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EASTERN MEDITERRANEAN OPISTHOBRANCHIA: ELYSIIDAE (SACOGLOSSA = ASCOGLOSSA)

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ABSTRACT

An account is given of the elysiid sacoglossans collected on diving expeditions to the eastern Mediterranean shores of Yugoslavia and Greece during the period 1978-1986, supplemented by material collected around Naples and some preserved specimens from other Mediterranean localities. In all, 6 species of *Elysia* and 1 of *Bosellia* were investigated, including one new to science, *E. gordanae* from the Yugoslav Istrian Peninsula. The enigmatic *Elysia translucens* Pruvot-Fol, 1957 was found in the eastern basin for the first time. The presence of the Bermudan, Canary Islands and Jamaican *E. flava* Verrill, 1901 was confirmed in the Greek Ionian and Aegean Seas, as well as in the Gulf of Corinth. The geographical ranges of the other species were extended by these collections from the eastern basin. The 7 elysiid species were illustrated from life and the radulae compared; great differences in the size, shape and denticulation of the teeth of the different species were evident.

INTRODUCTION

Members of the Elysiidae lack the shell in all post-larval stages. The body is elongated and dorso-ventrally flattened, with conspicuously wide parapodial lobes which may meet mid-dorsally. These parapodia contain ramifying tributaries of the digestive gland, ovotestis and albumen gland; their mesial faces sometimes exhibit lamellar folds which probably function as gills, as well as arborescent venules which collect up into the rear of the median dorsal heart.

The head lacks oral tentacles, but has prominent inrolled rhinophoral tentacles. The anterior propodial border is sometimes produced laterally to form short tentacles. The pedal sole usually has a transverse mesopodial furrow, dividing it into anterior and posterior moieties. There is no mantle cavity, no gill, and no osphradium. The anus is antero-lateral, on the right side. The closed vas deferens leads to the penis, which is unarmed (except in *Bosellia*, and the tropical *Plakobranchus*, which have a chitinous penetrant stylet) on the right side of the body. There is no external oviducal groove.

The family contains at least three genera, *Elysia* Risso, 1818 (having the parapodial rim separate on the two sides of the body) and the predominantly tropical *Tridachia* Deshayes, 1857 (with sinuous parapodial rims meeting in front) and *Plakobranchus* Hasselt, 1824 (with a series of parallel longitudinal folds on the mesial faces of the parapodia). The necessity for certain other generic categories may be argued (Marcus, 1982), but we remain unconvinced. It is, however, convenient to consider here a fourth genus, *Bosellia* Trinchese, 1891, of unquestioned validity. It has sometimes been included within the Polybranchiidae (e.g. Thompson, 1976) and has also been accorded familial status on its own (Marcus, 1982). The genus contains a number of species which are flattened and leaf-like so as to escape notice upon the *Udotea* and *Halimeda* which constitute the normal diet.

Until our expeditions, very little was on record concerning the opisthobranch molluscs of the eastern Mediterranean basin. This was certainly true for the elysiids, and for the Sacoglossa in general. Forbes' (1844) pioneering material was largely dissipated, as was noted in a previous paper (Thompson, Jarman & Zenetos, 1985), and the other noteworthy contribution, by Swennen (1961), who visited the coast of Turkey, mentioned only a single specimen each of two elysiid species.

Interest in this topic began to revive with the publication of Marcus's valuable checklist of western Atlantic warm water opisthobranchs (1977) and her essay-review of the systematics of the genera of the order (1982). A notice of the discovery in the Aegean Sea of the hitherto Bermudan, Canary Islands and Jamaican elysiid

E. flava Verrill, 1901 soon followed (Thompson, 1983), preceding a penetrating review by Bouchet (1984), in which he confirmed the validity of a little-known Pruvot-Fol species (1957), *Elysia translucens*, and extended the known range from Banyuls to Corsica. Meanwhile, Barash & Danin (1971; 1973; 1982) published records of three species of *Elysia* from the Mediterranean coasts of Egypt and Israel. At this point, the number of valid species of *Elysia* in the Mediterranean Sea was held to be 4 (Bouchet, 1984); these were:

1. *Elysia flava* Verrill, 1901
2. *E. timida* (Risso, 1818)
3. *E. translucens* Pruvot-Fol, 1957
4. *E. viridis* (Montagu, 1804)

For reasons that were argued in an earlier paper (Thompson, 1981), it is both feasible and desirable to include within the genus *Elysia* the visually spectacular *E. hopei* Vérany, 1853, which had been earlier placed in the unsustainable genus *Thuridilla* Bergh, 1872. This brings into consideration:

5. *E. hopei* Vérany, 1853

As the result of the present investigation, range extensions and many new biological data are presented, as well as a new species, which has been found in the shallow waters of the Istrian Peninsula in northern Yugoslavia, yielding a final member of the Mediterranean elysiid fauna:

6. *E. gordanae* n.sp.

This new species proves to be the second Mediterranean elysiid (the other is *E. hopei*) which exhibits the remarkable nutritional phenomenon of extra-capsular yolk within the spawn jelly. The role of this material has been investigated by Clark & Jensen (1981) and by Thompson & Salghetti-Drioli (1985), and reviewed by Thompson & Brown (1984); Thompson & Jarman (in press).

MATERIALS AND METHODS

The present paper concerns elysiids collected and studied alive on research visits to the northern Adriatic coast of Yugoslavia, and to the Aegean and Ionian coasts of Greece in 1978, 1982 and 1986. The initial laboratory work was carried out in the Ruder Bošković Institute (Yugoslavia) and in the University of Athens, to be completed in the University of Bristol. Comparative material was sent by collaborators from other parts of the Mediterranean Sea, and personal visits to the Stazione Zoologica, Napoli in 1973, 1974 and 1984 enabled direct comparisons to be made between our eastern Mediterranean material and that from the centrally located Tyrrhenian Sea.

