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### TURBELLARIA FROM SOMALIA.

#### II. KALYPTORHYNCHIA (PART 2)

(PUBBLICAZIONI DEL CENTRO DI STUDIO  
PER LA FAUNISTICA ED ECOLOGIA TROPICALI DEL C.N.R.: CCXXXVIII)



**Vlaams Instituut voor de Zee**  
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In a first contribution on Somalian marine microturbellarians, three species of Kalyptorhynchia belonging to the family Polycystididae were described (SCHOCKAERT, 1971). Seven more species of Kalyptorhynchia are now added to the list: five of them are also Polycystididae while, one is a representative of the Cicerinidae and one of the Karknorhynchidae. Four of these species are new.

I wish to thank the « Centro di Studio per la Faunistica ed Ecologia Tropicali » of the Consiglio Nazionale delle Ricerche, Florence (Director Prof. Dr L. Pardi) for financing my mission in Somalia. I also thank Prof. Dr A. ROECK of the Limburg Business School for correcting the English.

#### MATERIAL AND METHODS

All species described occur in littoral habitats in the neighbourhood of Mogadiscio. They have been collected and studied alive by the author during a stay in Mogadiscio in April and May 1970. Whole mounts were made with Turtox embedding medium from the individuals studied alive. Specimens of species found in sufficient numbers were fixed in Bouin's fluid and serially sectioned. Sections were stained with Heidenhain's or Ehrlich's hematoxylin, using eosin as a counterstain. Figures without a scale are free hand drawings. All material, including types, will be deposited in the collections of the Museo Zoologico dell'Università of Florence (Italy).

## DESCRIPTIONS

## FAMILY POLYCYSTIDIDAE

*Polycystis ali* n. sp. (Fig. 1).

*Locality*: N of Mogadiscio at a place locally called Hawadli. On algae in pools in the rocky shore at low tide (27.4.1970) (type locality).

*Material*: several animals studied alive, nine in whole mount (one of them designated as holotype) and three individuals serially sectioned.

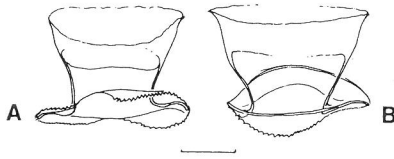


Fig. 1. — *Polycystis ali* n. sp. Stylets from whole mounts (A, holotype). Scale line = 10  $\mu$ m.

*Description*: the living animals are spindle-shaped and heavily, nearly uniformly coloured black without a defined pattern. They behave in the same way as *Polycystis năgelii* Kôlliker, 1945, from which they differ in their habitus in that in *P. năgelii* the

pigmentation is mostly less dense and distributed in longitudinal lines. Both species also have the same internal organisation (genital organs, pharynx, proboscis with four retractors and a pair of ventral integument-retractors). The new species is characterised by the construction of its stylet (Fig. 1). It consists of a broad funnel, 17  $\mu$ m high (measured along the central axis in the holotype) and 28  $\mu$ m wide distally. The internal stylet is about 2/3 of the external one. The distal border is reflected, its rim provided with delicate teeth.

*Discussion*: *Polycystis ali* n. sp. clearly belongs to the *năgelii*-species group within the genus *Polycystis* and constituted by *P. năgelii* Kôlliker, 1945, *P. gabriellae* (Marcus, 1948) and *P. orientalis* Evdonin, 1968 and characterised by: (i) a well developed bursa connected to the male genital canal by a muscular duct guarded by an asymmetric sphincter; (ii) accessory glands in the male atrium; (iii) a T-shaped female duct without seminal receptacles nor bursa (see also SCHOCKAERT & KARLING, 1975).

GRAFF (1882, 1905, 1913) mentioned for *P. năgelii* the occurrence of specimens with a stylet with a long spur or flagellum or without such a flagellum. In our opinion, the Somalian species may correspond with GRAFF's « *P. năgelii* » of which the stylet bears no flagellum.

However, no evidence could be found in the literature as to whether both types occur in the same populations or not, nor where both types were to be found. All specimens of *P. năgelii* present in the collections of

the Swedish Museum of Natural History at Stockholm studied by the author (but see also KARLING, 1978) and those from different populations from the Mediterranean (M. Brunet, leg. and our own observations on many individuals from Leghorn, Italy) possess such a flagellum. The inverse is true for the Somalian population: not one individual had a flagellated stylet.

*Polycystis subcontorta* n. sp. (Figs 2, 3).

*Locality:* N of Mogadiscio (Hawadli) on the sandy bottom of a pool on the rocky shore at low tide (23.4.1970) (type locality).

