of the male copulatory apparatus *Cirroposthia* ought to be ranged into the first subfamily, however its prostatic vesicle is free, which fact approaches it to the second subfamily. As LANG'S vesicle is missing it removes from both families. According to BRESSLAU'S opinion a new subfamily should have to be established for *Cirroposthia*. As the animal can however be considered a joining link between the two families it is to my opinion more advantageous to resign the two subfamilies. BOCK-BRESSLAU'S family-diagnosis of *Planoceridae* should accordingly have to be completted thus that one adds *Cirroposthia* to those genera without neck-tentacles and the supplement: "with or without Lang's vesicle." Within the family *Cirroposthia* stands most certainly closest to Disparoplana Laidlaw as can be seen by Fig. 7 which Professor STUMMER kindly put at my disposition for publishing. The conformity is striking if one can compare vs_1 and vs_2 with vs and apv of my figure which is however not certain. A penis is absolutely missing in *Disparoplana* and the prostatic vesicle opens not separately but at the side into the cirrus.

A separate discussion is necessary for the peculiar organ (apv) situated between vesicula seminalis and penis which resembles very much to the prostatic vesicle. One should most certainly and unreluctantly call it prostatic vesicle if a well developed vesicle of this kind were missing. This not being the case it will be best to call it

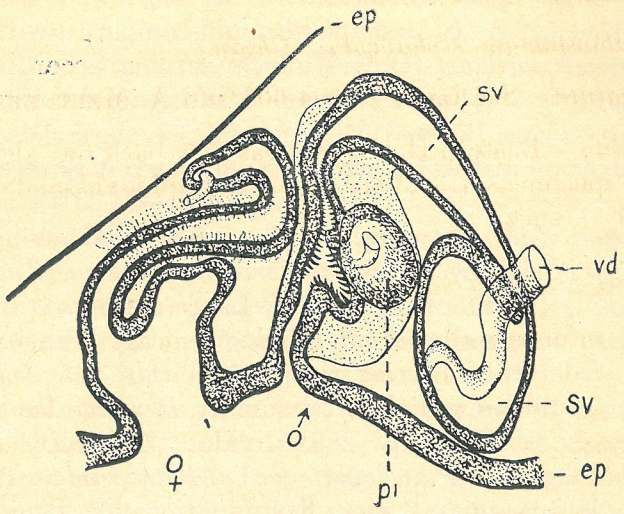

FIG. 7.—Disparoplana dubia Laidlaw. After a drawing by Prof. R. Stummer-Traunfels. Ep, epithelium; pv. prostatic vesicle; sv, seminal vesicle; vd, vas deferens.

accessory prostatic vesicle (apv). As one can suppose that the prostatic vesicles are derived from venomenous organs which could also occur in plurality, nothing can prevent one of supposing that one of those vesicles had been inserted in the male ducts another one having remained separated. One can however also suppose that the epithelium of the ductus ejaculatorius had been transformed secundarily in a glandulous one. This possibility seems to me the more likely one, wherefore I call the vesicle " accessory " prostatic vesicle.

In this connection it is interesting to see that in another family of the *Schematommata* viz. the *Leptoplanidae* forms are to be found which have *no* prostatic vesicle as *e.g. Discoplana subviridis* Laidlaw. The male ducts of *Leptoplana tremellaris* (O.F. Müller) very much resemble those of *Discoplana subviridis* (compare BOCK 1913, textfig. 33 and A. MEIXNER 1907, T. 28, fig. 6), at *Leptoplana* however the ventral epithelium is glandulous wherefore this part is named prostatic vesicle, though it is to my opinion absolutely problematical whether this duct is really homologous to an inserted prostatic vesicle. Perhaps the resemblance in the copulatory organs of the genera *Discoplana*, *Leptoplana* and *Cirroposthia* is to be attributed to their being related, by which fact the two most important and largest families of the *Schematommata*, the *Leptoplanidae* and *Planoceridae* would come still nearer to one another. A closer relationship of these two families would prove besides that BOCK'S *sectio Schematommata* is an absolutely natural group.

Suborder : *Cotylea.*

Family. Prosthiostomidae.