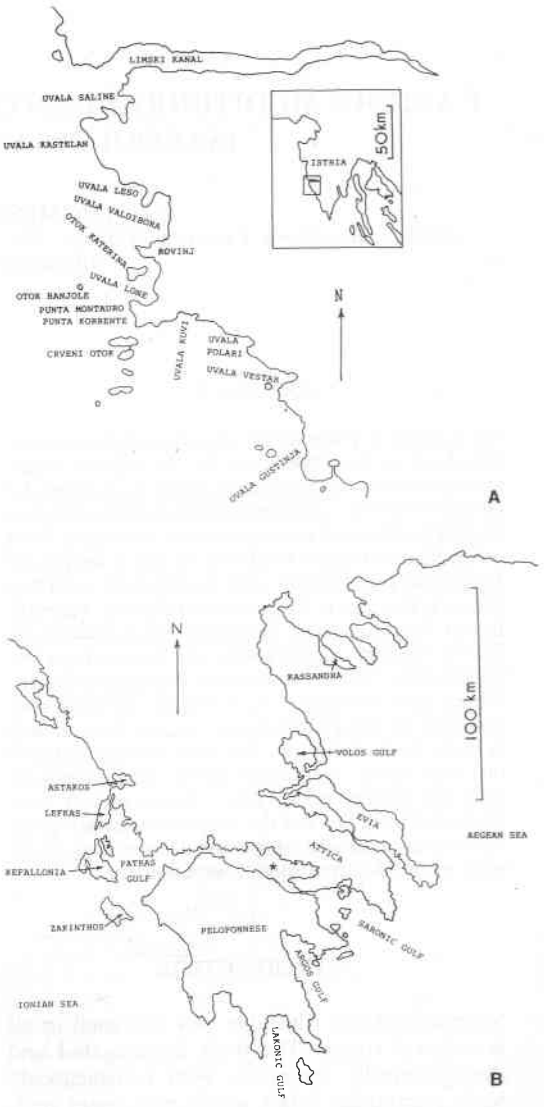

Fig. 1. Elysiid collecting localities: A, in northern Yugoslavia, bordering the Adriatic Sea; B, in Greece, bordering the Ionian and Aegean Seas. Not all the localities illustrated yielded elysiid specimens. (* = Corinth Gulf).

Radulae were prepared for microscopical examination in polyvinyl lactophenol (Thompson, 1958), and drawn under an oil-immersion lens, with the aid of a camera lucida apparatus. Material for sectioning was fixed in 10% formalin, dehydrated through amyl acetate to paraffin wax, serially sectioned at 10 µm, and stained using Steedman's (1970) triacid dye-mixture.

SYSTEMATIC DESCRIPTIONS

Genus *Elysia* Risso, 1818
Type species *Notarchus timidus* Risso, 1818

DIAGNOSIS: Elysiids possessing smooth (rarely papillate), flattened, leaf-like, parapodial lobes (separate on the two sides of the body; absent in juvenile specimens). The foot exhibits a transverse mesopodial groove. The anal opening is antero-lateral, on the right side. The radular teeth often bear fine denticulations. The penis lacks chitinous armature.

Elysia flava Verrill, 1901

EXTERNAL FEATURES (Fig. 4D): This slender and fragile species reaches 20 mm in length and is pale yellowish green in overall colour; the outline of the darker green digestive gland lobes can often be discerned through the skin. There is usually, but not always, a peppering of crimson sometimes accompanied by black speckling. The edges of the parapodia are white, and there are often white spots placed rather symmetrically close to each eye and on each rhinophore.

The head is small in proportion to the rest of the body, compared with other Mediterranean elysiids, and is slightly bilobed anteriorly. The propodium is markedly bilobed. The parapodial lobes have papillate rims, and similar white papillae are found also on the inner faces of the parapodia. Delicate veins may be discerned, leading into the rear of the pericardial prominence.

ANATOMY (Fig. 3E): The conical penis was in the semi-retracted state approximately 0.5 mm in diameter. It was unarmed, as is typical for the genus. The ovotestis of a 15 mm specimen (23.vii.82) was serially sectioned. It contained abundant ripe ova and sperm, but no spawn was discovered either in the field or in the laboratory. The radula contained extremely small teeth. Note that in Fig. 3, the teeth of several Mediterranean elysiids are represented by drawings to the same scale; in *E. flava* no radular tooth exceeded 40 µm in length. In a 10 mm specimen (10.viii.82) the radular formula was 19 × 0.1.0; no denticulations were detected along the cutting edge of the typical tooth. In

