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ON A COLLECTION OF OPISTHOBRANCHIA FROM TURKEY

by

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(with 18 figures)

This paper deals with the Opisthobranchia collected by the Netherlands Biological Expedition to Turkey 1959. The collection is deposited in the Rijksmuseum van Natuurlijke Historie at Leiden.

The material was chiefly collected in three areas, viz. the Bay of Antalya and the Bay of Mersin (formerly İçel), both in the Eastern Mediterranean on the south coast of Turkey, and the environs of Trabzon on the south-east coast of the Black Sea.

The collection is rather small, comprising 25 species, which is probably only a fraction of the total Opisthobranchiate fauna of Turkey. Of course most of these species have also been recorded from the much better known Western Mediterranean. All the same, examination of the collection yielded some surprising facts. To my knowledge the species *Cyerce jheringi* and *Discodoris maculosa* had so far only been found near Naples. Up to now species of the genera *Chelidonura*, *Bursatella* and *Taringa* had not been recorded from the Mediterranean. Three species could not be identified with known species and are here described as new.

LIST OF THE SPECIES

Order Cephalaspidea

- Family Bullidae. 1. *Bulla striata* Bruguière, 1792.
Family Gastropteridae. 2. *Gastropteron rubrum* (Rafinesque, 1814).
Family Aglajidae. 3. *Chelidonura mediterranea* spec. nov.
Family Philinidae. 4. *Philine aperta* Linné, 1767.
Family Atyidae. 5. *Haminea hydatis* (Linné, 1758).
Family Retusidae. 6. *Retusa semisulcata* (Philippi, 1836). 7. *Retusa mam-*
millata (Philippi, 1836).

Order Anaspidea

Family Aplysiidae. 8. *Aplysia punctata* Cuvier, 1803. 9. *Aplysia depilans* (Linné, 1767). 10. *Bursatella leachii* Blainville, 1817.

Order Sacoglossa

Family Lobigeridae. 11. *Lobiger serradifalci* (Calcara, 1845).
 Family Polybranchiidae. 12. *Cyerce jheringi* Pelseneer, 1892.
 Family Elysiidae. 13. *Elysia timida* Risso, 1818.
 Family Plakobranchiidae. 14. *Thuridilla splendida* (Grube, 1861).
 Family Limapontiidae. 15. *Limapontia capitata* (O. F. Müller, 1774).

Order Notaspidea

Family Umbraculidae. 16. *Umbraculum mediterraneum* (Lamarck, 1819).
 Family Pleurobranchaeidae. 17. *Pleurobranchaea meckelii* (Blainville, 1825).

Order Nudibranchia

Family Dorididae. 18. *Discodoris maculosa* Bergh, 1884. 19. *Taringa armata* spec. nov. 20. *Dendrodoris grandiflora* (Rapp, 1827).
 Family Tritoniidae. 21. *Tritonia moesta* Bergh, 1884.
 Family Dotonidae. 22. *Doto pontica* spec. nov.
 Family Fimbriidae. 23. *Fimbria fimbria* (Bohadsch, 1761).
 Family Cuthonidae. 24. *Trinchesia foliata* (Forbes & Goodsir, 1839).
 Family Aeolidiidae. 25. *Spurilla neapolitana* (Chiaje, 1823).

LIST OF THE LOCALITIES WITH THE COLLECTED SPECIES

Sea of Marmara. *Aplysia punctata*.

Mediterranean.

a. Bay of Antalya. *Bulla striata*, *Gastropteron rubrum*, *Chelidonura mediterranea*, *Philine aperta*, *Haminea hydatis*, *Retusa semisulcata*, *Retusa mammillata*, *Aplysia punctata*, *Bursatella leachii*, *Elysia timida*, *Thuridilla splendida*, *Umbraculum mediterraneum*, *Pleurobranchaea meckelii*, *Discodoris maculosa*, *Taringa armata*, *Dendrodoris grandiflora*, *Tritonia moesta*, *Fimbria fimbria*, *Spurilla neapolitana*.

b. Bay of Mersin. *Aplysia punctata*, *Aplysia depilans*, *Lobiger serradifalci*, *Cyerce jheringi*.

Black Sea, near Trabzon. *Limapontia capitata*, *Doto pontica*, *Trinchesia foliata*.

Aegean Sea, near Porto Lagos. *Fimbria fimbria*.

NOTES ON THE SPECIES

1. *Bulla striata* Bruguière, 1792.

Province of Antalya, near the ancient Greek harbour of Side (now Selimiye), April 23, 1959, loose on the sand, depth 0-1 m, 7 empty shells, 15-22 mm long. Coll. no. V.74.

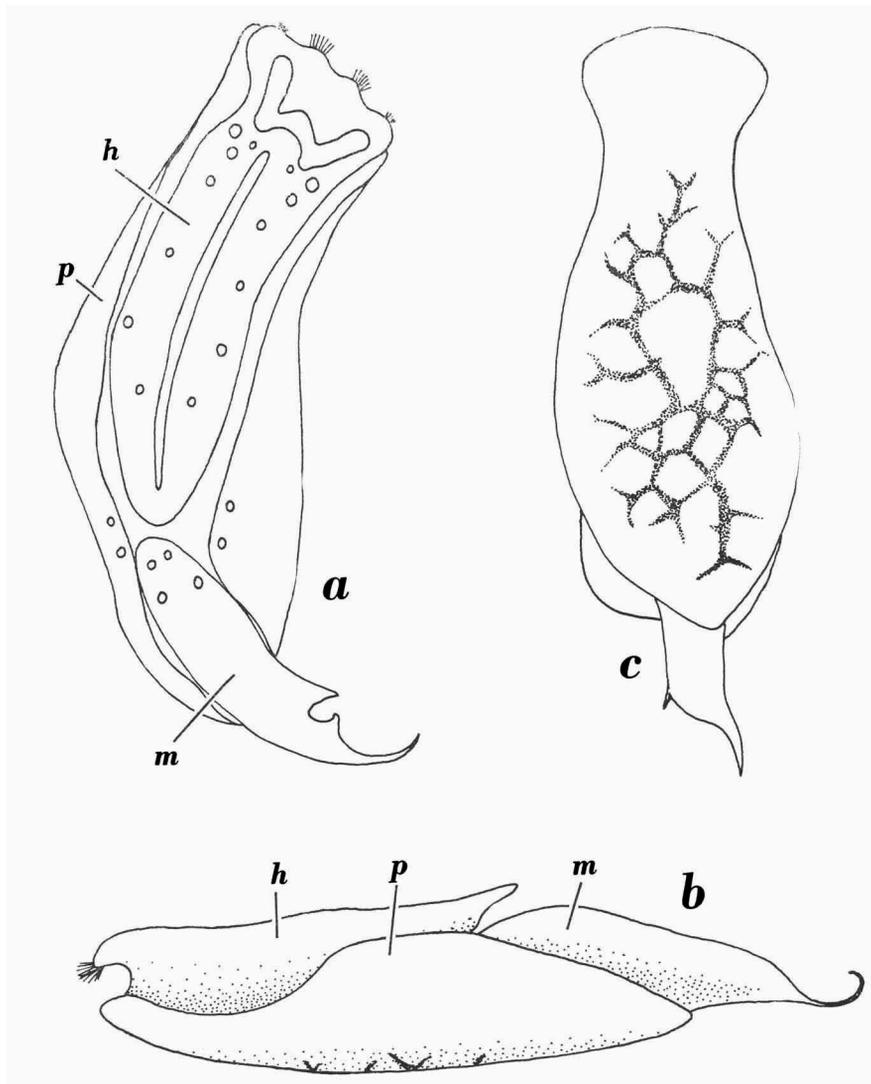


Fig. 1. *Chelidonura mediterranea* sp. n.; living slug. *a*, dorsal view; *b*, left side view; *c*, ventral view; *h*, head shield; *m*, mantle shield; *p*, parapodium.

Same locality, April 23 and May 4, 1959, sieved from sand, depth 10-70 cm, 3 empty shells, 5, 10 and 20 mm long. Coll. no. V.75.

2. *Gastropteron rubrum* (Rafinesque, 1814).

Province of Antalya, 1-2 km off the coast between Lara and Zincir, April 25, 1959, 12 specimens trawled on fine sandy bottom, depth 15-20 m. Coll. no. S. 63.

The slugs were 10-18 mm long and had the usual tomato-red colour with some light spots.

This Mediterranean species is well known through the publications of Vayssière (1880, 1885), Bergh (1893), and Guiart (1901). From Turkish waters the species had already been recorded by Demir (1952-'54), who found it in the Sea of Marmara.

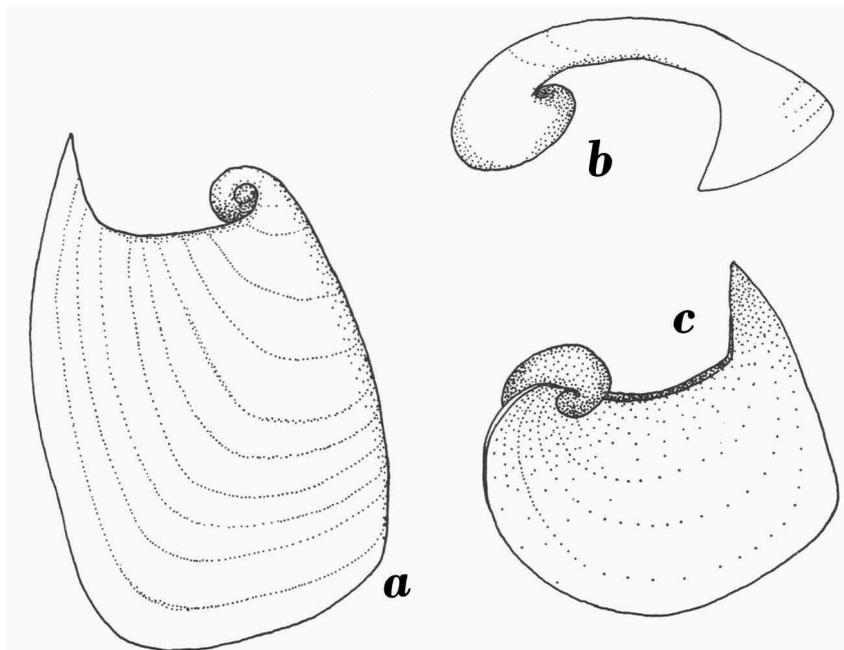


Fig. 2. *Chelidonura mediterranea* sp. n.; shell. a, dorsal view; b, posterior view; c, oblique ventral view.

3. *Chelidonura mediterranea* spec. nov. (figs. 1 and 2).

Province of Antalya, under a stone near the ancient Greek harbour of Side (now Selimiye), May 4, 1959, 1 specimen at a depth of $\frac{1}{2}$ m. Coll. no. S. 72.

The length of the living slug was 18 mm, the preserved animal measures only 8 mm. For the shape of the slug I may refer to the figures. The foot

is white, netted over with black lines. The parapodia as well as the upper side of both shields are greyish brown. There is a yellowish white figure shaped like the letter W on the anterior part of the head shield; beyond that there is a median stripe of the same colour, symmetrically flanked by round orange spots. The posterior shield and the upper parts of the parapodia have only a few small orange spots. The "tail-piece" is asymmetrical. The front side of the animal bears the small sense organs which characterize the genus. In the preserved animal no colour is left at all, except for the black stripes on the foot.

The shell is $2\frac{1}{2}$ mm long, rather solid, yellowish white, the oldest part is brown.

The distinction of species within the genus *Chelidonura* is chiefly based on differences in the colour pattern.

The only other species with a W-shaped head-spot is *C. fulvipunctata* Baba, 1938, which, however, lacks the median line and the orange spots. *C. africana* Pruvot-Fol, 1953, seems to be a small-sized animal just as *C. mediterranea*. I am, however, not sure that the specimen described here was full-grown.

So far 13 species and 2 varieties of *Chelidonura* had been described. Two of these species are Atlantic, all others come from Indo-Pacific waters (Marcus, 1955). *Chelidonura mediterranea* is the only species of the genus found in the Mediterranean.

4. *Philine aperta* Linné, 1767.

Province of Antalya, 1-2 km off the coast between Lara and Zincir, 4 specimens April 25, 1959, trawled on fine sandy bottom, depth 15-20 m. Coll. no. S. 63.

The length of the living animals was 15-20 mm. Shell, radula and gizzard plates corresponded with those of a specimen of *P. aperta* collected on the Dutch coast, only the colour of the gizzard plates of the Turkish ones was very dark brown, while those of the Dutch animal were yellowish. This does not seem to me a sufficient reason to consider the Turkish animals non-conspecific with the slugs from the North Sea.

It remains to decide whether the species should be called *P. aperta* or *P. quadripartita*. Pruvot-Fol (1954) and Wirz-Mangold & Wyss (1958) state explicitly that *Philine aperta* L. from the Cape of Good Hope is not the same as the European *P. quadripartita* (Ascanius). On the other hand Lemche (1948) after studying an extensive material, concludes that the two names must be synonyms. When comparing shells present in the Leiden Museum, which came from the Red Sea, the Cape, the Mediterranean and Western Europe I could not find any specific difference in the shell and

therefore I agree with Lemche that *P. quadripartita* is a synonym of *P. aperta*.

Demir (1952-'54) recorded *Philine aperta* Lamarck from the Sea of Marmara, possibly referring to the same species.

5. *Haminea hydatis* (Linné, 1758) (fig. 3).