Prosthiostomum siphunculus (*Chiaje*).

Literature.—See LANG p. 594-605 and A. MEIXNER 1907, p. 481.

Locality.—Eastern Harbour, near the bath on algae (Corallinaceae), 2 specimens; 30.VIII.1933. "Amphioxussand," St. 125,13. XI. 1933, 1 spec.

Material.—3 specimens.

Very interesting was one of the 3 specimens which one might have counted to another genus on account of the conditions of the pharynx, if not the rest of the organisation would speak doubtlessly for its being *Prosthiostomum siphunculus*. The normal animal has,

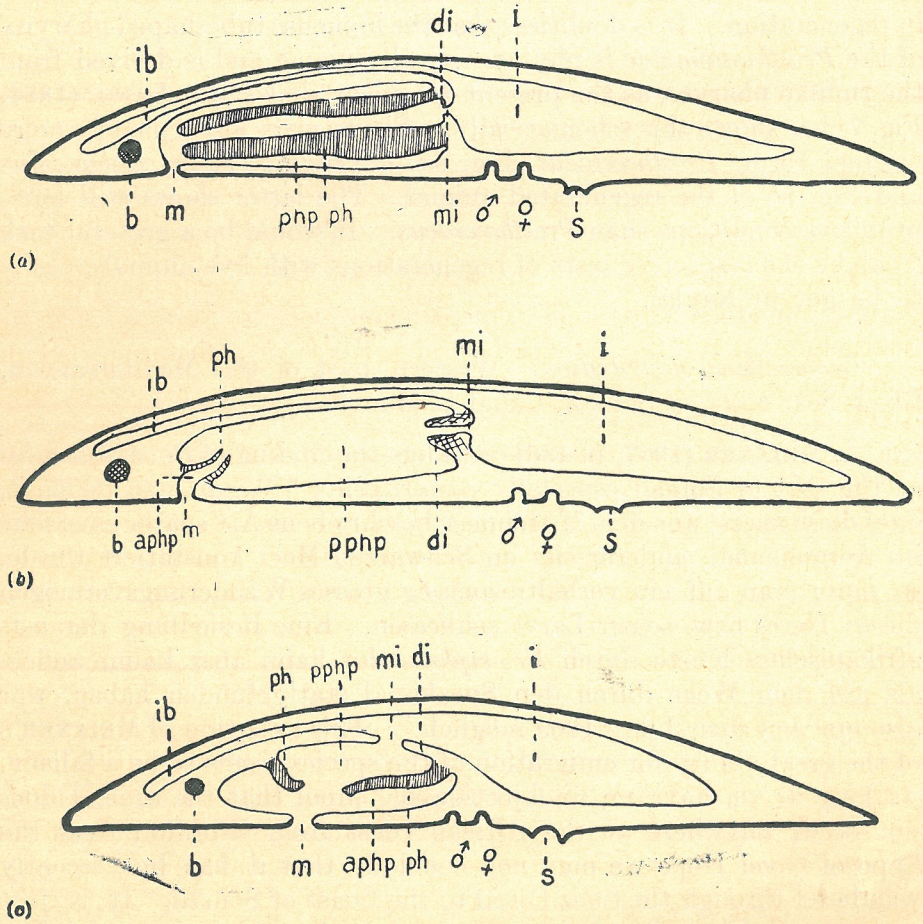

FIG. 8.—Diagrammatic sections through (*a*) Prosthiostomum siphunculus; (*b*) Prosthiostomum siphunculus aber; (*c*) Prostheceraeus; aphp, anterior pharyngeal pocket; b, brain; di, diaphragma; i, main intestine; ib, intestine branch; m, mouth; mi, mouth of intestine; ph, pharynx; php, pharyngeal pocket; pphp, posterior pharyngeal pocket; s, sucker.

as is shown by fig. 8 a an immense cylindric pharynx directed straight forward and forming a little diaphragma (di) at its transition into the intestine. At the aberrant specimen (8b) however the cylindric pharynx is missing; at its place there is a large cavity, the pharyngeal pocket (php) which in its posterior part immediately behind the mouth is devided into two inequal parts, the anterior, smaller (aphp) and the posterior, larger one (pphp) by a rufflike, projecting, backturned muscular fold, the secondary pharynx (ph). The diaphragma, small at the normal animal, projects here as a mighty lip-wall (di) into the posterior pharyngeal cavity.