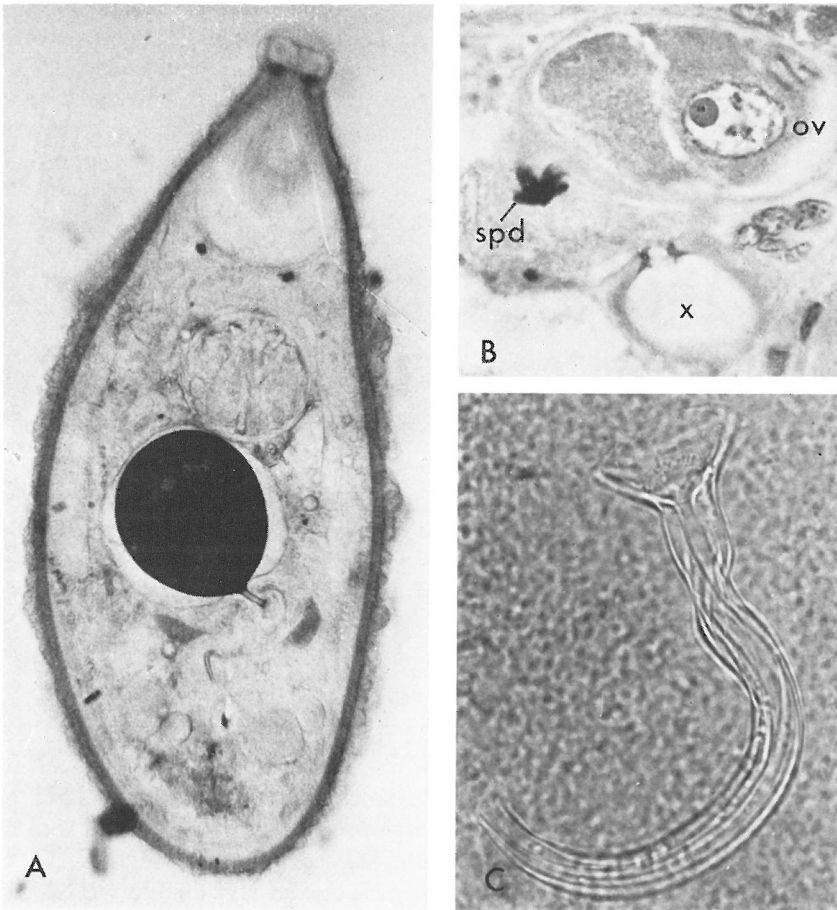


Fig. 2. — *Polycystis subcontorta* n. sp. A, slightly squeezed living animal; B, section through part of the female organs; C, stylet (from whole mount, holotype).

*Material*: two animals studied alive and mounted (one of them holotype) and one animal serially sectioned.

*Description*: the animals are 1-1.5 mm long, colourless but often with yellow-green gut content. The habitus can be seen in Fig. 2A. Fine rhabdite like elements occur in the syncytial epidermis. The construction of the

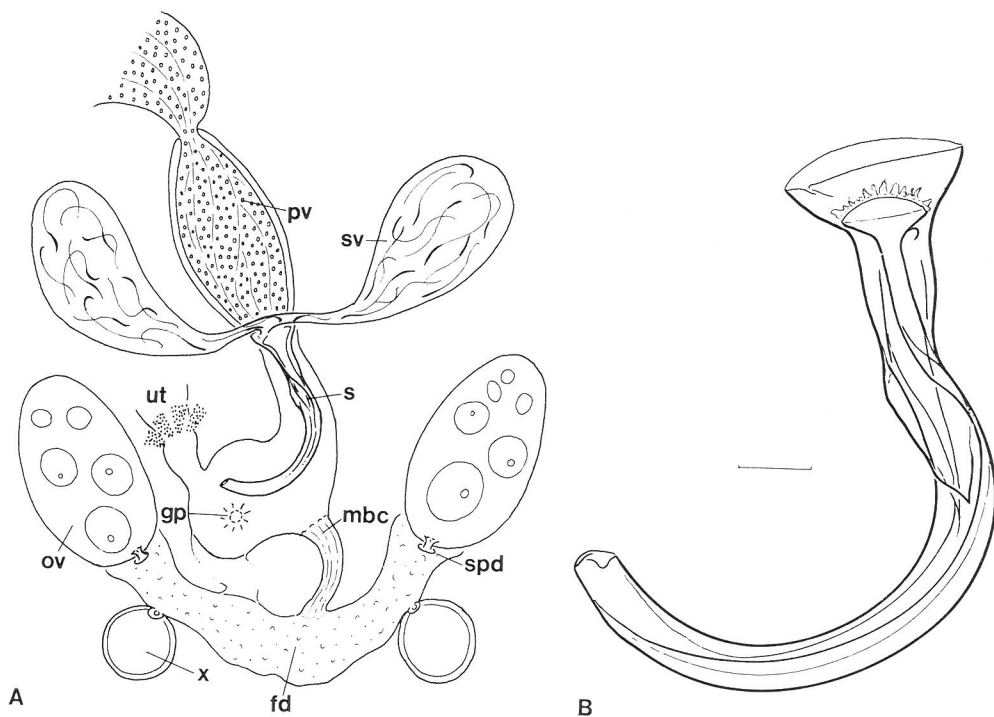


Fig. 3. — *Polycystis subcontorta* n. sp. A, organisation of the genital organs from squeezed living individual; B, stylet (from whole mount, holotype, scale line = 10  $\mu$ m).