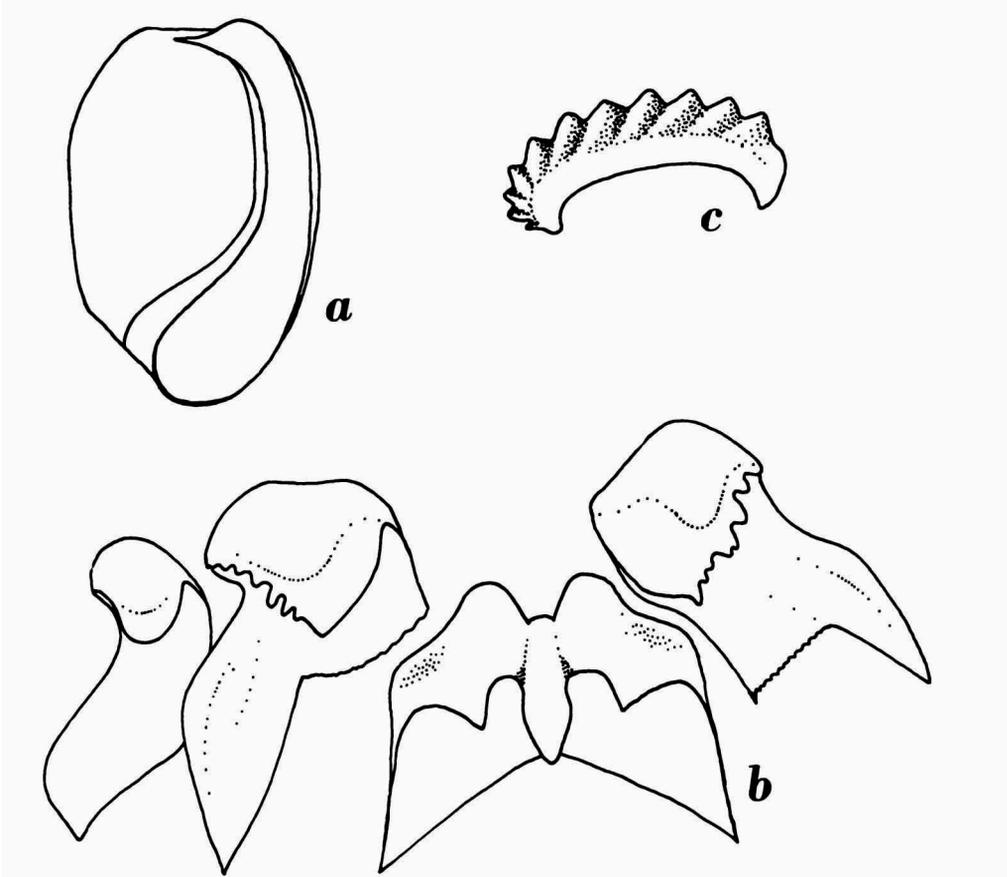


Fig. 3. *Haminea hydatis* (L.). a, shell; b, plates of radula, central part; c, gizzard plate.

Province of Antalya, on stones covered with decaying algae in the harbour of Antalya, depth 20-50 cm, April 19, 1959, about 20 living snails. Length of shell 3-8 mm. Coll. no. S. 47.

Same province, sieved from sand in the ancient Greek harbour of Side (now Selimiye), depth 10-70 cm, April 23 and May 4, 1959, 3 empty shells. Coll. no. V.75.

6. *Retusa semisulcata* (Philippi, 1836).

Province of Antalya, near the ancient Greek harbour of Side (now Seli-

miye), April 23 and May 4, 1959, sieved from sand at a depth of 10-70 cm, 3 empty shells, 3.5, 4 and 4.3 mm long. Coll. no. V. 75.

7. *Retusa mammillata* (Philippi, 1836).

Province of Antalya, near the ancient Greek harbour of Side (now Seli-miye), April 23 and May 4, 1959, sieved from sand at a depth of 10-70 cm, 2 empty shells, 2 mm long. Coll. no. V. 75.

8. *Aplysia punctata* Cuvier, 1803 (figs. 4 and 5a).

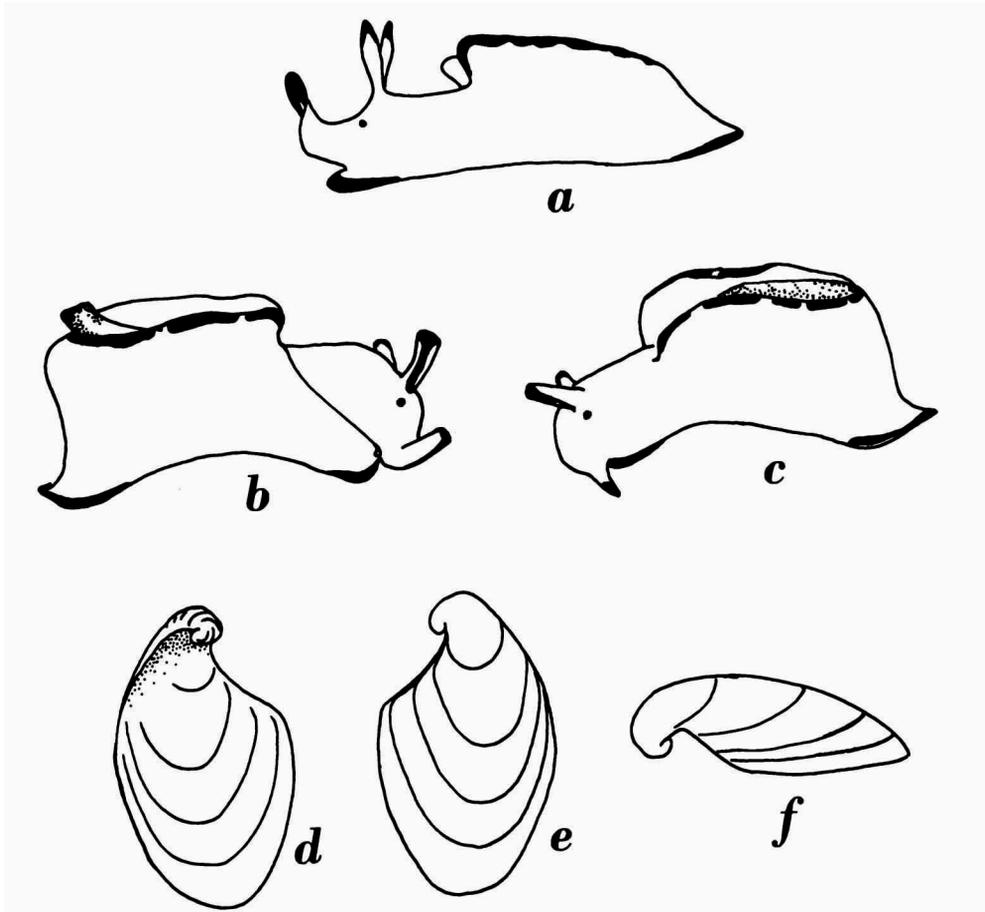


Fig. 4. *Aplysia punctata* Cuvier. a, living specimen from Side; b, c, preserved young specimen from Side; d, e, f, shell of young specimen from Side in ventral, dorsal, and side view.

Province of Istanbul, Sea of Marmara near Florya, April 2, 1959, 1 specimen on stone near the water line. Coll. no. S. 11. Length of living animal 54 mm, preserved in alcohol 30 mm. Radula $26 \times 3.10.1.10.3$.

Province of Antalya, on stones near the ancient Greek harbour of Side (now Selimiye), May 11, 1959, 9 specimens, depth 0-1 m. Coll. no. S. 72.

Province of İçel, along the coast near Kizkalesi, May 12, 1959, 2 specimens at 1-2 m depth. Coll. no. S. 84.

Same province, from harbour-wall of Mersin, May 16, 1959, 1 specimen. Coll. no. S. 93. Length of living animal 25 mm. Radula formula $24 \times 3.10.1.10.3$.

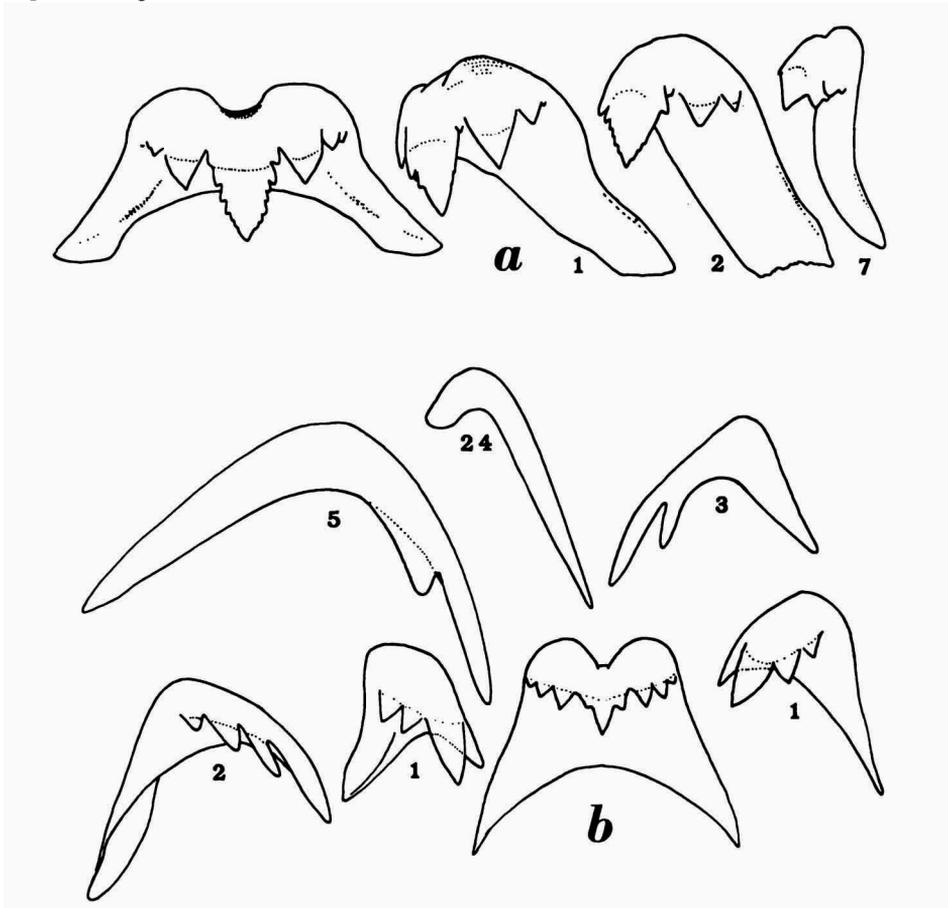


Fig. 5. *a*, *Aplysia punctata* Cuvier, specimen from Side, plates of radula. *b*, *Bursatella leachii* Blainville, plates of radula.

The animals from Florya, Kizkalesi and Mersin were of the usual type, but the very young specimens from Side so closely resemble the description of *Aplysia parvula* Mörch, 1863, that I have long been in doubt whether they ought not to be allocated to this species. The living animals in this locality

were like *A. punctata*, but redder than the ones I have seen so far. All of them have black lines along the parapodia, around the hole in the mantle, along the anterior edges of the foot and around the tip of the tail. They have also some black pigment in the rhinophores and the tentacles. Length 7-16 mm. In the preserved animals this black is even more obvious as the red colour has vanished.

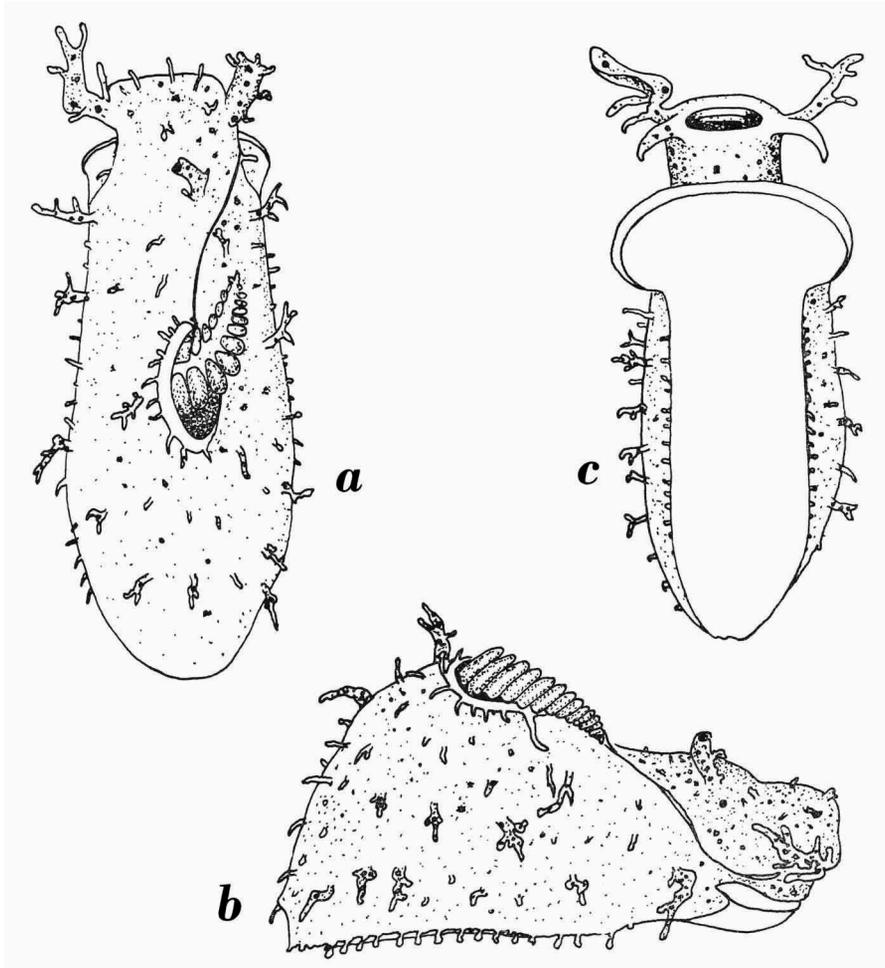


Fig. 6. *Bursatella leachii* Blainville; living slug. *a*, dorsal view; *b*, lateral view; *c*, ventral view.