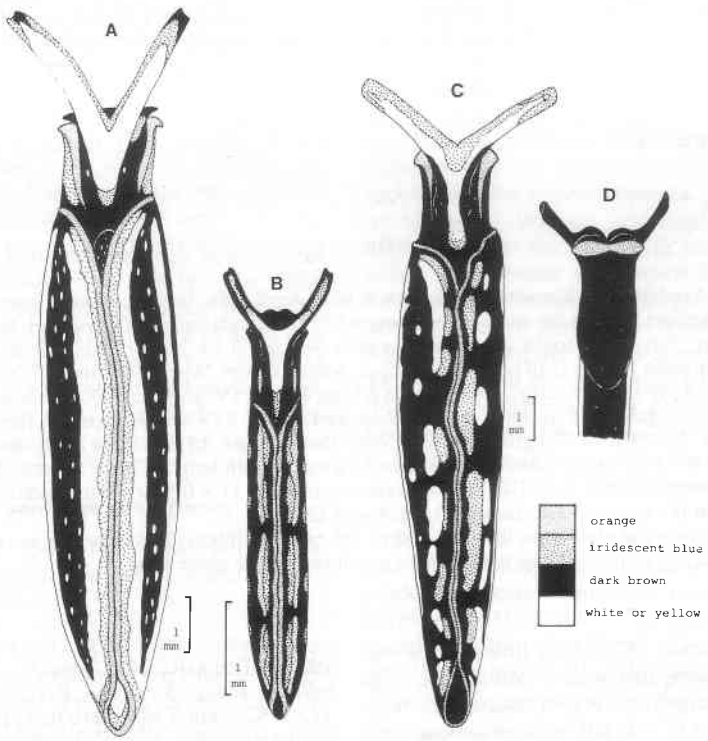

Fig. 2. *Elysia hopei*: A, length 13 mm, July 1982, Evia; B, length 4.5 mm, September 1982, Saronic Gulf; C, length 15 mm, August 1978, Rovinj (Yugoslavia); D, the same, ventral view of the head (C & D after Thompson 1981).

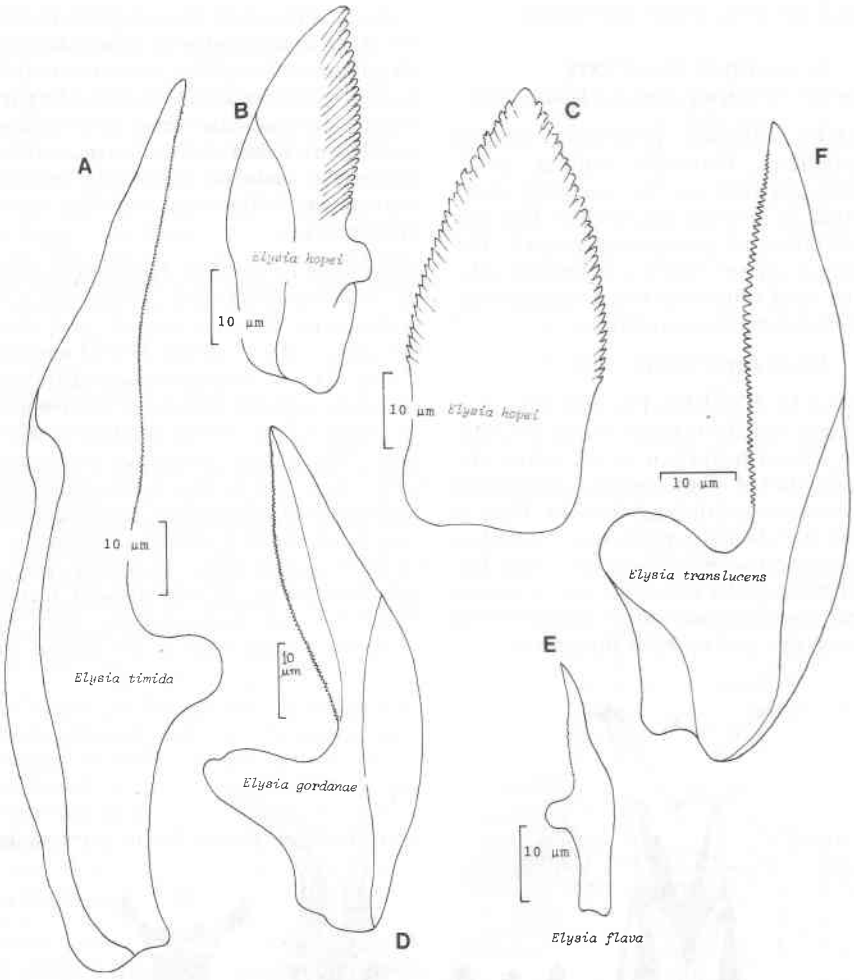

Fig. 3. Elysiid radulae: A, *Elysia timida*, length 11 mm, April 1986, tooth 4, radular formula 11 × 0.1.0 (+ numerous effete teeth in the ascus), tooth-length 120 µm, Uvala Saline (Yugoslavia); B, *Elysia hopei*, length 20 mm, July 1986, tooth 2, radular formula 34 × 0.1.0 (+ 3 pre-radular teeth), tooth-length 52 µm, Amaliopolis (Volos Gulf); C, *Elysia hopei*, length 12 mm, April 1986, tooth 7, radular formula 27 × 0.1.0 (+ 3 pre-radular teeth), tooth-length 60 µm, Rovinj (Yugoslavia); D, *Elysia gordanae* n.sp., length 10 mm, August 1986, tooth 2, radular formula 12 × 0.1.0 (+ 8 effete teeth in the ascus), tooth-length 70 µm, Uvala Kuvi (Yugoslavia); E, *Elysia flava*, length 15 mm, June 1986, tooth 8, radular formula 17 × 0.1.0 (+ numerous effete teeth in the ascus), tooth-length 33 µm, Saronic Gulf; F, *Elysia translucens*, length 10 mm, July 1986, tooth 5, radular formula 11 × 0.1.0 (+ 3 pre-radular teeth and 11 effete teeth in the ascus), tooth-length 90 µm, Volos Gulf.

The teeth are numbered from the new end of the radular ribbon. The drawings were made with a camera lucida apparatus. All the components are drawn to the same scale.

a 15 mm specimen (17.vi.86), however, it was possible to distinguish such a denticulate edge by the use of an oil-immersion microscope lens: the formula was 17 × 0.1.0, with an uncountable jumble of obsolete teeth in the ascus. This description differs in some features from that given in earlier papers (Thompson, 1977; 1983).