pharynx and of the proboscis do not deviate from what is known for other *Polycystis*-species. *P. subcontorta* has a set of four proboscis-retractors and a pair of integument retractors.

The ovoid prostatic vesicle apparently contains only one kind of secretion. The rather short seminal duct opens freely in the ventral wall of the male genital canal at the stylet base. This curved stylet (Fig. 2C, 3B) is 126  $\mu$ m long in the holotype, faintly spiral-shaped and double walled, i.e. with an internal and an external stylet. Folds in the middle of the stylet suggest that it may have a role in sperm evacuation.



None of the individuals studied had reached full female maturity. The oviducts in the sectioned animal (Fig. 2B) were filled with cellular material and no sperm was observed in any part of the female organs. The more or less spherical ovaries are provided with cuticular insemination ducts (Fig. 2B, 3A). Next to the ovaries, and communicating with the oviducts, a small optically empty vesicle was observed. Its wall is formed by a flattened epithelium and the passage to the oviduct seems to be slightly cuticularised. A narrow duct connects the oviducts and the male genital canal.

*Discussion:* though the anatomy of the genital organs at full female maturity is unknown, there is no doubt that the new species belongs to the *P. riedli* Karling, 1956 species-group within the genus *Polycystis* (see SCHOCKAERT & KARLING, 1975), because of the stylet's general construction and the presence of cuticular insemination ducts at the ovaries. The spherical vesicles associated with the oviducts remain rather enigmatic and have not been observed so far in other representatives of the genus *Polycystis*. Their function (seminal receptacles?) and homology may become clear when fully mature individuals can be studied.

*Polycystis contorta* Schockaert & Karling, 1975 (Fig. 4A).

*Distribution:* Norway, S of Bergen, shell gravel, 7-50 m. Mediterranean, Marseille area, *Amphioxus*-sand.

*Localities in Somalia:* N of Mogadiscio (Hawadli and Warshek) on algae in pools on the rocky shore at low tide (3.4.1970 and 6.5.1970).

*Material:* two specimens from Hawadli and one from Warshek studied alive and mounted.

*Description and discussion:* the animals are about 1 mm in length, those from Hawadli colourless, the one from Warshek brownish with glittering white spots near the proboscis under reflected light. When studied the specimens were in a rather bad condition and very few data could be recorded on their organisation. From these data and from the stylet structure, the Hawadli-specimens can doubtless be indentified as *P. contorta* (Fig. 4A). For the Warshek-individual however, we can not be certain, though the stylet structure and size falls within the range of variation observed in *P. contorta* by SCHOCKAERT & KARLING (1975).

*Gyatrix hermaphroditus* Ehrenberg, 1831 (Fig. 4B).

*Distribution:* cosmopolitan and holeuryhaline species. Reported from the indopacific region by EVDONIN (1971, NE Asia: *G. arenarius* Evdonin, 1971), from Hawaii (KARLING et al., 1972) and from California (KARLING & SCHOCKAERT, 1977).

*Locality in Somalia:* N of Mogadiscio (Hawadli) in a pool with sandy bottom and algae in the upper level of the rocky shore at low tide (23.4.1970).

*Material:* two individuals studied alive, one of them mounted.

*Description and discussion:* the measurements on the cuticular apparatus of the mounted specimen are: stylet: 116  $\mu\text{m}$ , sheath: 23  $\mu\text{m}$ , stalk: 75  $\mu\text{m}$ .

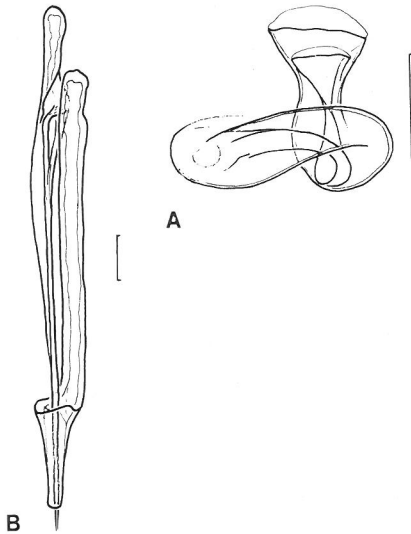


Fig. 4. — Stylet of *Polycystis contorta* Schockaert & Karling, 1975 (A) and *Gyralix hermaphroditus* Ehrenberg, 1831 (B), both from whole mounts of individuals from Hawadli (scale lines = 10  $\mu\text{m}$ ).