When we compare these slugs with the coloured figures of Baba (1949, figs. 7 and 8) and the radula with his textfigure 3 on page 33 of *A. parvula*, and when we compare the shell with the figure of the shell of *A. parvula*

in Engel & Hummelinck (1936), then we certainly would conclude that the slugs from Side must be *A. parvula*. It is known that juveniles of *A. punctata* strongly resemble *A. parvula*. The two species seem to be very closely related and the names might be considered synonyms but for the fact that the adult *A. parvula* retains the black markings and that animals with those characters have never been found in the Mediterranean. Engel & Hummelinck (1936) point this out in their detailed discussion on *A. parvula*.

9. *Aplysia depilans* (Linné, 1767).

Province of İçel, in the harbour of Mersin, May 16, 1959, 12 specimens at a depth of 0.2 m. Coll. no. S. 93. The length of the slugs varied from 10-75 mm, all were juveniles.

10. *Bursatella leachii* Blainville, 1817 (figs. 5b and 6).

Province of Antalya, 1-2 km off the coast between Lara and Zincir, April 25, 1959, 1 specimen trawled from fine sandy bottom, depth 15-20 m. Coll. no. S. 63.

When alive the slug was 35 mm long. The preserved animal has a length of 31 mm, a width of 10 mm and a height of 15 mm. Largest width and height slightly beyond the middle. The tip of the tail is somewhat damaged, but does not give the impression of having been much longer than in the figure of the living animal. The body is beset with numerous scattered small simple and larger compound villi. About halfway on the back, slightly to the right of the median line, there is a dorsal slit, the rim of which is slightly bent upwards and beset with simple villi. A compound gill protrudes forward from this slit. Colour light dirty yellow, with many brown spots especially on the head and the larger villi. These spots often have a light centre and form "eye-spots".

In the slug preserved in alcohol the brown spots are clearly visible in a few places only. The dirty yellow colour has turned a dirty green, probably as a consequence of the pigments of the green algae, present in the gizzard. Although we renewed the alcohol several times and emptied the stomach the green colour has not yet quite gone. The gizzard plates in the stomach have a nearly round base with an upright triangular thorn. Radula: 27 × 33.1.33.

This is undoubtedly a specimen of the variable *Bursatella leachii*. This species had not been found so far in the Mediterranean, unless we count the specimen recorded from Palestine by O'Donoghue & White (1940), the exact locality of which is unknown, but was assumed to be in the Red Sea because the species had never been found in the Mediterranean at the time.

In older literature a great number of slugs were described, which belong to *Bursatella*. Eales & Engel (1935) brought them back to one single species with at the utmost six subspecies. When we try to identify the slug from Turkey with one of these subspecies we must eliminate the Indo-Pacific *Bursatella leachii leachii* because of the presence of green ocelli and the South African *B. leachii africana* as well as the Brazilian *B. l. lacinulata*, which have a woolly appearance on account of their thick-set villi. As far as the last one is concerned I base this assumption on the description and figure by Marcus (1955). The West African *B. l. rosea*, of which only one specimen is known, is distinguished by its rose colour. Thanks to the courtesy of the Director of the Zoological Museum in Amsterdam, Prof. Dr. H. Engel, I could examine the type specimen. It has more villi on the head than the animal from Turkey, but the latter is smaller and probably younger. The even rose colour which also characterizes all internal organs may have a postmortal origin as a consequence of pigments from red algae consumed by the slug, just as the Turkish animal has turned green after preservation. *B. l. pleii*, recorded from the West Indies and Brazil, has pronounced black pigment, furthermore this subspecies seems to be much broader and less high than our specimen. From the Red Sea *B. l. savigniana* was described. It is remarkable that this subspecies can be clearly distinguished from the Indo-Pacific subspecies. Eales & Engel (1935) quote the description of slugs from the Red Sea by Rüppell & Leukart, which tallies excellently with our specimen.

The characters, however, are very variable and the differences from *B. l. rosea* and also from *B. l. pleii* are only very slight, so for the present I do not feel justified to give the Turkish animal a subspecific name on the ground of morphological characters. Nor is it possible to take a decision on geographical grounds because the species may have entered the Eastern Mediterranean by way of the Suez Canal, or perhaps it is an Atlantic species which has penetrated into the Eastern Mediterranean by way of the North African coast. This coast is hardly or not at all investigated. Both possibilities are known for crustaceans (Holthuis & Gottlieb, 1958).

There is still the possibility of an undescribed Mediterranean subspecies but this seems very unlikely to me, because it could hardly have been overlooked.

11. *Lobiger serradifalci* (Calcara, 1845) (fig. 7).

Province of Içel, 5 km off the coast near Mersin, May 12, 1959, 12 specimens trawled from sandy bottom together with fragments of the alga *Caulerpa*, depth 10 m. Coll. no. S. 96.

All slugs had cast off the parapodial lobes when they came on deck, a

few also shed the tip of the foot directly behind the shell, a phenomenon to which Smith (1889) already drew attention.

The colour of the living animals was canary-yellow. The warts on the anterior part of the body had whitish spots and those at the posterior end red spots. Directly under the genital aperture a black pigmented line runs

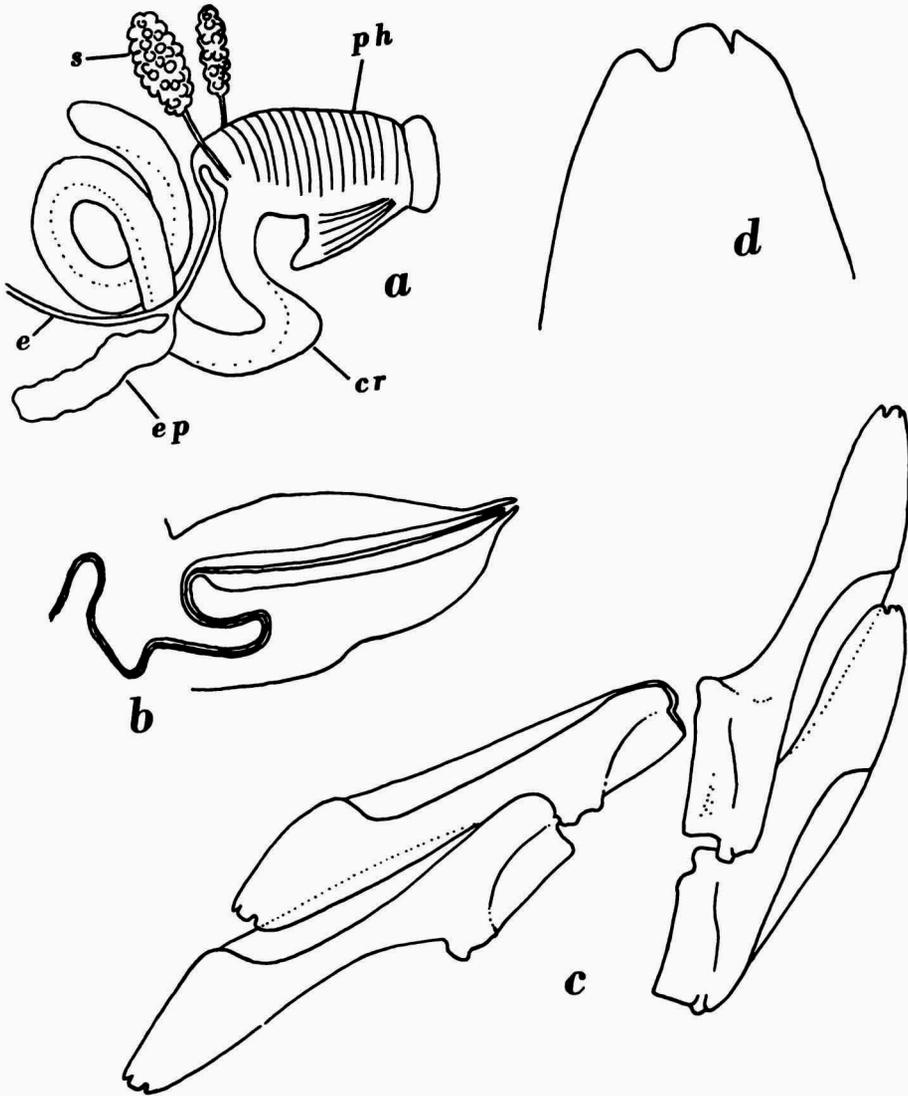


Fig. 7. *Lobiger serradifalci* (Calcara). *a*, alimentary tract; *b*, penis; *c*, plates of radula; *d*, cusp of tooth. *cr*, crop; *e*, esophagus; *ep*, esophageal pouch; *ph*, pharynx; *s*, salivary gland.

from below the eye to over the place where the foremost right parapodium is attached. The mantle under the shell is unicolored, the black lines described by Engel (1927) for *Lobiger souverbiei* Fischer, 1856, are absent. The living animals were 23-30 mm long.

The external features and the shell are well known from a great many

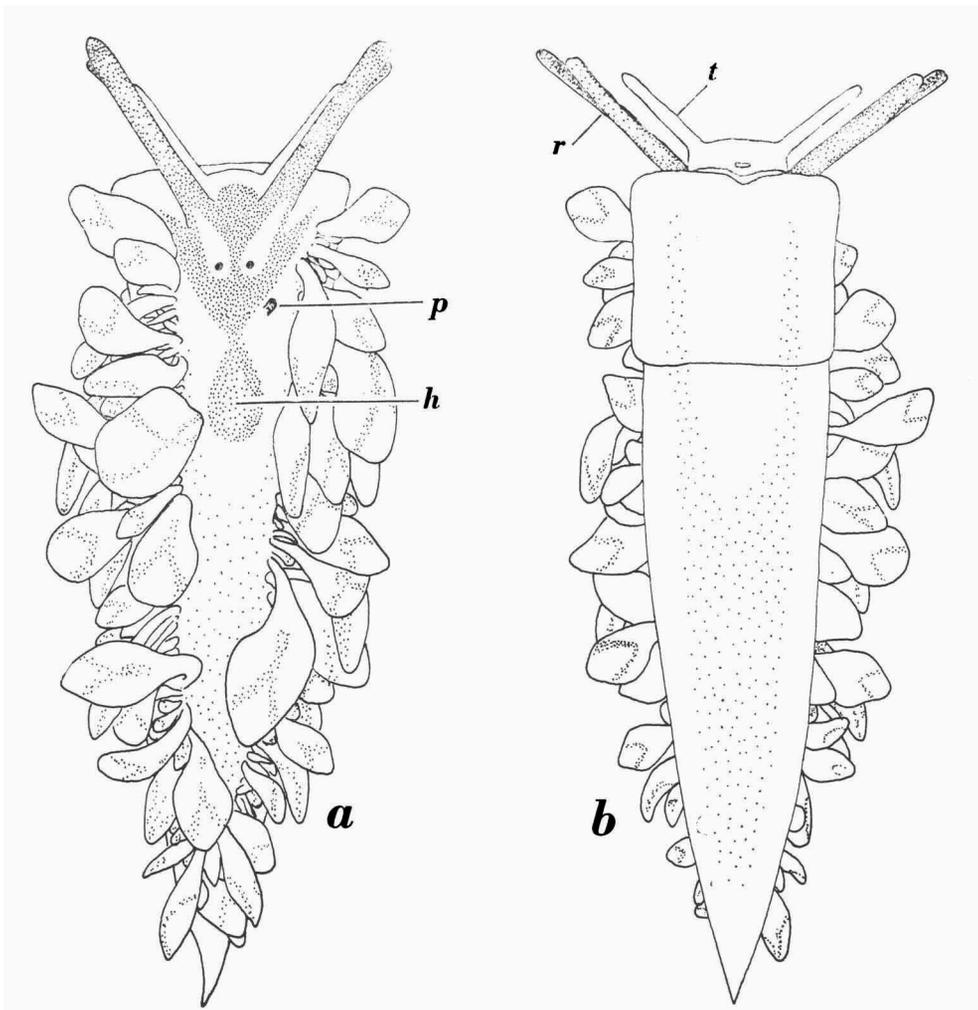


Fig. 8. *Cyerce jheringi* Pelseneer. *a*, dorsal view; *b*, ventral view. *h*, region of the heart; *p*, anus papilla; *r*, rhinophore; *t*, oral tentacle.

figures. I only give here figures of the alimentary tract, the penis and the radular teeth. The teeth of our specimens are similar to those in the figure

of Vayssière (1885, pl. 2 fig. 50), they are broader than in the figure of teeth of the same species given by Pruvot-Fol (1954, pl. 68a).

12. *Cyerce jheringi* Pelseneer, 1892 (figs. 8-10).

Province of Içel, on a stone on the coast near Kizkalesi, May 12, 1959, one specimen, depth 2 m. Coll. no. S. 84.