RECORDS: GREECE 23.vii.82, 3 km S of Amarinthos, Evia; 30.vii.82, Eratini, Corinth Gulf; 17.viii.82, 3 km S of Amarinthos, Evia; 7.v.86, 3 km S of Amarinthos, Evia; 5-7.vi.86, Astakos; 17.vi.86, Lagonisi, Saronic Gulf; 25.vi.86, 3 km W of Aliveri, Evia; 30.vi.86, Nea Anhialos, Volos Gulf; 2,3,7.vii.86, bays near Nea Anhialos, Volos Gulf;

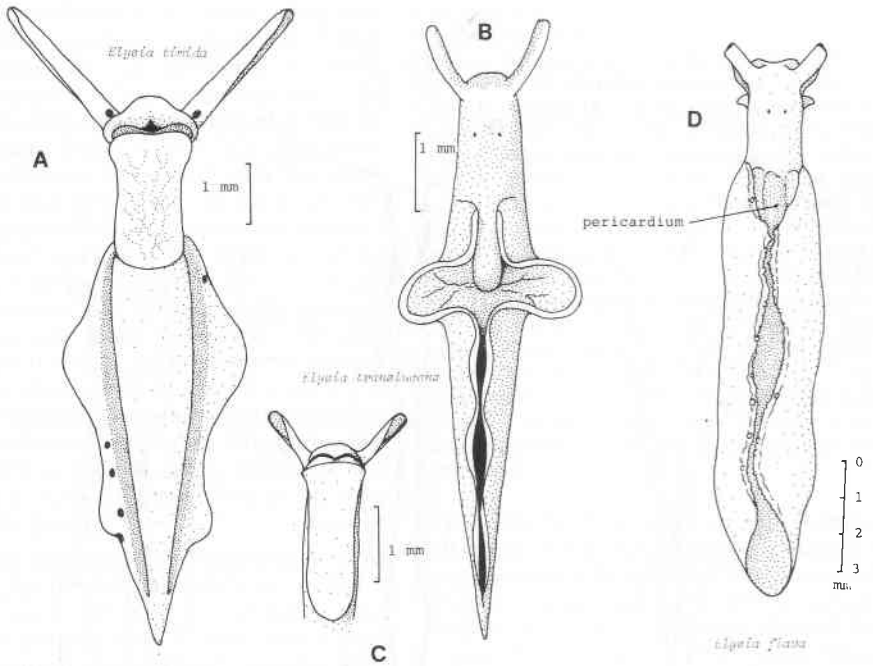

Fig. 4. Mediterranean elysiids: A, *Elysia timida*, length 11 mm, April 1986, Uvala Saline (Yugoslavia); B, *Elysia translucens*, length 9 mm, August 1978, Rovinj (Yugoslavia); C, ventral view of the head of the same; D, *Elysia flava*, length 15 mm, June 1986, Saronic Gulf (B & C after Thompson, 1981).

17.vii.86, 3 km W of Aliveri, Evia; 19.vii.86, 3 km S of Amarinthos, Evia; 21.vii.86, Hrisi Akti Panagias, Volos Gulf; 22-23.vii.86, bays near Nea Anhialos, Volos Gulf (maximal depth 4 m).

DISCUSSION: Until its discovery in the Greek Aegean Sea (Thompson, 1983), this little-known elysiid had been recorded only from Bermuda (Verrill, 1901), Jamaica (Thompson, 1977) and the Canary Islands (Ortea, 1981). Bouchet (1984) has reported material of *E. flava* from the Tunisian coast near Jerba. There is an unconfirmed record (photograph only) from Puerto Rico (Marcus, 1980).

Elysia gordanae new species

TYPE: BMNH 19870 10, Uvala Kuvi, near Rovinj (Yugoslavia). The specific name honours Gordana Jaklin.

EXTERNAL FEATURES (Fig. 5B): Three specimens were examined, varying in length from 10 to 17 mm. To the unaided eye, this slender and graceful species appears pale yellow-green, but the microscope shows the colour pattern to be more complex. The green coloration results from the presence beneath the translucent skin of innumerable sage-green tributaries of the digestive gland, overlain by superficial blue iridescent spots. There is also a sprinkling of brilliant red superficial specks, most abundant over the pink areas of the skin which characterise the upper surfaces of the head, pericardium, rhinophoral tentacles, and the low, fleshy parapodia. There is no black pigment around the mouth or anywhere else on the body, with the exception of the eye spots (Fig. 5B), which lie under patches of pigment-free epithelium. The parapodial edge is marked by a bright green line within the fleshy margin, itself thickened in places to form conspicuous white pustules.

The head is rounded anteriorly, not bilobed, and the inrolled rhinophores are slender and moderately long (compared with, for example, *Elysia flava* (Fig. 4D)). The propodium is also rounded anteriorly. There are no papillae or gills (blood-engorged folds), but some delicate veins may be discerned, leading into the rear of the pericardial swelling.