The range of variation in the size of the cuticular elements in *G. hermaphroditus* recorded so far are respectively 87-272  $\mu\text{m}$ , 23-87  $\mu\text{m}$  and 55-160  $\mu\text{m}$  (KARLING & SCHOCKAERT, 1977). Paired vitellaries were observed in the Somalian individuals. However this character is not always very reliable when observed only in living animals. Moreover, we doubt whether such a character, even when it is the real situation, may have taxonomical implications in such a highly variable species that often has a branching vitellary.

*Cincturorhynchus karlingi* n. sp. (Figs 5-9).

*Locality:* N of Mogadiscio (Hawadli) in a pool with sandy bottom and algae on the rocky shore at low tide (23.4.1970).

*Material:* two animals studied alive and mounted (one of them designated as holotype). Four specimens sectioned serially (two of them immature).

*Description:* the animals (Fig. 5A), which swim in a lively way, are rather clumsy. They are about 0.7 mm long (about four times as long as wide), with rounded ends and a pair of eyes. They are nicely coloured with reddish brown pigment arranged in irregular patches and with longitudinal lines in front of the pharynx, diverging over the proboscis. The pharynx is about in the middle of the body and has the usual construction

for a polycystidid. The epidermis is syncytial with numerous small dermal rhabdites. EVDONIN (1970) mentions « adenal » rhabdites in *Cincturorhynchus ruber* Evdonin, 1970. It this appears to be true it would be an unique feature for a member of the family. Nothing of the kind was observed in *C. karlingi*. Some « vacuoles » in the epidermis (in fact the ducts of underlying glands) are filled with heavily stained granules and may be mistaken for adenal rhabdites. A large set of glands, ventral to the proboscis, discharge their content on the epidermis.

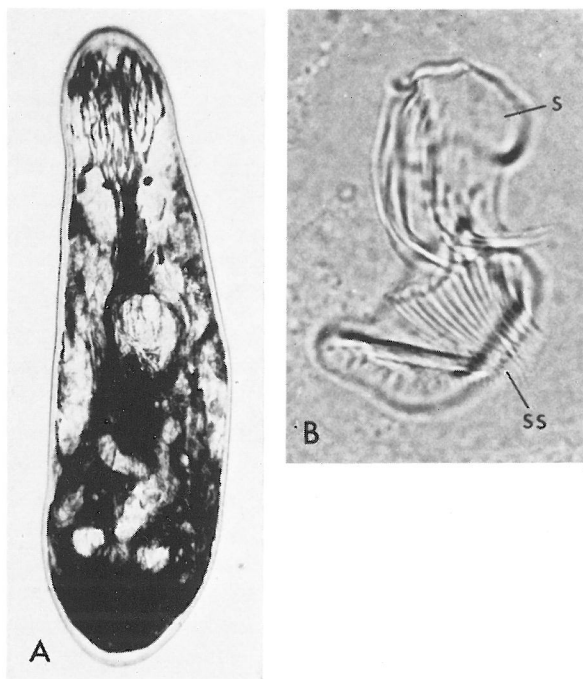


Fig. 5. — *Cincturorhynchus karlingi* n. sp. A, slightly squeezed living animal; B, cuticular organs.

The proboscis is very large (1/4 to 1/5 of the total length in the living animal). Two peculiar characteristics are to be mentioned: small nuclei at the junction of the sheath epithelium with the epithelium of the cone, and eosinophilous glands discharging their content into the anterior part of the sheath. All other features of the proboscis are in common with all Polycystididae such as the distinct apex of the cone, the six fixator-muscles, absence of nuclei inside the proboscis bulb and the system of retractors (four pairs and one pair of ventral integument-retractors).

The topography of the genital organs and the organisation of the atrial organs can be understood from Figs 6 and 7. The common genital pore is located ventrally, not terminally. The common genital atrium is lined with a nucleated epithelium; it receives the female duct caudally, the uterus from

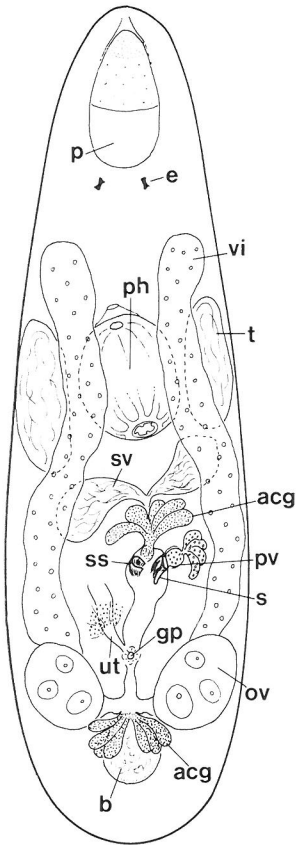


Fig. 6. — *Cineturobynchus karlingi* n. sp. General organization from living animal (dorsal view).