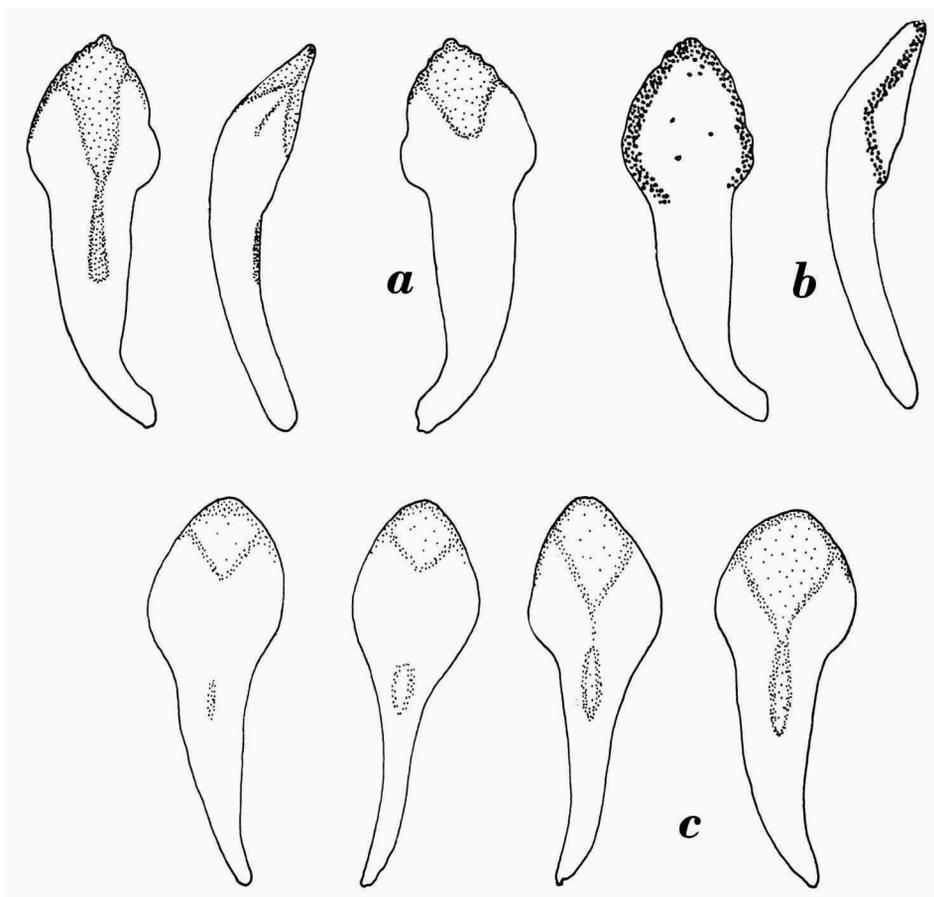


Fig. 9. *Cyerce jheringi* Pelseneer. *a*, one ceras of preserved slug in three different views, showing the pigment cells; *b*, one ceras of preserved slug in two different views, showing the gland cells; *c*, four cerata of living slug, showing the variable pigmentation.

The length of the living slug was 28 mm. Head small, the short tentacles are rolled up. The relatively long rhinophores are split at the end. Foot transparent colourless, broader than the body and divided by a furrow at $\frac{1}{5}$ of the distance between anterior margin and posterior tip. Anus papilla yellowish, dorsal, slightly to the right of the median about halfway between

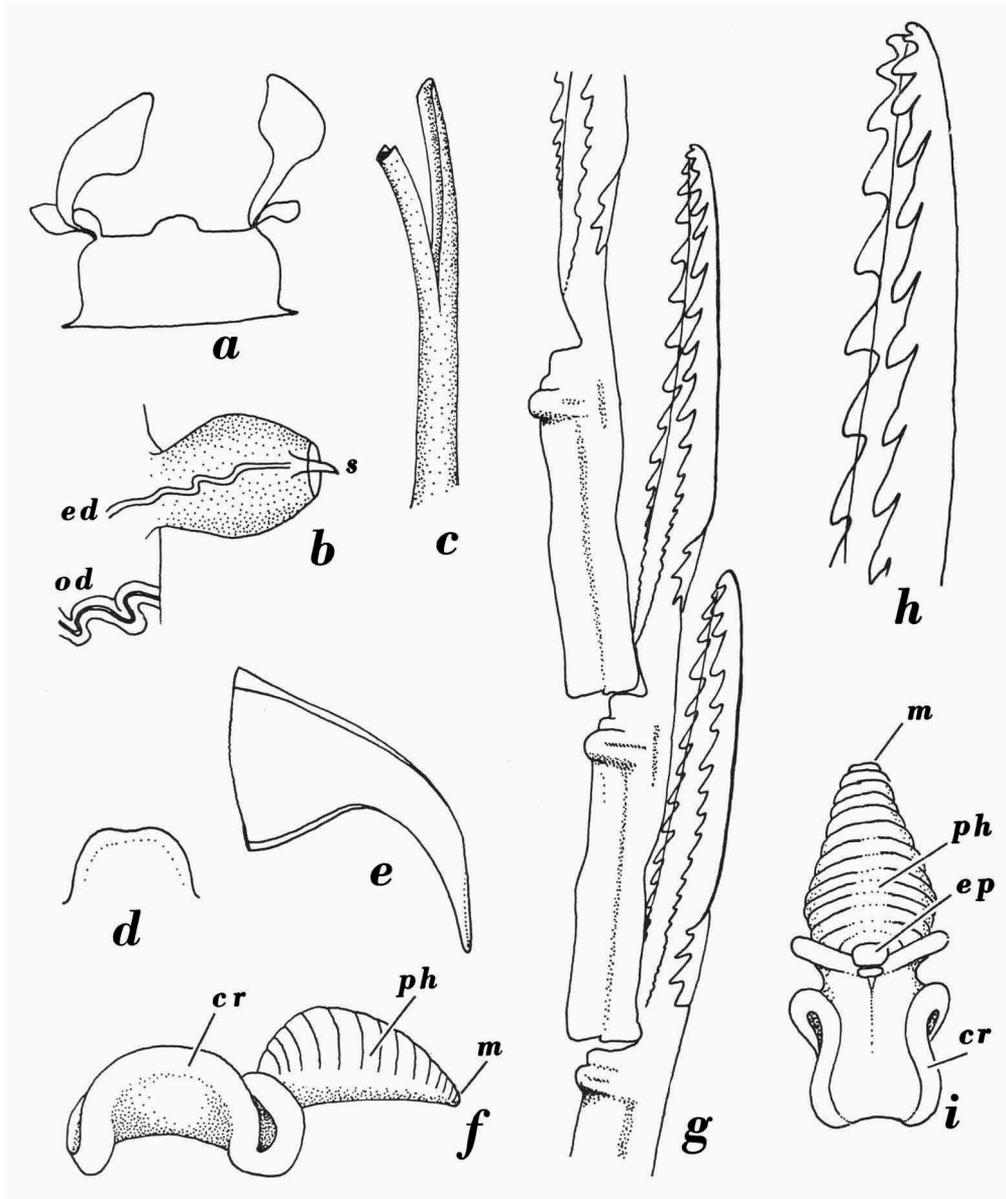


Fig. 10. *Cyerce jheringi* Pelseneer. *a*, transverse section of the heart region of the body; *b*, penis; *c*, rhinophore; *d*, anus papilla; *e*, penial stylet; *f*, pharyngeal bulb in side view; *g*, plates of radula; *h*, cusp of plate of radula; *i*, pharyngeal bulb in dorsal view. *cr*, crop or ingluvies; *ed*, efferent duct; *ep*, esophageal pore; *m*, mouth; *od*, oviduct; *ph*, pharynx; *s*, stylet.

the eyes and the cardial region. Papillae pointed, the upper part flattened and widened. There are no branches of the liver or other organs intruding the papillae, but in the uppermost part there are a few opaque white grains, probably gland cells. The colour of the papillae is greyish hyaline with a fine brownish violet pigment on the margin of the tip and on the side which is carried upward. These coloured areas may or may not be connected. Papillae numerous, crowded, on both sides of the back in 2-3 rows which are prolonged to past the rhinophores. The papillae differ greatly in length but large and small ones alternate in a distinct pattern.

Body broader than high, flat on the upper side except for the bulging cardial region. Colour grey, transparent; head, rhinophores, and cardial region covered with brownish violet pigmentation. The eyes are placed in large unpigmented regions beyond the rhinophores. The compact green liver is dimly visible through the back. It fills the posterior part of the body cavity completely. Two branches extend forward, one on each side of the body, to past the rhinophores.

The slug was anaesthetized with $MgSO_4$ and preserved in sea-water with 4% formol. Before preservation the animal had shed most of its papillae. After 6 months the slug was again examined. It turned out to have kept well in all its parts. The papillae now seem to stand in one row along the back. The transparent parts are slightly clouded and the liver has turned brown. The anus papilla is somewhat higher than broad, the end is smooth and blunt. The penis is situated under the right rhinophore, the exterior part has a brownish violet pigment. The tip is armed with a small, bent stylet. The female opening is slightly posterior to the male. The pharynx is unarmed, but very solid. Under the thin esophagus there is a saddle-shaped organ (ingluvies or Kropf in Bergh) of the same consistence as the pharynx. Together they form one organ. The radula has 9 teeth, but it is possible that some became lost in the process of preparation. Furthermore there are 10 strongly reduced teeth in the ascus. The teeth are uncoloured, hyaline. The top is nearly twice as long as the basal part and the margin has two rows of coarse denticles bent backwards.

Although there is no doubt that the slug from Kizkalesi is conspecific with *Cyerce jheringi* Pelseneer from Naples, there is still a problem of nomenclature to be considered.

In "Faune de France" Pruvot-Fol referred to the species under the name of *Lobifera jheringi*. Though the author states "elle est insuffisamment connue" the species is transferred to a different genus because it was supposed that the genus *Cyerce* Bergh is synonymous with *Lobifera* Pease. That this is not so appears from the following considerations. In 1860

Pease published his *Polybranchia* gen. nov. with the monotype *P. pellucida* spec. nov. Because afterwards he came to the conclusion that the papillae did not contain real branchia, he changed the name in 1866 substituting *Lobifera* for *Polybranchia*, while referring to his description from 1860. At the same time he added to the genus the species *Lobifera nigricans* Pease and *L. papillosa* Pease. Therefore the name *Lobifera* is an objective synonym of *Polybranchia* and invalid, according to the rule of priority. It is true that later some authors were of the opinion that *Polybranchia* had already been used by Latreille in 1825 for a different genus (Thiele, 1931), but this is due to a mistake (Pruvot-Fol, 1954, foot-note p. 175). Furthermore I may remark that Pruvot-Fol (1954) erroneously dates the genus *Lobifera* Pease from 1860 instead of 1866 probably due to a printer's error in her Pease revision (1946). Still later Pease (1871) discovered that in 1864 Alder & Hancock had described a genus *Phyllobranchus*, which according to him is synonymous with his *Polybranchia* from 1860. He now withdraws the name *Lobifera* and sticks to his *Polybranchia* from 1860. In the same year Bergh (1871) published his genus *Cyerce* with *C. elegans* Bergh as type. To this genus Pelseneer (1892) added his species *C. jheringi*.

We have now to decide whether *Cyerce* Bergh is synonymous with *Polybranchia* Pease. We cannot compare anatomical characters, since Pease did not give them. According to Bergh (1871) *Cyerce* is distinguished by a transverse groove in the foot and the possession of hyaline papillae. Pease does not state either in his description of the genus *Polybranchia* or in that of the type specimen *P. pellucida* that the foot is grooved. He does state this in his description of *Lobifera nigricans*, a species which is also different in other ways and clearly is synonymous with *Cyerce nigra* Bergh, 1871. So the latter should be called *Cyerce nigricans* (Pease) and not *Lobifera nigricans*, as was done by Pruvot-Fol (1946). Even if further research should prove that this *Cyerce nigricans* does not really belong to the genus *Cyerce* we still cannot give it the name *Lobifera*. In the description of the genus *Polybranchia* Pease remarks: "branchia imbedded in the lobes", in that of the type species *P. pellucida*: "branchia imbedded in the substance of the lobes, ramose; the stem commencing at the base of the lobes and branching out, following their form, not extending to the edges of the lobes". We know already that in 1866 Pease was convinced that these are not branchia. Still there is something in the papillae which clearly appears like a branching stem and which cannot be anything else than branches either of the liver or of one of the glands of the reproductive organs. In *Cyerce* they never spread as far as the inside of the papillae. So *Cyerce* is not identical with *Polybranchia*, nor is it, therefore, with the substitute name *Lobifera*.

Furthermore it is certain that *Cyerce jheringi*, because of its divided foot, dorsally placed anus and leaf-shaped hyaline papillae — to which we may now add the spined penis and the shape of the radula — has been rightly allocated to the genus *Cyerce* by Pelseneer (1892).

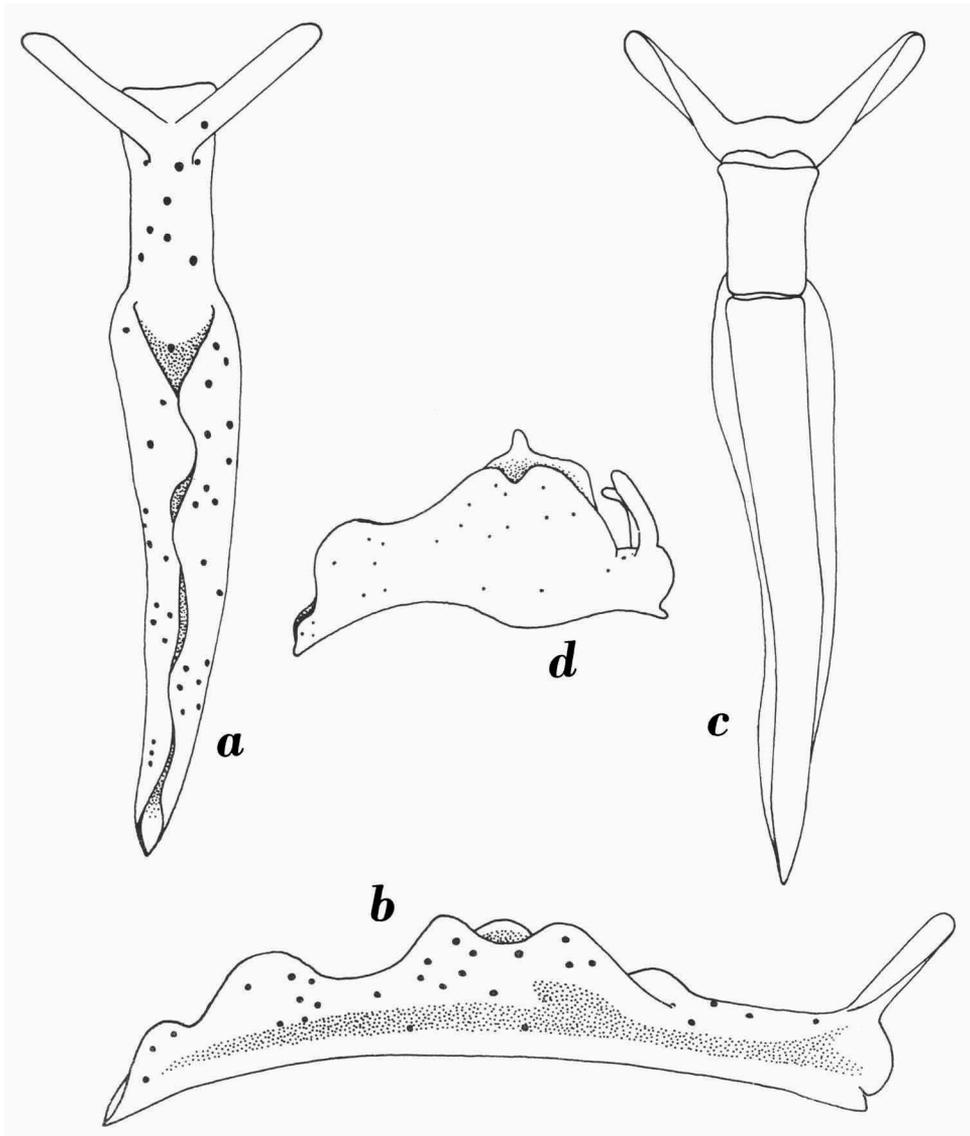


Fig. 11. *Elysia timida* Risso. *a*, *b*, *c*, living slug in dorsal, lateral, and ventral view; *d*, lateral view of preserved specimen.

