Bollettino Malacologico, Vol. 32 N° 1-4, pp 57-66, 1996 Società Italiana di Malacologia
Stampato in Italia, Milano15 settembre 1997 Lavoro accettato il 4 aprile 1996

DESCRIPTION OF TWO NEW SPECIES OF HYALOGYRINIDAE (GASTROPODA, HETEROBRANCHIA) FROM THE MEDITERRANEAN

ANDERS WARÉN, FERDINANDO CAROZZA AND ROMUALDO ROCCHINI

WARÉN A., F. CAROZZA & R. ROCCHINI 1996. Description of two new species of Hyalogyrinidae (Gastropoda, Heterobranchia) from the Mediterranean. - *Boll. Malacol.* **32** (1-4): 57-66.

Key words: New species, Gastropoda, Heterobranchia, Hyalogyrinidae, Mediterranean, cave fauna.

Abstract: Two new species of the heterobranch gastropod family Hyalogyrinidae are described. *Hyalogyrina amphorae* Warén, Carrozza & Rocchini, sp. n., was found in deep water in the Tuscan Sea and on sunken wood, south of Crete. Its protoconch morphology is puzzling in that some specimens give an impression of lacking heterostrophy. *Hyalogyra zibrowii* Warén, sp. n., is described from a submarine cave at Iles d'Hyères (southern France). Both species are known from shells only and their systematic position is tentative.

Riassunto: Si descrive la scoperta in due ambienti diversi del Mediterraneo di due nuove specie di micro gastropodi attribuibili ai generi *Hyalogyrina* Marshall, 1988 e, tentativamente, *Hyalogyra* Marshall, 1988 della famiglia Hyalogyrinidae istituita da Warén & Bouchet, 1993 su materiale tipico di soffioni idrotermali di grande profondità degli oceani o trovato su legni o ossa di cetacei sommersi.
Finora sono stati rinvenuti pochissimi nicchi in ottime condizioni di queste specie di ridotte dimensioni. Solo l'esame di esemplari viventi potrà consentirne in futuro una più corretta posizione sistematica.
Gli autori colgono questa inaspettata occasione per esprimere alcune considerazioni di diversa natura sulla presenza nel nostro mare di specie rare o, ancor più raramente, trovate viventi.

ANDERS WARÉN, Naturhistoriska Riksmuseet, Box 50007, S-10405 Stockholm, Sweden.
FERDINANDO CAROZZA, Via degli Olivi 11, I-56030 Soiana (Pisa) (PI), Italia.
ROMUALDO ROCCHINI, Via don Bosco 15, I-51100 Pistoia (PT), Italia.

Introduction

The Tuscan and Ligurian Seas seem to be one of the richest parts of the Mediterranean regarding the mollusc fauna. To some extent this may be a bias caused by the interest in the area by several Italian amateur malacologists, who have explored the area thoroughly. The main source for material is side cathches by fishing boats. This material is traded by the fishermen who are well aware of its value for the malacologists and consists of sediment samples caught by trawls, debris and pieces of "white coral" (Madreporaria) caught in the nets, and various objects like pieces of sunken wood with its associated fauna or, as in the present case, an amphora filled with sediment which was caught in a net. This material comes from depths down to several hundred meters, and rich samples are traded.

Many of these Italian malacologists are mainly concerned with the Mediterranean malacology and material from outside this area is of much less interest to them. The value of the samples and the species therefore enters an uncertainty factor because fishermen and dealers sometimes try to sell samples from outside the Mediterranean with erroneous locality information. Careful observations of accompanying fauna and caution are thus needed when this material is treated to avoid complications like those described by BOUCHET & GOFAS (1983), about *Terebra cosentini*, with species being known from numerous "reliable" records because every collector wanted his collection to contain a Mediterranean specimen.

Usually the deep water species obtained in this way are represented by empty shells only, and it is uncertain to what extent the species still live in the Mediterranean or if they are fossil (see for example *Neopilina zografi* (Dautzenberg & Fischer, 1896) in CESARI *et al.* 1987). BOUCHET & TAVIANI (1989) assumed some such species to be late glacial or older fossils and claimed that others may have Mediterranean pseudopopulations based on a continuous inflow of larvae from the Atlantic Ocean with the strong surface current through the Strait of Gibraltar. That is a possibility only for species with planktonic larval dispersal.