the front and the male genital canal from above. The latter forms a widely enlarged sinuous atrium lined by a low and ruffled epithelium with very dark staining (necrotic?) nuclei. Two cuticular elements are found in its anterior part. The first one, situated at the right side (Fig. 8A), consists of a small tubiform and slightly curved stylet (50  $\mu\text{m}$  in the holotype) with a ring-like structure at its base from where five hollow and curved spines emerge. The ring is about 30  $\mu\text{m}$  in diameter, the spines and the stylet all have nearly the same length. The second cuticular organ (Fig. 8B) lies at the left side of the male canal. It is composed of a semicircular or horseshoe-shaped broad ring with flattened, curved spines on its inner surface. This ring with the implantations of the spines is represented in Fig. 8C. It is about 25  $\mu\text{m}$  in diameter and approximately 15  $\mu\text{m}$  high in the middle, narrowing at both sides.

The stylet of the first cuticular organ described above is connected with a small secretion reservoir with a muscular wall, filled with one kind of coarse basophilic secretion (Fig. 9A). This stylet is therefore considered as the prostate stylet (but see discussion below). Associated to the second, horseshoe-shaped cuticular apparatus, considered as accessory, large glands (accessory) can be found. They produce a coarse eosinophilic and a fine basophilic secretion. The distal parts of the ducts of the gland cells bulge into a laterodorsal diverticle of the male

atrium. The horseshoe-like cuticular element surrounds the exit of this diverticle (Fig. 9A-B).

The relatively short seminal duct merges from the confluence of the paired seminal vesicles dorsally to the prostate vesicle. Running downwards

it enters the male genital canal freely, adjacent to and anteriorly to the accessory gland mass. In no way is there a close topographic relationship between the seminal duct and the (prostatic) stylet (Fig. 9 A, B).

The female genital canal is an S-shaped tube with a terminal bursa (Fig. 7). The terminal part of this female duct is guarded by an asymmetric

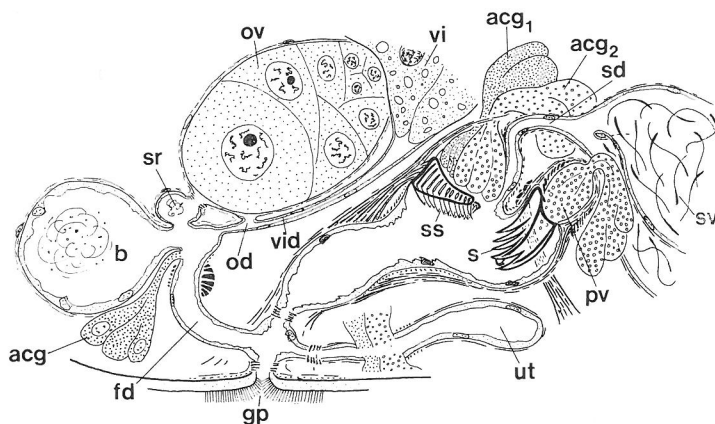


Fig. 7. — *Cincturorhynchus karlingi* n. sp. Reconstruction of genital organs from serial sagittal sections (viewed from the right; anterior end of animal to the right).

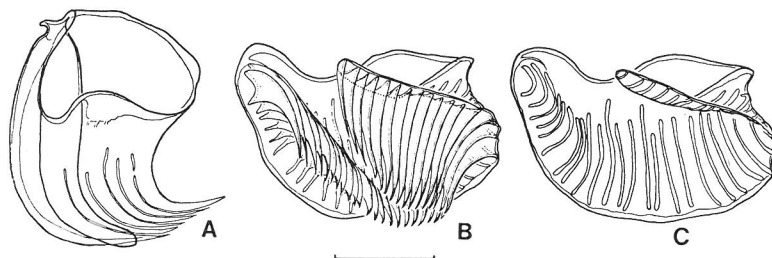


Fig. 8. — *Cincturorhynchus karlingi* n. sp. A, prostate stylet; B, accessory cuticular organ; C, horseshoe-shaped ring of the accessory cuticular organ with implantation of the spines (all from whole mount, holotype). Scale line = 10  $\mu$ m.

sphincter. Each ovary is connected with the female duct in two ways: via a short ovovitelloduct and via a duct that may be enlarged to a seminal vesicle and that can be closed by a weak sphincter near the ovaries. In one of the sectioned animals the seminal vesicles were strongly expanded and in part confluent with the bursa. A large set of glands also discharge into the proximal end of the female duct.