The specimen from Kizkalesi seems to be the first of the species to be found since the description in 1892.

13. *Elysia timida* Risso, 1818 (figs. 11 and 12).

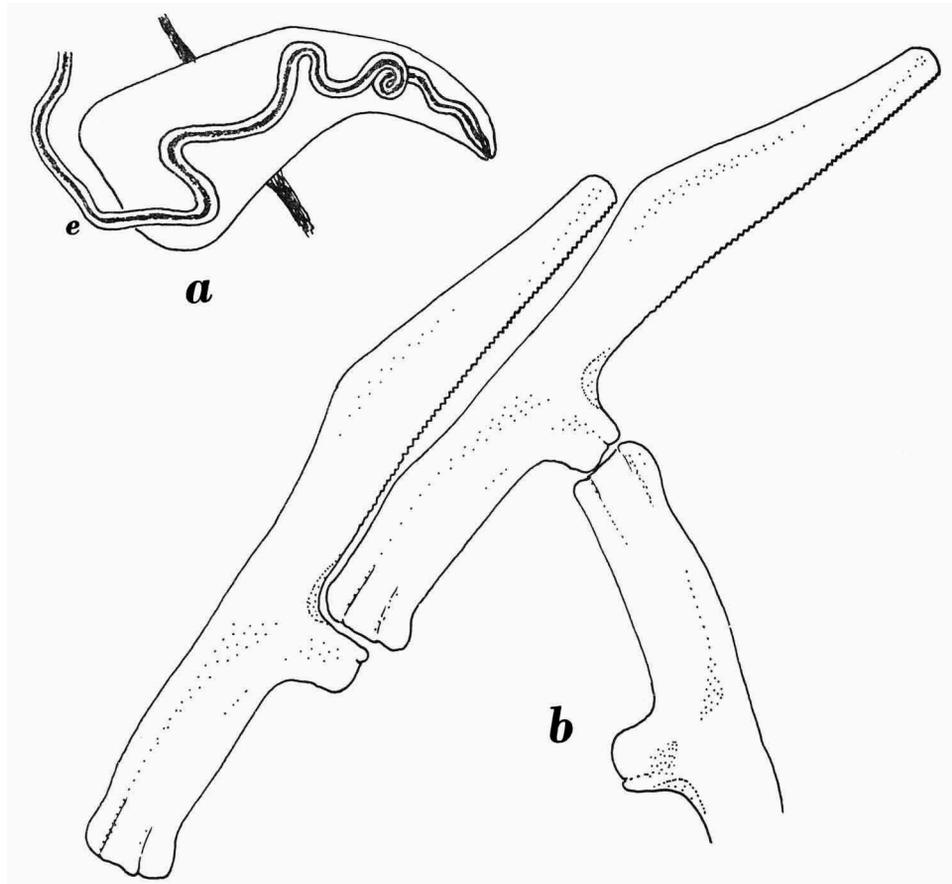


Fig. 12. *Elysia timida* Risso. *a*, penis; *b*, plates of radula. *e*, efferent duct.

Province of Antalya, under a stone near the ancient Greek harbour of Side (now Selimiye), April 23, 1959, 1 specimen, depth $\frac{1}{2}$ m. Coll. no. S. 60.

The length of the crawling animal was 10 mm, the width 1.3-1.4 mm. Parapodia low, with a few higher projections which gave the slug a hunch-backed outline when seen from the side. On the first projection of the left parapodium there is a tiny protuberance which fits into a small groove in the first projection of the right parapodium. Colour of the slug chalk white with a few vermilion dots. The brightly green branches of the liver shine through the sides of the body, the inner side of the parapodia and the back

between the parapodia behind the cardinal region. The foot is divided by a transverse furrow. The rhinophores are rather thick and rolled up as usual.

In the animal which was anaesthetized with $MgSO_4$ and preserved in 4% formol-seawater the projections on the parapodia are still clearly discernible. The green colour of the branches of the liver has changed to a hardly perceptible light brown. The vermilion dots have turned orange.

The radula has 12 teeth, 5 in the ascending and 7 in the descending line and a few reduced ones in the ascus. The teeth are colourless, slender, serrated along the front margin and have a large articulation knob on the top of the basal part. The penis is bent and unarmed, the efferent duct is sinuous but lacks the swelling as in *Elysia viridis*.

Vayssière (1888) does not mention the projections on the margin of the parapodia, nor does he show them in the figure of the contracted animal (pl. 2 fig. 8). Also his animal has a greater number of red dots than the specimen from Side. Finally his figure of a tooth shows a slightly bent top, a character which is also mentioned in his text. In my opinion these differences are too small to consider the single specimen to belong to another species than those of Vayssière.

14. *Thuridilla splendida* (Grube, 1861) (fig. 13a-d).

Province of Antalya, under a stone near the ancient Greek harbour of Side (now Selimiye), April 23, 1959, 1 specimen at a depth of $\frac{1}{2}$ m. Coll. no. S. 60.

The length of the living animal was 8 mm. The colour of the spots on the outside of the parapodia immediately behind the orange border line was bright green. The foot is divided by a transverse groove which is still clearly discernible in the preserved slug.

The radula has 8 (10) teeth in the ascending and 9 in the descending row and 13 more in the ascus. The latter are placed in a perfect spiral of 2 whorls. The cutting edges of the teeth are very finely denticulated while on the upper side of the cutting plate a very fine striation may be observed.

Pruvot-Fol (1954) considers *Elysia splendida* Grube, 1861, from Triest to be synonymous with *Elysia (Acteon) Hopei* Verany, 1853, from Nice and calls the species *Thuridilla hopei* (Verany). The animals from Nice, however, as well as those from Banyuls (Pruvot-Fol, 1951), have blue spots on the parapodia, while *Elysia splendida* of Grube, *Thuridilla splendida* of Bergh (1872, 1885) and our animal from Side have green spots in that place. Still, these colours are closely related and there would be no reason to keep the species separate if Pruvot-Fol (1954) did not state very emphatically that the animals do not have a divided foot. As Bergh (1872, 1885) states that *Thuridilla splendida* has a transverse groove in the foot we

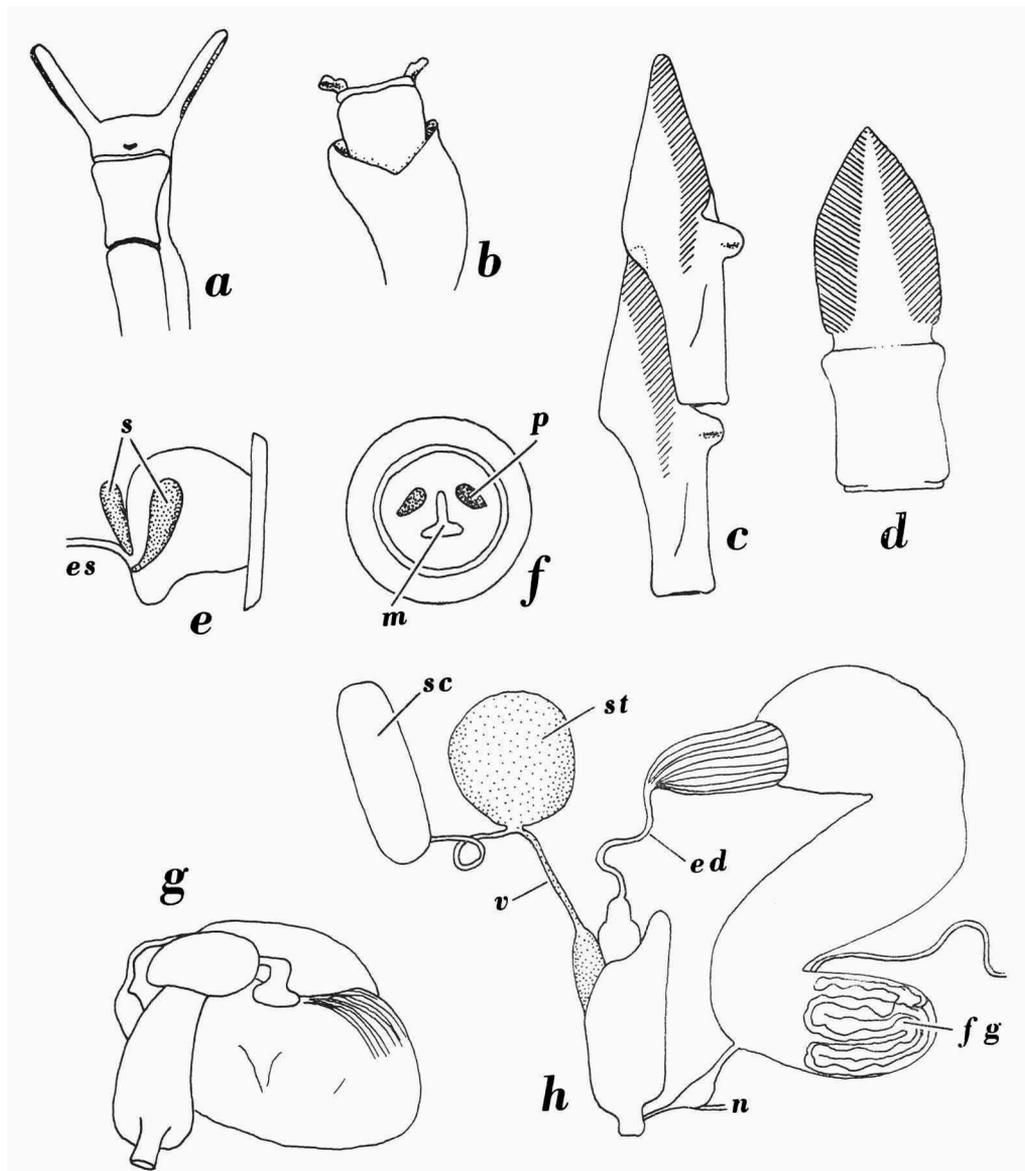


Fig. 13. *a-d*, *Thuridilla splendida* (Grube). *a*, anterior part of living animal, ventral view; *b*, anterior part of preserved animal, ventral view; *c*, *d*, plates of radula in side view and in dorsal view. *e-h*, *Discodoris maculosa* Bergh. *e*, *f*, pharynx in lateral and frontal views; *g*, *h*, reproductive organs. *ed*, efferent duct; *es*, esophagus; *fg*, female gland mass; *m*, mouth; *n*, nidimental duct; *p*, pore of oral gland; *s*, salivary gland; *sc*, spermatocyst; *st*, spermatheca; *v*, vagina.

must assume that the two species are different, unless the statement of Pruvot-Fol is erroneous.

15. *Limapontia capitata* (O. F. Müller, 1774).

Province of Trabzon, in the harbour of Trabzon, June 3, 1959, 2 specimens on algae between *Zostera*, depth 1-2 m.

The slugs were 3 mm long and looked quite similar to those found along West European coasts. Unfortunately our specimens could not be found back in the collection.

Limapontia capitata (O. F. Müller) has often been confounded with *L. depressa* Alder and Hancock and recently Pruvot-Fol (1954) even considered the two names synonymous. Engel et al. (1940), however, carefully collected the points of difference from the literature and later Quick (1950) studied the ecological differences and gave good figures and descriptions of the two species, while Gascoigne (1956) clearly exposed the anatomical characters.

Limapontia capitata was recorded by Demir (1952-'54) for the Sea of Marmara and is probably the same species as recorded by Ostroumoff (1893) under the name of *Pontolimax* spec. from the Black Sea and the Sea of Azov.

16. *Umbraculum mediterraneum* (Lamarck, 1819).

Province of Antalya, near the ancient Greek harbour Side (now Selimiye), April 23, 1959, 1 specimen under a stone at a depth of $\frac{1}{2}$ m. Coll. no. S. 60.

The living snail was 55 mm long, the preserved animal measures only 42 mm. The shell is 35 mm long and 28 mm wide. The species had already been recorded from Turkish waters by Demir (1952-'54) from the Sea of Marmara.

17. *Pleurobranchaea meckelii* (Blainville, 1825).

Province of Antalya, 1-2 km off the coast between Lara and Zincir, April 25, 1959, 1 specimen trawled from fine sandy bottom at a depth of 15-20 m. Coll. no. S. 63.

When alive the slug was 47 mm long, the preserved animal measures only 38 mm.

From Turkish waters this well-known species had already been recorded by Demir (1952-'54), who found it in the Sea of Marmara.

18. *Discodoris maculosa* Bergh, 1884 (fig. 13e-h).

Province of Antalya, under a stone near the ancient Greek harbour of Side (now Selimiye), April 23, 1959, 1 specimen, depth 1 m. Coll. no. S. 60.