ANATOMY (Fig. 3D): The radula of a 10 mm specimen was examined. The formula was

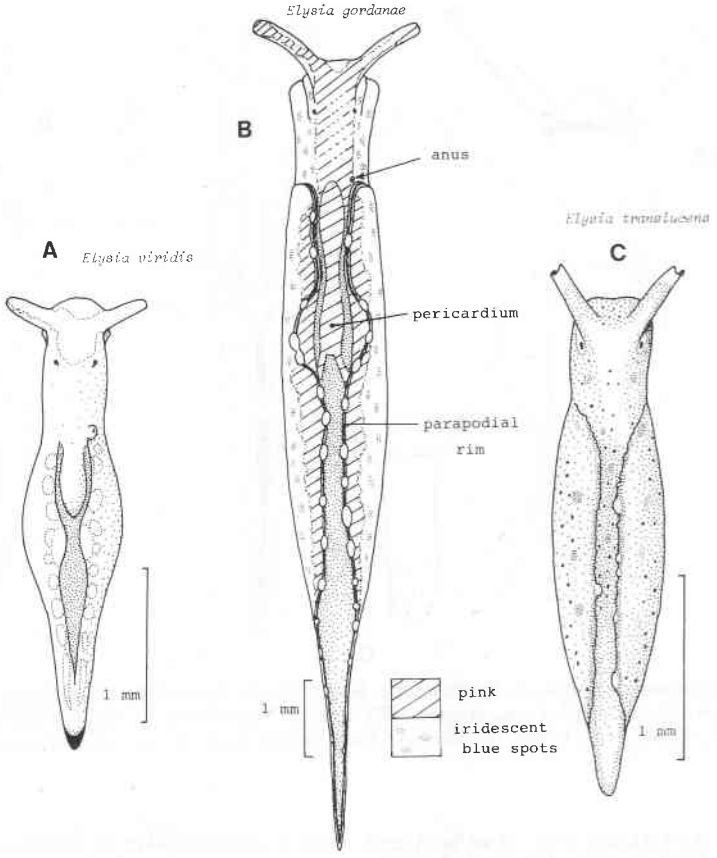

Fig. 5. Mediterranean elysiids: A, juvenile *Elysia viridis*, length 3 mm, April 1986, Rovinj (Yugoslavia); B, *Elysia gordanae* n.sp., length 11 mm, Uvala Kuvi (Yugoslavia); C, juvenile *Elysia translucens*, length 3 mm, May 1986, Gythio (Lakonic Gulf).

12 × 0.1.0, with a further 8 obsolete teeth in the ascus. A representative tooth measured 70 μm in length; all the teeth exhibited regular fine denticulation along the cutting face of the cusp (Fig. 3D). The tooth is smaller than a comparable tooth from a 10 mm *Elysia translucens* and the denticulation is markedly finer (compare Fig. 3D with 3F).

SPAWN: This was readily deposited in laboratory vessels, shortly after collection. The spiral masses contained white ova, one in each capsule, together with amorphous but distinct masses of orange extra-capsular yolk (ECY—see Thompson & Salghetti-Drioli, 1984), deposited during the process of oviposition at regular intervals while the flattened spawn coil is being extruded.

RECORDS: 15.viii.86, Uvala Kuvi (Yugoslavia) (maximal depth 3 m).

DISCUSSION: The diagnostic features for this new species are (a) low parapodia and long thin tail; (b) white pustules along the parapodial rims; (c) pink coloration on the rhinophores, head, pericardium and upper parts of the parapodia; (d) moderately robust radular tooth, smaller than that of *E. translucens* and bearing finer denticulation; (e) spawn containing white ova and orange ECY.

Elysia hopei (Vérany, 1853)

Acteon hopei Vérany, 1853
Elysia splendida Grube, 1861
Thuridilla hopei; Pruvot-Fol, 1954; Schmekel & Portmann, 1982
Thuridilla splendida; Riedl, 1963

EXTERNAL FEATURES (Fig. 2): This bold and robust species is brightly marked in life, and reaches 25 mm in length. The colour pattern

consists of vivid blotches of orange, white and iridescent blue, against a background of rich chocolate brown. In some specimens, the white areas are replaced by pale lemon-yellow. The pale areas may be separate, or linked in various ways (compare Figs 2A and 2C). The most constant features of the pattern were the white or yellow Y-shaped marking on the head, and the orange propodium and parapodial margins.

The frontal margin of the head is slightly bilobed, as is the propodial rim. The parapodial lobes are ample, but not especially swollen; there are no gills inside these lobes, but conspicuous blood vessels can be observed, linking up to enter the rear of the heart. Pruvot-Fol (1954) was mistaken in stating that the foot is in any way different from other Mediterranean species of *Elysia*. Fig. 2D clearly shows that the pedal sole is transversely divided in the way usual for the genus.

ANATOMY (Fig. 3B & C): Three radulae were examined. The formulae were 23 × 0.1.0 (body-length 11 mm), 27 × 0.1.0 (12 mm), and 34 × 0.1.0 (20 mm). Each radular ribbon consisted of a curved series of teeth, together with approximately 3 vestigial pre-radular teeth which lacked cusps. The maximal length of tooth recorded was 60 μm; all the teeth possessed fairly even but blunt denticulations along each side of the cusp. Serial sections confirmed Pruvot-Fol's (1954) statement that a muscular dorsal oesophageal pouch was present. (There is a strong possibility that this occurs in all species of the genus *Elysia*).

SPAWN: This was described by Thompson & Salghetti-Drioli (1984). The egg masses are attached to the holdfasts of calcareous algae such as *Lithothamnion* and the green *Udotea petiolata*; the ova measured 100 μm in diameter. Each ovum lies within an ovoid capsule, and the capsules in turn are imbedded in jelly. Dispersed through the jelly are blobs and streaks of extracapsular material (ECY), consisting of countless 0.8 μm granules which resemble the embryonic yolk or deutoplasm in size and colour (orange or rose-red). This ECY has a part to play in the nutrition of the late veliger embryos (for further details, see Thompson & Salghetti-Drioli, 1984). Such ECY is present also in *Elysia gordanae* n.sp., but in that example the deutoplasm and the yolk are of different colours, hence presumably they are of different origin within the oviducal system.