*Discussion:* *Cincturorhynchus karlingi* deviates in its organisation of the genital apparatus from *C. ruber* Evdonin, 1970 in that in the latter species the seminal duct, according to EVDONIN's description, enters the male genital canal close to the prostatic stylet. According to this author, the specially constructed stylet would even help in evacuating the sperm. As emphasized before, this situation certainly does not occur in *C. karlingi*. The material of *C. ruber* we received from L. A. Evdonin did not allow us to confirm or to deny the statements of our Russian colleague.

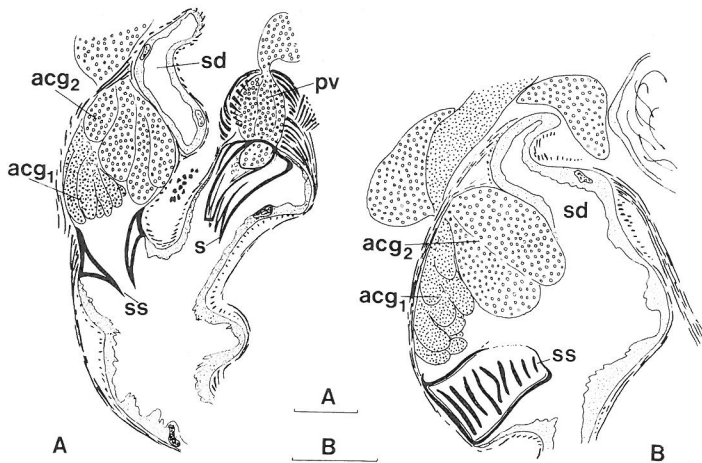


Fig. 9. — *Cincturorhynchus karlingi* n. sp. Parts of the male atrial organs from two consecutive horizontal sections. Scale lines = 10  $\mu$ m.

We have no doubt however, that the new Somalian species belongs to the genus *Cincturorhynchus* as shown by the otherwise extremely high degree of similarity.

A close relationship may be accepted for the genera *Cincturorhynchus* Evdonin, 1970, *Austrorhynchus* Karling, 1952, *Porrocystis* Reisinger, 1926, *Antiboreorhynchus* Karling, 1952, *Phonorhynchus* Graff, 1905, *Albertorhynchus* Schockaert, 1977 and *Parastrorhynchus* Karling & Schockaert, 1977 (see also SCHOCKAERT, 1976; EVDONIN, 1977). However, KARLING (in KARLING & SCHOCKAERT, 1977) has discussed the problem of homology of the different glandular and cuticular elements in the male canal of these genera, and the above statement on the relationship must be considered as a provisional one and used with the necessary caution. The establishment

of a separate subfamily for a number of these genera as proposed by EVDONIN (1977) may also need reconsideration. This matter must be treated in a broader context which is beyond the scope of this contribution.

### FAMILY CICERINIDAE

*Pocillorbynchus spiroductus* n. sp. (Fig. 10).

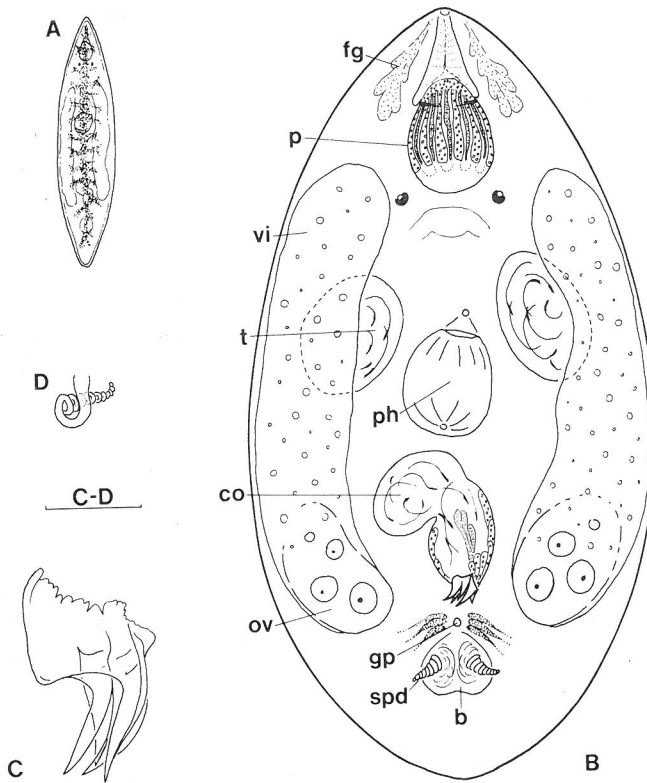


Fig. 10. — *Pocillorbynchus spiroductus* n. sp. A, habitus of free-swimming animal; B, general organisation from living animal; C, cuticular part of copulatory organ; D, insemination ducts (C and D from whole mount, holotype, scale line = 10  $\mu$ m).