The length of the living slug was 60 mm. The animal is creamy white with numerous small and bigger spots, brown as well as white ones. The tips of many of the tubercles on the notum are white. The six thrice-feathered gills are yellowish. The radula formula is about $37 \times 40.0.40$.

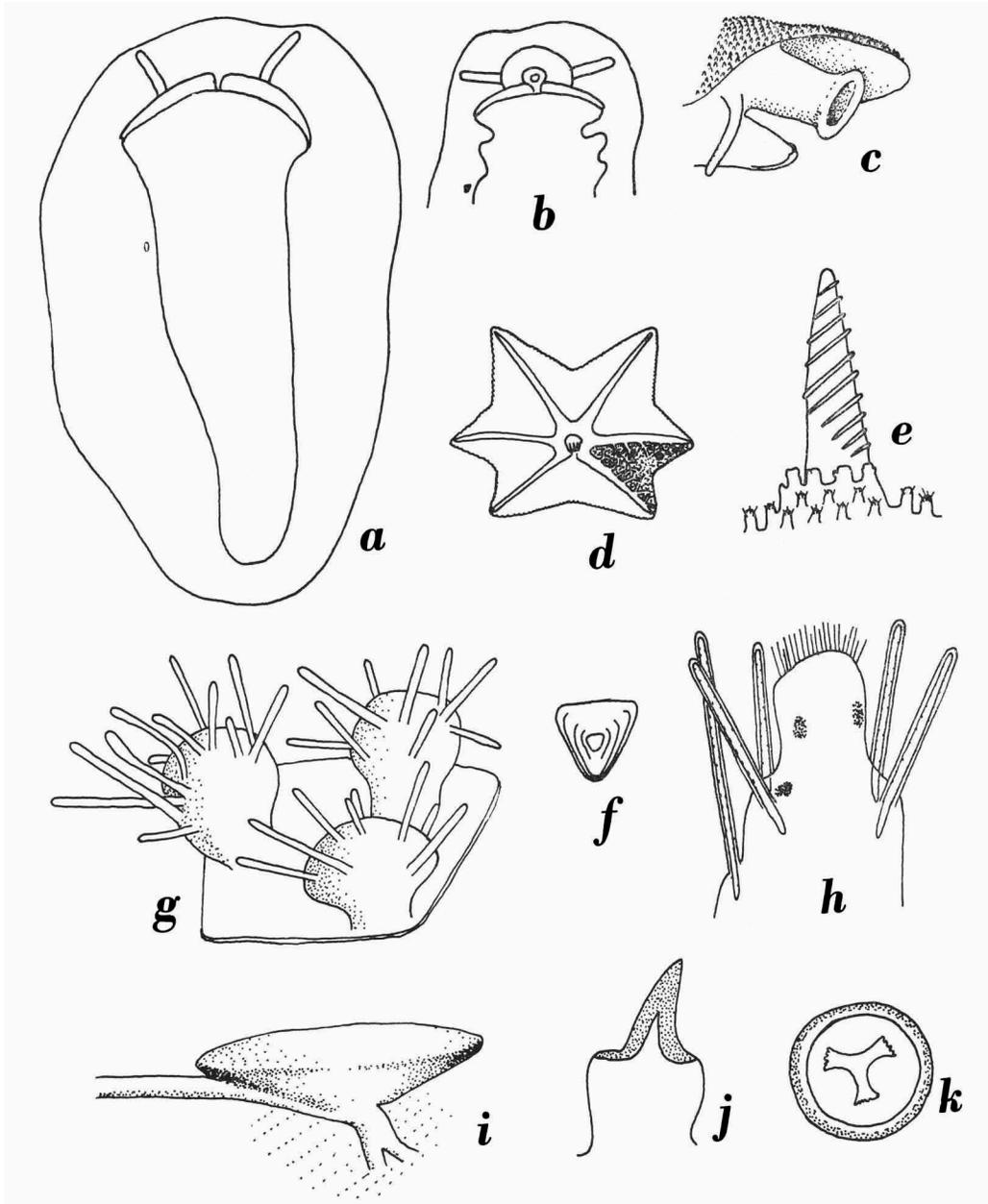


Fig. 14. *Taringa armata* sp. n. *a*, ventral view of living animal; *b*, *c*, preserved specimen, ventral and lateral view of head; *d*, gills, with anal papilla; *e*, lateral view of rhinophore; *f*, rhinophore from above; *g*, papillae of notum of preserved specimen; *h*, clarified papilla of notum; *i*, left side view of stomach; *j*, vestibular hook; *k*, labial cuticle.

In contradistinction to the description by Bergh I found that the pseudo-peritoneum contains scattered black chromatophores, which stand closer together over the ganglia. The vestibulum is strengthened by longitudinally placed spicula. I have not been able to discover any other differences. It seems that the species has not been found again after the description by Bergh.

19. **Taringa armata** spec. nov. (figs. 14 and 15).

Province of Antalya, 4 km west of the harbour of Antalya, April 21, 1959, 2 specimens on *Cystoseira*, depth 1 m. Coll. no. S. 53.

The length of the living slugs was 24 and 11 mm respectively, in preserved condition 16 and 9 mm. The length of the crawling animals varied between $1\frac{1}{2}$ and twice the breadth. The slug is rather flat, the foot is narrow. The anterior border of the foot is transversely grooved, the upper lip is notched in the middle. Oral opening on a small round proboscis. Tentacles thin, finger-shaped. Mantle wide, totally covering the slender body. Papillae on the mantle uniform, small, rather close together, provided with sensory epithelium, protected by a crown of soft spicula which are completely covered by epithelial tissue. The margin of the mantle forms a rim around the opening for the rhinophores, notched, with about 8 sinuosities, with papillae like those on the back. Rhinophores about triangular in section, the flat side to the front, on the sides 10 or 8 plates respectively, of which 6 or 4 are fused together on the back to form a V. Gills in a crown around the anus, fused at the base, 6 thrice-feathered branches in all. Colour brown with dark and lighter spots. Underside of the mantle lighter, also spotted. Anus papilla white, notched. Lips armed with a round, thin, chitinous plate with Y-shaped aperture.

Radula formula $31 \times 5.29.0.29.5$ or $27 \times 3.22.0.22.3$. respectively. From the centre outward the lateral teeth increase gradually in length up to the last two, which are smaller, though still larger than the inner ones. The first lateral tooth has one denticle on the inner side and two on the outer side. The others have only denticles on the outer side, the number of denticles increasing to 7. In the same direction the marginal teeth grow smaller, they are thin and serrated like a comb. The salivary glands are folded, long, the end touches the front of the liver. Stomach flat, situated left of the median line, on the dorsal surface of the liver. The intestinal canal runs from the anterior side of the stomach in a curve over the right side of the liver to the anus. Penis armed with a chitinous bell-shaped wrapping. Vestibulum provided with a small number of chitinous spines.

Taringa telopia Marcus, 1955, from Brazil, the monotype of *Taringa* Marcus, 1955, differs from the species described here, (1) in the shape of the

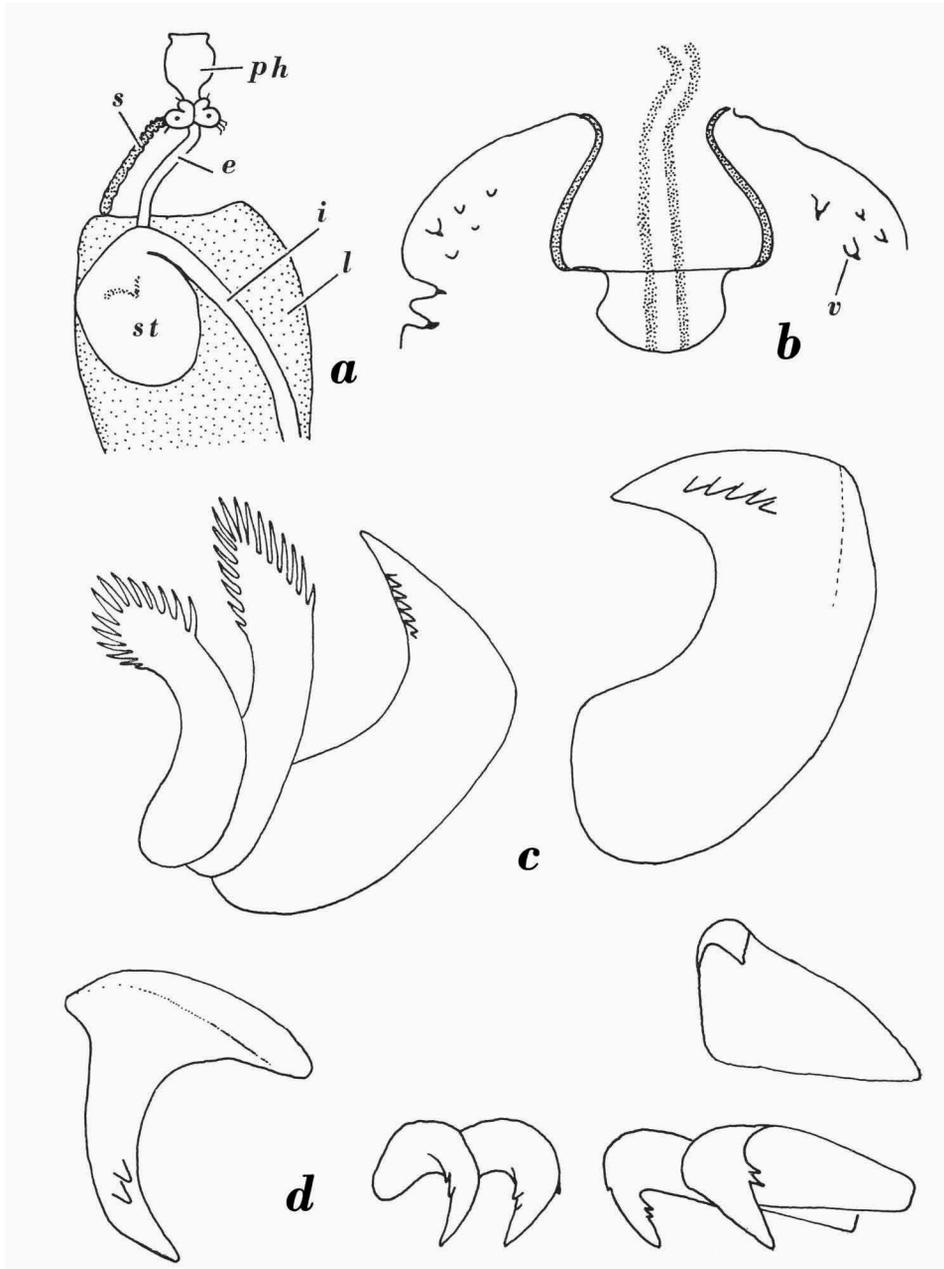


Fig. 15. *Taringa armata* sp. n. a, alimentary tract; b, penis; c, d, plates of radula. e, esophagus; i, intestine; l, liver; ph, pharynx; s, salivary gland; st, stomach; v, vestibular hook.

tentacles, which in *telopia* are flattened and triangular, (2) in the armature of the lips, which is lacking in *telopia*, (3) in the third outermost lateral tooth, which in *telopia* is remarkably bigger than the preceding ones, (4) in the number of lateral teeth, which in *telopia* may amount to 40.

The presence of triangular, flattened tentacles and the absence of a labial armature is included by Marcus in the genus description of *Taringa*. I would recommend to expand the limits of the genus a little and consider these characters specific and not generic.

The two species have too many fundamental characteristics in common to allocate them to different genera. For further comparisons with related genera I may refer to Marcus (1955).

20. *Dendrodoris grandiflora* (Rapp, 1827).

Province of Antalya, under stones near the ancient Greek harbour of Side (now Selimiye), depth 0-1 m, April 23, 1959, 3 specimens of 31, 31 and 33 mm, respectively. Coll. no. S. 60; May 4, 1959, 2 specimens of 35 and 40 mm, respectively. Coll. no. S. 72.

All the slugs had the characteristic black striation on the margin of the mantle. The colour of the living animals corresponds to that in the figure of Adams (1858, pl. 62 no. 4). I compared the anatomical characters with the comprehensive study of Bergh (1880).

21. *Tritonia moesta* Bergh, 1884 (fig. 16).

Province of Antalya, on the coast near Lara, April 8, 1959, 1 specimen on *Cystoseira*, depth 30 cm. Coll. no. S. 20.

The length of the living animal was 9 mm. The colour was brownish, on back and sides with a great many black spots which are partly fused together to form dark bands. The foot is practically colourless, the reddish-brown liver shines through. The back is flat and smooth, with 4 pairs of small gill appendages. The genital papilla is flat, situated at the right side halfway below the rhinophores and the foremost gill-appendage. Velum with 3 pairs of projections. The anterior ones are longest. The posterior ones are broadest and have a deep longitudinal groove on the underside. The middle processes are small.

The animal has a length of 5 mm after preservation in alcohol. The radula has 35 rows of teeth of the formula 14.1.1.1.14.