RECORDS: GREECE—17.vii.82, south Evia Gulf; 22.vii.82, 3 km W of Aliveri (Evia); 6.viii.82, Ermione (Saronic Gulf); 7.viii.82, Kilada (Argos Gulf); 12.viii, 7,14,28 & 29.ix.82, 3 km E of Saronis; 15.viii.82, 3 km W of Aliveri (Evia); 14 & 25.viii.82, Zogera Bay (Spetses, Saronic Gulf); 23.viii.82, Kalivia (Saronic Gulf); 23.ix.82, Astakos (Ionian Sea); 9.v.86, 3 km S of Amarinthos (Evia); 12.v.86, Aghios Dimitrios (Saronic Gulf); 22-24.v.86, Plitra (Lakonic Gulf); 3.vi.86, Kilini (western Peloponnese); 4-9.vi.86, Astakos (Ionian Sea); 8.iv.86, 2 km N of Mitikas (Ionian Sea); 15.vi.86, Fokea (Saronic Gulf); 16 & 17.vi.86, Lagonisi (Saronic Gulf); 24.vi.86, 3 km S of Amarinthos (Evia); 30.vi & 7.vii.86, bays around Nea Anhialos (Volos Gulf); 8.vii.86, Amaliopolis (Volos Gulf); 12.vii.86, Fokea (Saronic Gulf); 7.viii.86. YUGOSLAVIA—14, 18 & 25.viii.78, Rovinj; 15.iv.86, Uvala Saline; 21.iv.86, Rovinj; 23.iv.86, Vestar; 26.iv.86, Liznjan, near Rovinj; 7.viii.86, Uvala Saline; 12.viii.86, Punta Dantoli, near Rovinj; 18.viii.86, Uvala Catalan, near Rovinj 19.viii.86, Punta Montauro; 20.viii.86, Uvala Kuvi (maximal depth 10 m).

DISCUSSION: It has been argued (Thompson, 1981) that it was unnecessary to sustain the genus *Thuridilla* Bergh, 1872 to accommodate *E. hopei* (and perhaps a few others, such as *E. splendens* Baba, 1949, *E. bayeri* Marcus, 1965, *E. picta* Verrill, 1901 and *E. ratna* Marcus, 1965). The genus as originally defined embraced elysiids which had an undivided foot, posterodorsal anal papilla and an ingluvies. It is clear that the first two characteristics were mistaken observations, while the third although true may be a familial characteristic. Marcus (1982) does not accept that Grube (1861) and Bergh (1872) could have been mistaken in the way we have claimed. Bouchet (1984) accepts the arguments expressed in the 1981 paper, but proposes to retain the use of the genus *Thuridilla* for those elysiids which possess squat radular teeth with a row of denticles along either side of the cusp. This might present problems for future workers, because it could be unwise to perpetuate the use of a genus based upon a single internal microscopic feature, moreover on a feature which had not been included in the original designation of the genus. This is a widely distributed, endemic species within the Mediterranean Sea, from Spain to Greece.

Elysia timida (Risso, 1818)

Notarchus timidus Risso, 1818
Elysia margaritae Fez, 1962
?*Elysia fezi* Vilella, 1968

EXTERNAL FEATURES (Fig. 4A): This is a strongly built elysiid with a habit of twitching the rhinophores and the front part of the body at a rate of 60-80 contractions each minute. The body-length (including the rhinophores) reaches

17 mm. In the field these animals appear to be pale grey in colour and are inconspicuous, although they may be present in great numbers, often upon the upper surfaces of bare rocks in shallow waters. The overall colour of the body is pale green, which under the microscope appears distinctly granular. Superimposed upon this is a complex pattern of colours. The most obvious component of the pattern is a liberal speckling of superficial white pigment, especially on the rhinophores and the outer surfaces of the parapodial lobes. There are also dark green tributaries of the digestive gland, which can be glimpsed through the skin inside the parapodia and, to a lesser extent, elsewhere, and a faint freckling of brown over the flanks. Finally, and diagnostically, there are a large number of obvious bright red spots (lacking on the ventral surfaces and inside the parapodia). The eyespots are black, as usual, and there is some black speckling on the head, above the mouth. Delicate veins were discerned inside the parapodia, collecting up into the rear of the pericardial prominence.

The head is large in proportion to the rest of the body (compare Fig. 4A with Figs 4C & D), and is not bilobed anteriorly. The propodium bears slight anterior dilations on either side. The parapodial rims are smooth, but some individuals have low papillae on the outer faces. A noteworthy feature is that the parapodial lobes are smoothly scalloped so as to give rise to antero-lateral and postero-lateral prominences on each side (evident in the ventral view shown in Fig. 4A). A juvenile only 2 mm in length was found near Amarinthos (Evia) in May 1986; the parapodia were as yet undeveloped, but the rudiments of the rhinophores could be seen, forming simple lateral triangular flaps. Identification of such juveniles rests upon the presence of a copious dusting of superficial white pigment, and the bright red spots referred to above.

ANATOMY (Fig. 3A): The radulae of 2 individuals were prepared for examination. The first was from a 10 mm specimen (Saronic Gulf, 29.ix.82) and had the formula $10 \times 0.1.0$ (+ numerous effete teeth jumbled in the ascus). The second was 11 mm in life (Uvala Saline, Yugoslavia, 14.iv.86) and had the formula $11 \times 0.1.0$ (+ numerous effete teeth). The teeth all bore very fine denticles along the cutting edge of the cusp. The most striking feature was, however, their great size in comparison with most other Mediterranean elysiid species. Fig. 3 illustrates this point by depicting the teeth of all the species considered, drawn to the same scale. The slender teeth of *E. timida* reached a length of 136 μm in our samples.