*Locality*: N of Mogadiscio (Hawadli), in the same habitat as *Polycystis ali* (27.4.70) (type locality).

*Material*: one specimen studied alive and mounted (holotype).

*Description:* the specimen studied was very small, about 0.5 mm long. Under the stereomicroscope it looked grey with an irregular, longitudinal white glittering line. Under the microscope it was very opaque, brownish, the line being nearly black. The eyes are paired with a refracting corpuscule. The proboscis takes about 1/8 of the body length. It carries two girdles each of 10 large secretion ampullae, filled with two kinds of secretion. The proboscis sheath seems lined with a thick epithelium. A pair of obvious frontal glands are present as well. The pharynx is about in the middle of the body. The common genital pore is situated ventrally at about 80% body length, and all gonads are paired: globular ventrolateral testes at the level of the pharynx, laterodorsal vitellaries extending from the eyes down to the level of the genital pore and ventral ovaries at the caudal end of the vitellaries.

The unpaired external seminal vesicle is in broad connection with a weakly muscular copulatory bulb filled with sperm and some peripherally arranged secretion of two kinds. The cuticular organ consists of five spines on a common base.

The female apparatus is constituted by a bilobed terminal bursa with two cuticular and strongly spiral-shaped insemination ducts.

*Discussion:* the well developed secretion ampullae at the proboscis leave no doubt that the new species belongs to the family Cicerinidae. According to BRUNET (1973) the position of the pharynx, genital organs, the unpaired seminal vesicle, the frontal glands and the eyes with a distinct refracting « lens » are characteristics of the representatives of the genera *Pocillorhynchus*, *Toia* and *Nannorhynchides*. Only in *Pocillorhynchus*, does a posteriorly situated bursa with long and coiled insemination ducts occur.

It is with hesitation that we establish a new species based on an incomplete description of a single specimen, but we are convinced that the species can easily be recognised with the characters given. However, its inclusion into the genus *Pocillorhynchus* is provisional. We agree with BRUNET (1973) that the anatomy of the proboscis is of the greatest taxonomic importance and our observations on the living specimen of *P. spiroductus* suggests that the construction of the proboscis is not fully in accordance with that of the two species of this genus as described by BRUNET.

#### FAMILY KARKINORHYNCHIDAE

*Cheliplana asica* Marcus, 1952 (Fig. 11).

*Distribution:* the species is known from the Brazilian coast (muddy sand in brackish water; MARCUS, 1952) and from the Mediterranean (muddy sand in the laguna of Brusca; BRUNET, 1968).



*Locality in Somalia:* at the inlet of the salt garden at Djezira (S Mogadiscio) in a muddy habitat where a *Hydrobia*-like gastropod occurs in masses.

*Material:* two animals studied alive and mounted.

*Description and discussion:* these slender animals, about 1 mm long, depicted in Fig. 11 doubtless belong to MARCUS' species. Vitellaries were not observed in the living animal, nor was the caudal adhesive girdle as it was seen by MARCUS and BRUNET. The terminal part of the ejaculatory duct and the wall of the penial papilla protruding in the atrium appeared to be slightly cuticularised. For this reason the Somalian population most probably belongs to the subspecies *Cheliplanilla asica terminalis* Brunet, 1968.

ADDENDUM TO THE FIRST  
CONTRIBUTION ON  
SOMALIAN KALYPTORHYNCHIA

Simultaneously with our description of *Djeziraia pardii* as a new genus and a new species (SCHOCKAERT, 1971), a contribution on Roumanian Microturbellaria was published by MACK-FIRA (1971) in which a cicerinid *Torkarlingia euxinica* n. g. n. sp. was described. From contacts with Dr V. Mack-Fira who examined sectioned specimens of the Roumanian species, it appeared that *Torkarlingia* is in fact a member of the Polycystididae and has the same organisation as *Djeziraia*. Slight differences are to be mentioned concerning the stylet: nearly straight and 84  $\mu\text{m}$  long in the Somalian species (one measurement); 120  $\mu\text{m}$  in the Roumanian species (number of measurements unknown) and with two thick and distinct rings at the proximal end. At the present state of our knowledge I suggest both populations be considered as belonging to different species but that