Our animal completely corresponds with the specimens from Trieste described by Bergh (1884). His slugs were slightly smaller (4-5 mm) and most of them had only 2 pairs of appendages on the velum. For only one of his specimens he described a small lobe between the anterior and posterior appendages on the velum, which is also shown in one of his figures. Perhaps this lobe does not always develop or does so at a later stage. Bergh (1884)

considered his species to be new and not the same as *T. gracilis* Risso, 1818. At first Vayssière (1901) thought that *T. gracilis* and *T. moesta* were synonyms, but later (1913) he considered the two to be separate species. Pruvot-Fol (1936a and b, 1937, 1953, 1954) is convinced that *T. moesta* is synonymous with *T. gracilis*. If this is true, then our specimen ought to be called *T. gracilis*. It is, however, highly probable that *T. gracilis* is a closely related but separate species. In that case this must be the species

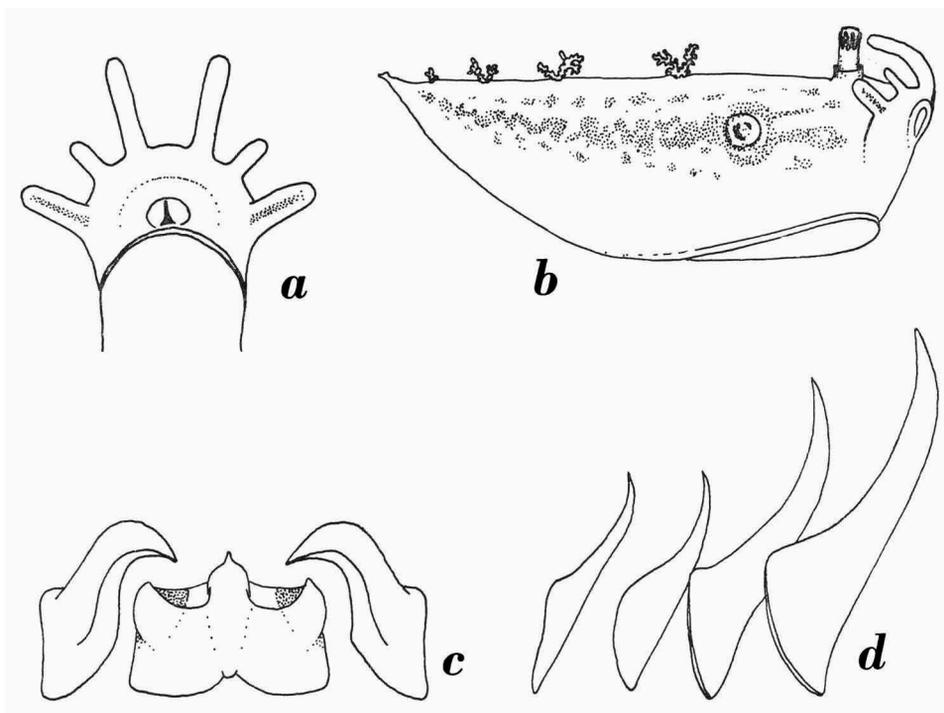


Fig. 16. *Tritonia moesta* Bergh. *a*, ventral view of anterior end of living animal; *b*, lateral view of preserved specimen; *c*, one median and two lateral plates of radula; *d*, four outermost plates of radula.

of the figure from the Atlantic coast of Morocco (Pruvot-Fol, 1953 fig. XX and pl. 2 nr. 36) and from the Mediterranean by Pruvot-Fol (1954, pl. 1 nr. 5 and 6). In both cases the groove in the outermost pair of velum appendages is not figured or described. It is true that Pruvot-Fol (1954, fig. 137 f.) gives a figure under the name *T. gracilis* of a head with 4 appendages, of which the outer two are grooved, but this is a copy of the figure of *T. moesta* by Bergh (1884, pl. LXXVI fig. 1) which Pruvot-Fol considers synonymous. Moreover the radula yields a slightly different

formula. For his slugs of 4-5 mm Bergh (1884) gives the formula $25-30 \times 13.1.1.1.13$. The Turkish specimen was 9 mm and had the formula $35 \times 15.1.1.1.15$. Pruvot-Fol (1954) on the contrary gives for slugs of 10-12 mm a radula of $21 \times 11.1.1.1.11$. Usually the larger the slug the greater the number of rows of teeth and the more lateral or marginal teeth, so that this is possibly another point of difference between *T. moesta* and *T. gracilis*.

22. *Doto pontica* spec. nov. (fig. 17).

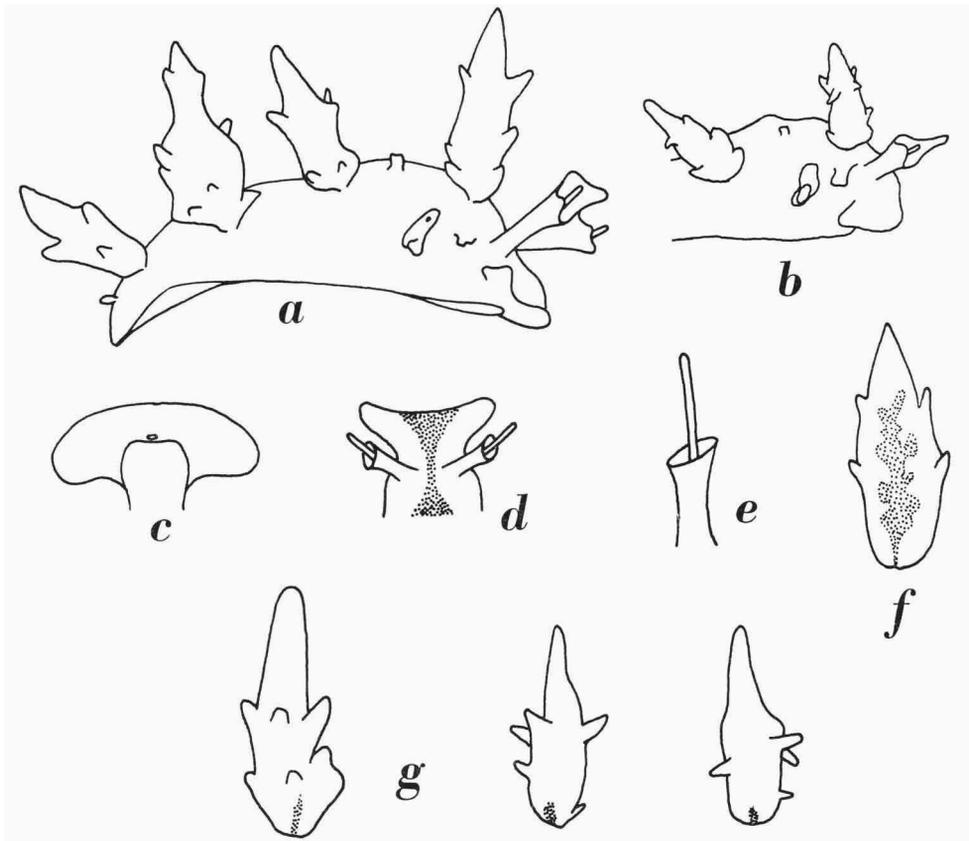


Fig. 17. *Doto pontica* sp. n. a, lateral view of preserved specimen; b, lateral view of anterior part of another preserved specimen; c, ventral view of head of living animal; d, dorsal view of head of the same specimen; e, rhinophore of living animal; f, ceras of living animal; g, three cerata of preserved specimen.

Province of Trabzon, 5 km NW of Akçaabat, June 4, 1959, 4 specimens with eggs on *Aglaophenia* spec. Depth 0.1 m. Coll. no. S. 123.

The length of the living slugs was 4, 6, 6, and 7 mm, respectively. The papillae are in four pairs, in the three largest animals there is another,

undeveloped fifth pair at the posterior end of the body. There are remarkably few tubercles on the papillae, it appears as if in principle there might be two rounds of four. The tubercles protrude and are somewhat pointed, the top of the papilla is free for about $\frac{1}{3}$ - $\frac{1}{4}$. The papillae are colourless, transparent, the grey ramifications of the liver are clearly visible. The tips of the tubercles as well as of the papillae are white, probably on account of a concentration of big glandular cells, there is a very small dark spot at the foot of the papillae. The body is colourless, with on the back and on the sides below the papillae a longitudinal band of brown pigment. Velum large, expanding at the sides. Sheath around rhinophore about half as long as the latter, upper margin even and smooth.

In the animals anaesthetized with $MgSO_4$ and preserved in alcohol the margin of the rhinophore sheath is now notched in a very conspicuous way. The spot at the foot of the papillae is now best visible on the posterior side. This patch of pigment is not situated in the epidermis, but deeper. In one of the slugs the branchial area on the papillae is now clearly folded longitudinally, so that it might be mistaken for a gill, in the other slugs it is smooth or at the utmost slightly wrinkled on some of the papillae. In living animals no wrinkling was observed in these places. Moreover a number of small tubercles on the papillae have turned up postmortally. The papillae are now opaque, only the branchial area is still semitransparent. As usual the anus papilla is situated between the first and second right papilla, slightly to the dorsal side. The genital aperture is large; it has a small lobe. Jaws and teeth are shaped as is usual in this genus, number of teeth 68-70.

Eggs in a string on hydroids, slung in the same way as is known from many other species of *Doto*.

The *Doto* species described here has few papillae and remarkably few tubercles on them; all the same it is certain that it is not a juvenile form, as not only did the slugs have eggs when collected but they deposited some more on the sides of the glass in which they were kept for some time.

As a genus *Doto* is easily recognizable but the difficulties begin when we try to distinguish the species. So far the classification by Odhner (1936) has proved to be the most effective. When following his synopsis we are led to group IIIB somewhere near *Doto cuspidata* A. & H. *D. aurea* Trinchese which comes next has dark lines on the back and its velum is too small. *D. cornaliae* Trinchese has a different colour of the papillae. If we leave out colour and only consider the species with a low number of papillae and also a low number of tubercles on them, then we are led again to *D. cuspidata*, which, however, has got too many papillae and also more tubercles on the papillae. Furthermore it is recorded from the Shetlands in the

Atlantic and not from the Mediterranean or the Black Sea. Vayssière (1913), on the other hand, mentions *D. cuspidata* as a synonym of *D. cornaliae* Trinchese from Genoa, and Eliot (1910) mentions as possible synonyms not only *C. cornaliae* but also *D. costae* Trinchese, also from Genoa. According to Pruvot-Fol (1954) these synonymies are perhaps doubtful. *Doto rosacea* Baba, 1949, which was described after Odhner's table had been published also belongs to group III B, but it has more papillae and it is also quite different in colour. *Doto pita* Marcus, 1955, has 4-5 pairs of papillae and few tubercles just as *D. pontica*, but the author assigns it to group II B, furthermore this species is different because it has a short rhinophore sheath and the papillae are broadest over the middle. *Doto pontica* differs from all the species mentioned here by a lower number of papillae, a very low number of tubercles and lack of pigmentation on the papillae. Characters, which are subject to irregular changes post mortem like the shape of the sheath margin around the rhinophore and whether or not at the base of the papillae gill folds are visible, must not be used to distinguish the species without due precautions.

It is possible that later on it will be proved that our species is a brackish-water subspecies of *D. cuspidata*, but for the time being I prefer to consider it a separate species.

23. *Fimbria fimbria* (Bohadsch, 1761).

Province of Antalya, 1-2 km off the coast between Lara and Zincir, April 25, 1959, 1 specimen trawled from fine sandy bottom, depth 10-20 m. Coll. no. S. 63.

The living slug was 41 mm long, sexually immature and had shed all papillae. We also collected one specimen in Aegean waters on June 29, 1959 near the harbour of Porto Lagos in Northern Greece. Coll. no. S. 160. This animal had a length of 185 mm. The species was obviously very numerous here. In the nets on fishingboats we saw a great many papillae of this slug.

24. *Trinchesia foliata* (Forbes & Goodsir, 1839).

Province of Trabzon, 5 km NW of Akçaabat, June 4, 1959, 1 specimen on hydroids between algae, depth 0.1 m. Coll. no. S. 123.

The living animal was 6 mm long. The body was transparent yellowish. Contents of papillae greyish brown, cnidosac light orange. White opaque dots were scattered all over the surface of the body and the papillae, on the head they were locally concentrated to form a white line. Radula formula $51 \times 0.1.0.$

The slug diverges from the normal Western European specimens of *T. foliata* by the absence of the orange or yellow pattern on the head; the radula is, however, normal and the position of the papillae is as figured

by Odhner (1939). Though at first I still had some doubts, I was convinced by the coloured form figured by Pruvot-Fol (1951, pl. IV fig. 5), which tallies completely with this specimen from Akçaabat.

T. foliata was already mentioned from the Black Sea by Ostroumoff (1893) as *Aeolis olivacea* A. & H.

25. ***Spurilla neapolitana*** (Chiaje, 1823) (fig. 18).

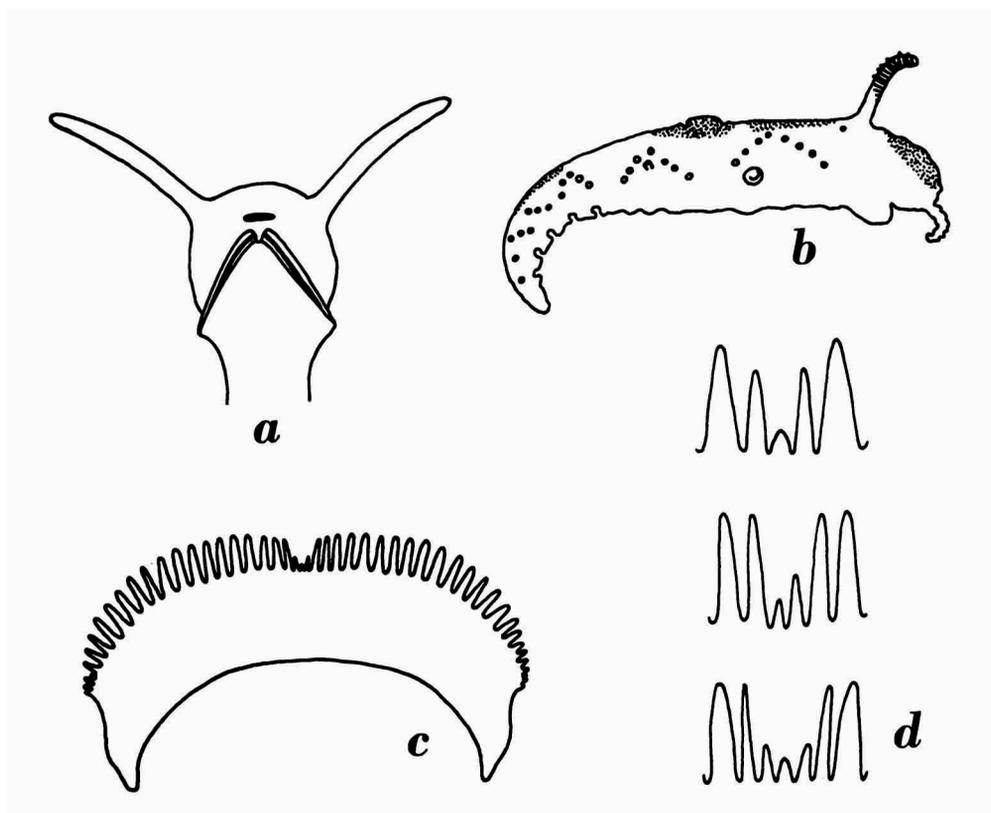


Fig. 18. *Spurilla neapolitana* (Chiaje). *a*, ventral view of anterior part of living slug from Antalya; *b*, lateral view of preserved specimen without papillae; *c*, plate of radula; *d*, central part of three plates of radula.