RECORDS: GREECE—12.viii.82, 3 km E of Saronis (Saronic Gulf); 17.viii.82, 3 km S of Amarinthos (Evia); 25.viii.82, Zogera Bay (Spetses, Saronic Gulf); 26.viii.82, 4 km E of Saronis; 29.viii.82, 3 km S of Saronis; 8.v.86, Drossia Beach (N. Evia Gulf); 9-10.v.86, 3 km S of Amarinthos (Evia); 15.v.86, Gythio (Lakonic Gulf); 16.v.86, 5 km E of Gythio; 18.v.86, Elea (Lakonic Gulf); 19.v.86, Monemvasio (eastern Peloponnese); 20.v.86, 5 km W of Demonia (Lakonic Gulf); 23-25.v.86, Plitra (Lakonic Gulf); 26.v.86, 5 km E of Gythio; 29.v.86, 4 km E of Saronis; 6-9.vi.86, Astakos (Ionian Sea); 13-16.vi.86, Fokea (Saronic Gulf); 17.vi.86, Lagonisi (Saronic Gulf); 20.vi.86, 4 km E of Saronis; 22.vi.86, Anavyssos (Saronic Gulf); 5.vii.86, Kato Gatzea (Volos Gulf); 12.vii.86, Anavyssos; 22.vii.86, Nea Anhialos (Volos Gulf); 27.vii.86, 4 km E of Saronis; YUGOSLAVIA—11-22.iv.86, Uvala Saline; 23.iv.86, Vestar; 24.iv.86, Uvala Leso; 26.iv.86, Liznjan, near Rovinj; 6.viii.86, Uvala Leso; 7.viii.86, Uvala Saline; 12.viii.86, Uvala Gustinja; 15 & 20.viii.86, Uvala Kuvi; 18.viii.86, Uvala Kastelan; 19.viii.86, Punta Montauro (maximal depth 3 m).

DISCUSSION: Although Schmekel & Portmann (1982) placed it in the synonymy of *E. viridis*, there can be no doubt of the validity and distinctness of *E. timida*. It may be pointed out that their illustrations of "*E. viridis*" were based upon good examples of the true *E. timida* (see Schmekel & Portmann, 1982, Abb.7.94; Tafel 17.6). It is one of the most successful sacoglossans in the Mediterranean Sea and specimens can be found in shallow waters at most seasons of the year. They seem to change their dietary preferences at different seasons. In the spring and summer months they are associated with *Acetabularia acetabularia*, but in the early autumn (September) they begin to associate with *Padina pavonia*. This diet is known to be augmented by chloroplast "farming" (Rahat, 1976; Ros & Rodriguez, 1985). This is an endemic Mediterranean species, with a wide distribution, from Spain to Israel and Turkey.

Elysia translucens Pruvot-Fol, 1957

Elysia viridis forme II Pruvot-Fol, 1954
E. viridis; Thompson, 1981

EXTERNAL FEATURES (Figs 4B & C; 5C): The maximal length was 10 mm (15 mm in Bouchet's samples from further west) and the general appearance matched that of *E. viridis* in most particulars, with a green or brown background colour overlying dark green digestive gland tributaries, and with superficial specks of red and of iridescent blue/green. Minor differences were noted by Bouchet, who provides

a useful tabulation of the colour pattern and other morphological details (1984, p. 22). But some of his criteria are difficult to apply, especially in juveniles, or in poorly preserved animals. In the present state of knowledge, it will usually be necessary to check the radulae of dubious specimens.

ANATOMY (Fig. 3F): Two radular preparations were made, one from Greek material, the other from Yugoslavian collections. The former measured 10 mm in length, the latter 9 mm (both measured in life); the formulae were $11 \times 0.1.0$ and $18 \times 0.1.0$ respectively, with numerous obsolete teeth in the ascus. Representative large teeth measured 90 and 80 μm, respectively. These teeth are larger by far than those of *E. flava*, *E. gordanae* and *E. hopei*, but are in turn dwarfed by those of *E. viridis* and *E. timida*. The denticulation of the cutting edge of the cusp is more coarse than that of *E. viridis*, and the tooth shape is more delicate in *E. translucens*.

RECORDS: YUGOSLAVIA—14 & 15.viii.78, Rovinj; GREECE—13.vii.82, Anavyssos (Saronic Gulf); 13.v.86, Gythio (Lakonic Gulf); 6.vii.86. Hrisi Akti Panagias (Volos Gulf) (maximal depth 3 m).

DISCUSSION: This enigmatic species is now known to occur within the Mediterranean Sea from Banyuls and Corsica (Pruvot-Fol, 1957; Bouchet, 1984) to both the Adriatic and Aegean Seas. More records may be accessible if some older collections could be re-examined. This would not be very difficult, because this species loses nearly all its colour after preservation in ethanol, whereas *E. viridis* retains more dark pigment on the front of the head, within the rhinophoral grooves, and often on the dorsum, the sides of the parapodia and on the tail-tip. Radular preparations would be necessary for confirmation.

Elysia viridis (Montagu, 1804)

Laplysia viridis Montagu, 1804
Elysia fusca Philippi, 1844

EXTERNAL FEATURES: The maximal length encountered in the eastern Mediterranean samples was 15 mm, compared with 45 mm in Atlantic specimens (illustrated by Thompson, 1976). The body-colour can vary with the diet; specimens have been induced to change in colour from green to red in 18 days, by feeding upon red algae (Colgan, reviewed by Thompson, 1976). Mediterranean specimens are usually green or brown in colour, with a speckling of superficial glistening red, blue and green spots. White patches may be found, particularly at the edges of the parapodial lobes, and black pigment is often present around the mouth and on the tail-tip. Ramifying tributaries of the digestive gland are visible through the skin in the parapodial lobes, and even in the rhinophores and other parts of the head. The parapodia start to develop at a body-length of 3 mm.

The shape of the front of the head is variable, but it is usually indented in the median plane. The propodium exhibits antero-lateral dilations. The parapodial lobes are ample, but not especially swollen; inside there are blood vessels, linking up to enter the rear of the heart.