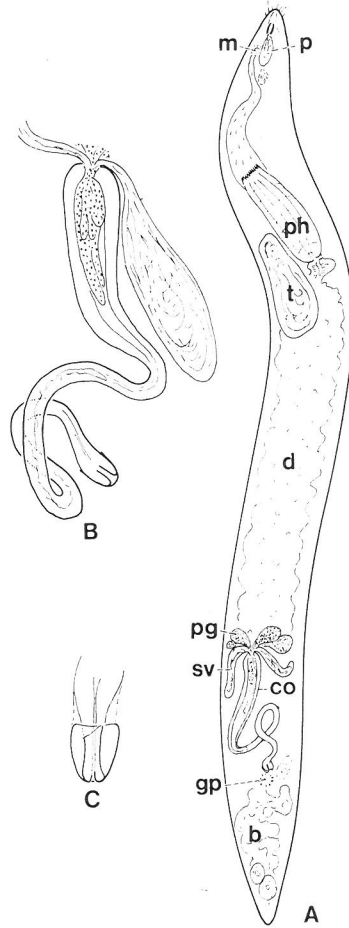


Fig. 11. — *Cheliplanilla asica terminalis* Brunet, 1968. A, general organisation; B, copulatory organ; C, terminal part of ejaculatory duct with slightly cuticularised penial papilla (all from living animal).

the genus-names *Torkarlingia* and *Djeziraia* must be synonymised. Since our description is dated 30.9.1971 and no precise date of publication is mentioned in the *Revue Roumaine de Biologie*, the name *Djeziraia* must have priority (Art. 21 of the International Code of Zoological Nomenclature).

In our original description of *Djeziraia pardii* we mentioned the existence of only two proboscis-retractors (and two pairs of integument-retractors). The proboscis is very small and only two bundles of muscle fibres are inserted on its bulb. However, further analysis revealed that some fibres split off from the ventral pair of bundles just behind the brain and join the ventral integument-retractors. It is thus clear that the retractor system of the proboscis in *Djeziraia pardii* does not deviate from the general polycystidid plan, i.e. four pairs of proboscis-retractors and one pair of integument-retractors, or three pairs of proboscis-retractors and two pairs of integument-retractors.

#### ABBREVIATIONS TO THE FIGURES

<i>acg</i> : accessory glands	<i>pb</i> : pharynx
<i>b</i> : bursa	<i>pv</i> : prostate vesicle
<i>co</i> : copulatory organ	<i>s</i> : stylet
<i>d</i> : intestine	<i>sd</i> : seminal duct
<i>e</i> : eye	<i>spd</i> : insemination duct
<i>fd</i> : female duct	<i>sr</i> : seminal receptacle
<i>fg</i> : frontal gland	<i>ss</i> : accessory cuticular organ
<i>gp</i> : genital pore	<i>sv</i> : seminal vesicle
<i>m</i> : mouth	<i>t</i> : testis
<i>mbc</i> : male bursa canal	<i>ut</i> : uterus
<i>od</i> : oviduct	<i>vi</i> : vitellary
<i>ov</i> : ovary	<i>vid</i> : vitelloduct
<i>p</i> : proboscis	<i>x</i> : vesicle with unknown function
<i>pg</i> : prostate glands	

#### SUMMARY

In this second contribution on Somalian marine microturbellarians four new Kalyptorhynchia are described and their relationship discussed: *Polycystis ali*, *Polycystis subcontorta*, *Cincturorhynchus karlingi* (Polycystididae) and *Pocillorhynchus spiroductus* (Cicerinidae). The presence of three other Kalyptorhynchia species is also mentioned: *Polycystis contorta* Schockaert & Karling, 1975, *Gyratrix hermaphroditus* Ehrenberg, 1831 (Polycystidae) and *Cheliplana asica* Marcus, 1952 subsp. *terminalis* Brunet,

1968 (Karkinorhynchidae). In an addendum the genus name *Torkarlingia* Mack-Fira, 1971 is synonymised with *Djeziraia* Schockaert, 1971 since it has been established that « *Torkarlingia* » belongs to the Polycystididae.

## RÉSUMÉ

Dans cette seconde contribution sur les Microturbellariés marins de la Somalie, quatre espèces de Kalyptorhynchia nouvelles pour la science, sont décrites: *Polycystis ali*, *Polycystis subcontorta*, *Cincturorhynchus karlingi* (Polycystididae) et *Pocillorhynchus spiroductus* (Cicerinidae). La présence sur la côte somalienne est signalée pour: *Polycystis contorta* Schockaert & Karling, 1975, *Gyratrix hermaphroditus* Ehrenberg, 1931 (Polycystididae) et *Cheliplana asica* Marcus, 1952 subsp. *terminalis* Brunet, 1968 (Karkinorhynchidae). Enfin, l'auteur signale que le genre *Torkarlingia* Mack-Fira, 1971 doit être considéré comme synonyme du genre *Djeziraia* Schockaert, 1971. Il s'agit en effet de représentants de la famille des Polycystididae.

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