Province of Antalya, 4 km West of the harbour of Antalya, April 21, 1959, 1 specimen on a bunch of *Cystoseira*, depth 2 m. Coll. no. S. 53.

Length of living animal 9 mm. Rhinophores with 16 alternating large and small lamellae, transparent yellowish. Tentacle about the same length as rhinophore, the tip for about $\frac{2}{3}$ opaque pink. Foot as wide as body, rather short and blunt at posterior end, reddish brown. The anterior pedal

border is opaque white, transversely grooved, with moreover a median notch; edges prolonged and rounded.

Papillae slightly bent, tip with white cnidosac, large opaque pink spot on front side. Papillae on cushions, arranged in 7 pairs of groups. The foremost 3 pairs of groups consist of 2 lines of about 7-8 papillae, which together form a \wedge , the following groups have only one line and the last two groups consist of a single papilla only.

Body transparent yellowish, rather tall. The branches of the liver reach to within the head as fine ramifications, having the same brown colour as in the papillae. On the head there is a big opaque pink spot, running from the anterior margin to near the rhinophores. On the central, open part of the back there is a line of big opaque yellow to white spots.

Radula formula $18 \times 0.1.0$. The teeth consist of a crescent-shaped plate with about 45 denticles on the front margin. The outer denticles are smaller than the others and the same holds for the inner denticle, sometimes for 2 or 3 denticles.

Penis unarmed, small, the specimen was, however, not sexually mature.

When we consider the rhinophores with the lamellae, the blunt foot with prolonged but not tentacle-shaped edges and the shape of the teeth we are led to the genus *Spurilla* Bergh, 1864, not in the extensive sense as used by Labbé (1930), but as restricted by Engel (1925). Perhaps we ought to add to these characters the coloured branches of the liver under the skin reaching to within the head. It is true that Engel (1925) gives this as character of *S. inornata*, but it also occurs in *S. neapolitana* as is clearly shown by a figure of a rhinophore with surrounding tissue in Vayssière (1880, pl. 15 fig. 79) which was copied by Pruvot-Fol (1954, fig. 169b). Concerning this figure Vayssière states clearly that these dark lines are "montrant des ramifications hépatiques". Our animal diverges in one point, viz. the division of the frontal margin of the foot into a left and a right part. I do not know of any Aeolid with such a character. I assume that this fissure was caused by an injury which healed up later on and that the exactly median position is a coincidence. In that case, if we leave aside the notch in the anterior border of the foot and try to allocate the slug to one of the described *Spurilla* species, we owe much to the work of Engel (1925). After a detailed study of literature that author comes to the conclusion that a number of the described species are synonymous and gives a table for the rest. In this table 3 characters are used, viz. whether the liver is branched or not in the skin of the head, the breadth/length relation of the animal, and the shape of the teeth. Not all these characters are of the same value. As the author has overlooked that the described dark veins in

S. neapolitana are also of hepatic origin we had better not use the first character. The relation breadth/length may perhaps be of use if living and crawling slugs are considered, but not with preserved animals. Especially the contraction of length at preservation is variable and depends among other things on the method of anaesthesia, the kind of preserving liquid and the amount of reproductive products in the body. I assume that some of the figures given by Engel (1925) refer to living slugs, but on the other hand preserved slugs are also used. For instance for *S. neapolitana* the author finds a breadth/length relation of $\frac{1}{2}$ to $\frac{1}{5}$, while Vayssière (1880) states: breadth $4\frac{1}{2}$ mm, length 40 mm, which makes $\frac{1}{8.8}$. Even if we measure the slug in the figure of a living slug, we get a relation smaller than $\frac{1}{5}$. So we had better not use the data on relation either, and all that is left are the teeth characters. Now it appears that the shape of the teeth of our specimen tallies completely with that of *S. neapolitana*, the only slight difference being that Engel (1925) concludes from literature that of the middle denticles 1, sometimes 2 are smaller than the rest while our animal has 1, 2, and in some teeth 3 short denticles. The colour is not quite the same either. In *S. neapolitana* the body is stated to be covered with many small opaque spots while our animal has rather got a few larger spots.

Labbé (1923) describes *Spurilla (Eolidiella) croisicensis* and *Spurilla (Berghia) margaritae*. In these species the radulae (Labbé 1930) are quite different from that in our specimen.

Leaving aside the median notch in the anterior border of the foot, which I assume to be caused by injury and subsequent healing, our specimen therefore diverges from what is stated for *S. neapolitana* in size and distribution of spots and, if only very slightly, in the denticulation of the teeth. The differences, however, are only very slight and may be due to the immature state of the animal, so that I see no reason to doubt the identity of our slug.

LITERATURE CITED

- ADAMS, H. and A., 1858. The Genera of Recent Mollusca III (plates). London.
 BABA, K., 1938. Opisthobranchia of Kii. Journ. Dept. Agricult. Kyusyu Imp. Univ., vol. 6, pp. 1-19.
 —, 1949. Opisthobranchia of Sagami-Bay. Tokyo.
 BERGH, R., 1864. Anatomiske Bidrag til Kundskab om Aelidierne. Dansk Vidensk. Selsk. Skr., vol. 7, pp. 1-175.
 —, 1871. Ascoglossa. Malacologische Untersuchungen, 1, pp. 49-118; in: Semper, C., Reisen im Archipel der Philippinen. Zweiter Theil. Wissenschaftliche Resultate. Wiesbaden.
 —, 1872. Malac. Unters., 2, pp. 199-201.
 —, 1880. Die Doriopsen des Mittelmeeres. Jahrb. Deutschen Malakozool. Gesellschaft, vol. 7, pp. 297-328.
 —, 1884. Nudibranchiata Holohepatica. Malac. Unters., 3, pp. 647-754.

- , 1885. Beiträge zur Kenntnis der Aeolidiaden. Verh. der k.k. Zool. Bot. Ges., vol. 35, pp. 1-60.
- , 1893. Die Gattung Gastropteron. Zool. Jahrb. Anat., vol. 7, pp. 281-308.
- DEMIR, M., 1952-'54. Boğaz ve Adalar Sahillerinin Omurgasız Dip Hayvanları. Istanbul.
- EALIS, N. B., and H. ENGEL, 1935. The genus *Bursatella*. Proc. Malac. Soc. London, vol. 21, pp. 279-303.
- ELIOT, C., 1910. A monograph of the British Nudibranchiate Mollusca. Part VIII (Supplementary). London.
- ENGEL, H., 1925. Westindische Opisthobranchiate Mollusken 1. Bijdragen tot de Dierkunde, vol. 24, pp. 33-80.
- , 1927. Westindische Opisthobranchiate Mollusken 2. Bijdragen tot de Dierkunde, vol. 25, pp. 83-122.
- , and P. WAGENAAR HUMMELINCK, 1936. Über Westindische Aplysiidae und Verwandten anderer Gebiete. Capita Zoologica, vol. 8, pp. 1-76.
- , S. J. GEERTS, and C. O. VAN REGTEREN ALTENA, 1940. *Alderia modesta* (Lovén) and *Limapontia depressa* Alder & Hancock in the brackish waters of the Dutch coast. Basteria, vol. 5, pp. 6-34.
- GASCOIGNE, T., 1956. Feeding and reproduction in the Limapontiidae. Trans. Roy. Soc. Edinburgh, vol. 63, pp. 129-151.
- GRUBE, E., 1861. Ein Ausflug nach Triest und den Quarnero. Berlin.
- GUIART, J., 1901. Contributions à l'étude des Gastéropodes Opisthobranches et en particulier des Céphalaspides. Mém. Soc. Zool. France, vol. 14, pp. 1-219.
- HAAAS, G., 1951. Preliminary Report of the Molluscs of the Palestine Coastal Shelf. Bull. Res. Council of Israel 1.
- HOLTHUIS, L. B., and E. GOTTLIEB, 1958. An annotated list of the Decapod Crustacea of the mediterranean coast of Israel, with an appendix listing the Decapoda of the eastern Mediterranean. Bull. Res. Council of Israel, 7 b.
- LABBÉ, A., 1923. Note préliminaire sur cinq espèces nouvelles d'Eolidiens de la Station du Croisic. Bull. Soc. Zool. France, vol. 48, pp. 265-268.
- , 1930. Remarques sur les genres *Aeolidiella* Bergh, *Spurilla* Bergh et *Berghia* Trinchese. Bull. Soc. Zool. France, vol. 54, pp. 619-630.
- LEMICHE, H., 1948. Northern and arctic Tectibranch Gastropods. Det. Kgl. Danske Vidensk. Selsk. Skr., vol. 5, pp. 1-136.
- MARCUS, E., 1955. Opisthobranchia from Brazil. Bol. Fac. Fil. Univ. S. Paulo, Zoologia, vol. 20, pp. 89-262.
- ODHNER, N. HJ., 1936. Nudibranchia Dendronotacea, a revision of the system. Mém. Mus. R. Hist. nat. Belg., sér. 2 fasc. 3, pp. 1057-1128.
- , 1939. Opisthobranchiate Mollusca from the western and northern coasts of Norway. K. Norske Vidensk. Selsk. Skr., vol. 1, pp. 1-93.
- O'DONOGHUE, C. H., 1929. Report on the Nudibranchia. Res. Cambridge Exped. Suez Canal 1924. Trans. Zool. Soc., vol. 22, pp. 713-841.
- , and K. M. WHITE, 1940. A collection of marine molluscs, mainly Opistobranchs, from Palestine. Proc. Malac. Soc. London, vol. 24, pp. 92-96.
- OSTROUMOFF, A., 1893. Catalogue des Mollusques de la Mer noire et d'Azoff, observés jusqu'à ce jour à l'état vivant. Zool. Anz., vol. 16, pp. 246.
- PEASE, H., 1860. Descriptions of new species of Mollusca from the Sandwich Islands 2. Proc. Zool. Soc., vol. 18, pp. 141.
- , 1866. Remarks on Nudibranchiata inhabiting the Pacific Islands, with descriptions of two new genera. Am. Journ. of Conch., vol. 2, pp. 204-208.
- , 1871. Descriptions of Nudibranchiate Mollusca inhabiting Polynesia. Am. Journ. of Conch., vol. 6, pp. 299-305.
- PELSENEER, P., 1892. Un nouveau Nudibranche Méditerranéen (*Cyerce jheringi*). Bull. Soc. Malac. Belgique 1892, pp. XIX-XXI.

- PRUVOT-FOL, A., 1936a. Nudibranches de Risso. *Rev. Suisse Zool.*, vol. 43, pp. 531-533.
- , 1936b. Essai d'identification des Nudibranches de Risso. *Rev. Suisse Zool.*, vol. 43, pp. 631-639.
- , 1937. Études des Opisthobranches de la Méditerranée. *Arch. Mus. Hist. nat. Paris*, ser. 6 vol. 14, pp. 35-74.
- , 1946. Les Opisthobranches de W. Harper Pease, révision. *Journ. de Conchyliol.*, vol. 87, pp. 96-114.
- , 1951. Étude des Nudibranches de la Méditerranée 2. *Arch. Zool. Exp. Gén.*, vol. 88, pp. 1-80.
- , 1953. Étude de quelques Opisthobranches de la Côte Atlantique du Maroc et du Sénégal. *Travaux Inst. Sc. Chérifien* nr. 5.
- , 1954. Mollusques Opisthobranches. *Faune de France* vol. 58. Paris.
- QUICK, H. E., 1950. Observations on *Limapontia*. *Proc. Mal. Soc. London*, vol. 28, pp. 134-137.
- SMITH, E. A., 1889. Notes on the genus *Lobiger*. *Ann. Mag. Nat. Hist.*, ser. 6 vol. 3, pp. 308-311.
- THIELLE, J. 1931. *Handbuch der Systematischen Weichtierkunde*, vol. 1, pt. 2. Jena.
- TORTONESE, E., 1947. Biological Investigations in the Aegean Sea. *Nature*, vol. 159, pp. 887.
- VAYSSIÈRE, A., 1880. Recherches anatomiques sur les mollusques de la famille des Bullidés. *Ann. Sci. Nat., Zool.*, ser. 6 vol. 9, pp. 1-123.
- , 1885. Recherches zoologiques et anatomiques sur les Mollusques Opisthobranches du Golfe de Marseille 1. *Ann. Mus. Hist. nat. Marseille*, vol. 2, pp. 1-180.
- , 1888. Recherches zoologiques et anatomiques sur les Mollusques Opisthobranches du Golfe de Marseille 2. *Ann. Mus. Hist. nat. Marseille*, vol. 3, pp. 1-160.
- , 1901. Recherches zoologiques et anatomiques sur les Mollusques Opisthobranches du Golfe de Marseille 3. *Ann. Mus. Hist. nat. Marseille*, vol. 6, pp. 1-130.
- , 1913. Mollusques de la France et les régions voisines. *Encyclopédie scientifique*, vol. 1. Paris.
- VERANY, J. B., 1853. Catalogue des Mollusques..., des environs de Nice. *Journ. de Conchyliol.*, vol. 4, pp. 375-392.
- WIRZ-MANGOLD, K., and U. WYSS, 1958. Opisthobranches. *Faune marine des Pyrénées-Orientales*, 3.