ANATOMY: The radula is well known, and has been adequately illustrated by Thompson (1976) and by Bouchet (1984). The formula of a typical specimen from Rovinj, April 1986, 13 mm in overall length, was $20 \times 0.1.0$. Each tooth measured up to 300 μm in length, and bore a row of very fine denticles along the cutting edge of the cusp. These denticles were much more delicate and small in proportion than those of *E. translucens* (Fig. 3F). It is noteworthy that the radular teeth of *E. viridis* illustrated by Thompson (1976, Fig. 102) measured 150 μm in length, not 40 μm as there stated; the original microscopical preparation has been found and re-measured.

SPAWN: This was attached to *Codium* in the month of August.

RECORDS: GREECE—12.viii.82, Saronis; 15.v.86, Gythio (Lakonic Gulf); 15.vi.86, Thimari (Saronic Gulf); 17.vi.86, Lagonisi (Saronic Gulf); 20.vi.86, 4 km E of Saronis; YUGOSLAVIA—19.viii.86, Punta Montauro; 4.iv.86, Punta Montauro; 19 & 26.iv.86, Uvala Leso; (maximal depth 3 m).

DISCUSSION: This species has recently been accurately delimited from *E. translucens* by Bouchet (1984). The most clear diagnostic feature is the size and shape of the radular tooth. It is by far the largest tooth found in any of the Mediterranean elysiids, reaching 300 μm in length in our samples, and bears exceptionally fine denticles (more delicate than those of *E. translucens*, with which the adults may be confused). *Elysia viridis* is almost invariably found feeding upon *Codium tomentosum*. It has a Lusitanian distribution from Scandinavia to Biscay and from Spain to Greece.

Bosellia mimetica Trinchese, 1891

EXTERNAL FEATURES (Fig. 6): This well-concealed species may measure up to 8 mm

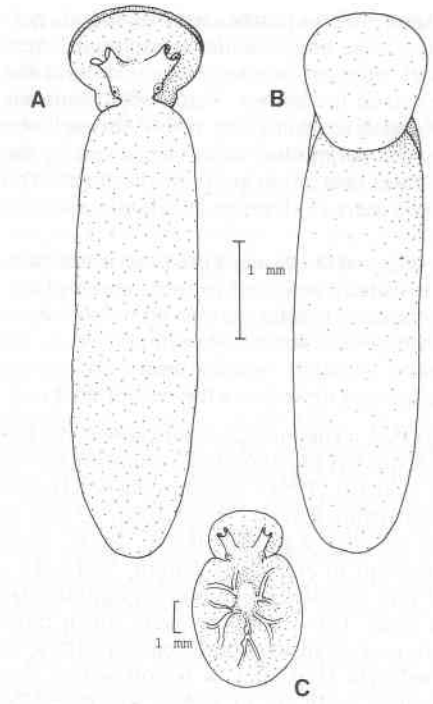

Fig. 6. *Bosellia mimetica*, length 5 mm, Rovinj (Yugoslavia), August 1978, A, dorsal view; B, ventral view; C, dorsal view of a contracted individual.

when extended, but when contracted in the normal feeding posture on the algae *Udotea petiolata* or *Halimeda tuna*, it becomes a small disc (Fig. 6C). Most of the body is strongly green in colour, with pale greyish purple rhinophores and scattered chalk-white pigment specks, especially on the upper parts of the flared, inrolled rhinophores and along the sides of the dorsum. The pedal sole is paler green, and the foot is transversely divided as in the genus *Elysia*. Parapodial lobes are lacking. When contracted, a pattern of blood-vessels can be distinguished in dorsal view, gathering up to enter the rear of the heart (Fig. 6C).

ANATOMY: The radula of a 6 mm specimen was examined. All but the oldest 6 teeth bore fine denticles along either side of the cutting face; the formula was 25 × 0.1.0.

SPAWN: Flattened, plano-spiral egg masses, containing yellow ova (as illustrated by Portmann, 1958) were attached to *Halimeda* or to *Udotea* during the summer months.

RECORDS: GREECE—12 & 26.viii.82, 3 km E Saronis; 13.v.86, 3 km E of Saronis; 22.v.86, Plitra (Lakonic Gulf); 8.vi.86, 2 km N of Mitikas (Ionian Sea); 17.vi.86, Lagonisi (Saronic Gulf); 30.vi.86, Skala (N. Gulf of Evia); YUGOSLAVIA—19.iv.86, Rovinj; 11.viii.86, Uvala Cisterna, near Rovinj; 15 & 20.viii.86, Uvala Kuvi: 18.viii.86, Uvala Catalan, near Rovinj 23-25.viii.78, Rovinj (maximal depth 3 m).

DISCUSSION: Marcus (1982) and Schmekel & Portmann (1982) placed the genus *Bosellia* Trinchese, 1891 in its own family Boselliidae, while Pruvot-Fol (1954) and others have included the genus in the Polybranchiidae (= Caliphyllidae). We prefer to follow an arrangement published by Marcus (1980), incorporating *Bosellia* within a broadly defined Elysiidae, although it differs from members of the genus *Elysia* by its possession of a chitinous penial stylet and other features of the reproductive system (Sanders-Esser, 1984), and by the absence of parapodia. *Bosellia mimetica* is widely distributed throughout the warm waters of the north Atlantic, from Brazil and Florida to Bermuda, and in all parts of the Mediterranean Sea. There are 3 other Atlantic species of *Bosellia*, *B. marcusi* Marcus, 1972, *B. corinneae* Marcus, 1973, and *B. leve* Fernando-Ovies & Ortea, 1986, but these have not as yet been reported from the Mediterranean Sea.

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