This peculiar condition I can only explain thus that the animal has lost its pharynx at some occasion and has now regenerated one of quite different shape. One can take this phenomenon as a "Defektbildung" in C. HERBST'S sense (*see* KORSCHELT 1927), one can however just as well or even with more reason design it as an *atavistic revulsion* in regeneration. It is doubtless that the immense tubeshaped pharynx of the *Prosthiostomidae* is phylogenetically young and is derived from the rufflike pharynx as the present specimen shows it. LANG (1884, Fig. 7) has shown this schematically. Fig. 8*c* gives a scheme of a more original form, *Prostheceraeus*, Fig. 8*a* of *Prosthiostomum siphunculus* and Fig. 8*b* of the regenerated animal. The latter shows still more primitive conditions than *Prostheceraeus*. It would be a grateful task to make the respective tests of regenerations with live animals, easily to be got in Naples.

Geographical distribution.—Western part of the Mediterranean, Black Sea, coast of Somali, Canal la Manche.

A. MEIXNER (1907, p. 486) considers the finding of *Pr. siphunculus* at the cost of Somali especially remarkable: "Wenn man bedenkt, dass diese zuerst aus dem Mittelmeer beschriebene Art später einerseits im Aermelkanal, andererseits im Schwarzen Meer konstatiert wurde, so muss man auf ein verhältnismässig grosses Wanderungsvermögen dieses Tieres bzw. seiner Larve schliessen. Eine Besiedlung der ostafrikanischen Küste durch *Pr. siphunculus* kann aber kaum anders als auf dem Wege durch den Suezkanal stattgefunden haben, war also erst seit dem Jahre 1869 möglich." This assertion of MEIXNER'S of the great ability for emigration of the species seems to be a fallacy. As long as we have no unobjectionable proof that the animal does not occur anywhere at the African coast from Gibraltar over the Cape of Good Hope we may not conclude that it has but recently wandered through the Suez Canal to the Coast of Somali. It is just as inadmissable to conclude from the fact that the animal had first been found in the Mediterranean and later only in the Black Sea and in the Canal la Manche that it had wandered there during the last de-

cades only. Every one who knows how easily at most careful investigation even large Turbellarians may be overlooked and who takes into regard that even the European coasts —not to speak of those out of Europe— are only badly known as to their Turbellarian fauna, cannot make such portentous conclusions.

As only two new species and a third one known as well from the Mediterranean as from the East-African coasts are the subject of consideration, general contemplations on the zoogeographical importance of the animals found are needless.

List of Localities.

Eastern harbour near the bath, on algæ, Corallinaceæ, 30.VIII.1933 :
Cirroposthia steueri nov.gen.,nov.spec. 1 specimen.
Prosthiostomum siphunculus (Chiaje) 1 spec.

Ibid. 10.XI. Prosthiostomum siphunculus (Chiaje) 1 spec.
Stylochus alexandrinus nov. spec. 3 specimens.

St.59a, 28.X. Cirroposthia steueri nov.gen.,nov.spec. 1 specimen.

St. 75, 4.XI. Stylochid, 1 specimen.

St. 102, 7.XI. Schematommatid, not adult, bedly preserved, 1 spec.

St. 125, 13.XI. Prosthiostomum siphunculus (Chiaje) 1 specimen.
Schematommatid, not adult, very badly preserved, 1 spec.

Appendix.

As Professor STEUER informed me later on there were Turbellarians also in the Plankton. In the haul of Station 26 from the 24th of November 1933 a species was met with which according to the description was a gray, acœl turbellarian, representing perhaps *Monochœrus illardatus* Löhner et Micoletzky, a species up to now found in the northwestern Adriatic only, in the Gulf of Triest, Rovigno. On account of the bad histological state an exact definition of the species is however impossible. According to Professor Steuer's statement there were also three specimens of Müller's larvæ in the plankton.

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