Some examples of species, known from shells only, among the small Mediterranean "skeneimorph" species are: *Akritogyra conspicua* (Monterosato, 1880), *Anekes sculpturata* Warén, 1992, *Lissotesta gittenbergeri* (Van Aartsen & Bogi, 1988), *Moelleriopsis messanensis* (Seguenza, 1876), *Rugulina monterosatoi* (Van Aartsen & Bogi, 1986), *Granigyra granulifera* Warén, 1992 (=*Maurolica insignis* Seguenza, 1876?), *Lissomphalia bithynoides* (Monterosato, 1880), *Mikro giustii* (Nofroni & Bogi, 1989) (see Warén 1996) and *Trochaclis versiliensis* Warén, Carrozza & Rocchini, 1989.

Contributing reasons for a very sparse proportion of live taken specimens is that these small shells are too small to become second hand housing for hermit crabs or other crustacea and are therefore not crushed by predators that pray on the tenants. Another reason is that the Mediterranean bottom water is less aggressive to shells then Atlantic water, especially in the North Atlantic, where the water has a tendency to dissolve the calcium carbonate. The result of this is that the shells in a sample of mud in the Mediterranean may represent an accumulation during a very long time, although they are perfectly preserved.

Some species, however, are known to maintain very sparse populations, or, perhaps, they are for some unknown reason caught very rarely:

A large material of the rissoid *Benthonella tenella* (Jeffreys) from the western Mediteranean, 500-3 000 m depth, consisted about 15 000 shells and 12 specimens with soft parts (BOUCHET, pers. comm.).

WARÉN has examined about 2 000 shells of the skeneid *Lissotesta turrita* (Gaglini), but only a single livetaken specimen (collection of F. GIUSTI, off Capraia, 400 m depth).

Anekes sculpturata Warén, 1992, shells not rare in 200-600 m; known from 2 live taken specimens, Tuscan and Tyrrhenian Seas, coll. W. Engl and L. Tringali.

Cirsonella (previously *Tharsiella*) *romettensis* (Granata, 1877) is quite common in the Mediterranean as empty shells, but has only very rarely been found living.

Laeviphitus verduini Van Aartsen, Bogi, & Giusti, 1989. Known from many shells but taken alive only as swimming veliger larva (BOUCHET & WARÉN 1993: 704).

Some species which normally live associated with special substrates are rarely found as shells, and never alive except when the correct substrate is examined. Examples of such molluscs are choristellid gstropods in elasmobranch egg cases; xylodisculid gastropods on pieces of wood; mytilids of then genus *Idas* on wood, whale, and dolphin skeletons; and some eulimid gastropods which live permanently attached on their host echinoderm.

It is thus possible that many of the Mediterranean species known from empty shells only, actually do live there, but in very sparse populations, in some cases "pseudopopulations" maintained by an Atlantic inflow of larvae; in other cases on rarely occurring or examined substrates.

The submarine cave fauna of the Mediterranean, on the contrary, is largely unexplored malacologically, although it has yielded some highly interesting animals of other phyla, for example the carnivorous cladorhizid sponge *Asbestopluma* (VACELET *et al* 1994, VACELET &

BOURY - ESNAULT 1995) found in a cave at a depth of 17-23 m. This animal belongs to a family which occurs mainly in abyssal depths, and never in places available by SCUBA diving. HAYAMI & KASE (1993) and KASE & HAYAMI (1992) have reported spectacular findings of submarine cave molluscs from Japan, but probably the Mediterranean area has not been stable for enough long a time to allow the evolution of anything similar.

Systematics

Gastropoda, Heterobranchia J. E. Gray, 1840

The more "primitve" species of Heterobranchia were discussed by PONDER (1991). WARÉN *et al.* (1993) transferred two Mediterranean species, *Skenea* (now *Xenoskenea*) *pellucida* Monterosato, 1874 and *Oxystele* (now *Tomura*) *depressa* Granata, 1877 to the families Hyalogyrinidae and Cornirostridae respectively in the Heterobranchia.

Family HYALOGYRINIDAE Warén & Bouchet, 1993

This family was recognized by WARÉN & BOUCHET (1993) for two genera of skeneimorph gastropods which live associated with sunken driftwood and hydrothermal vents, *Hyalogyrina* and *Hyalogyra*. WARÉN *et al.* (1993) described a third genus, *Xenoskenea* Warén & Gofas, 1993, for the Mediterranean species *Skenea pellucida* Monterosato, 1874.

Genus *Hyalogyrina* Marshall, 1988

Hyalogyrina Marshall, 1988: 984. Type species, *H. glabra* Marshall, 1988, bathyal, off New Zealand, on sunken driftwood.

Remarks. One additional species has been described from deep-water hydrothermal vents in the Gulf of California (*Hyalogyrina grasslei* Warén & Bouchet, 1993).

Hyalogyrina amphorae Warén, Carozza & Rocchini sp.n.

Type material. Holotype and 10 paratypes Swedish Museum of Natural History, Stockholm, reg n°. 4774 and 4775; 2 paratypes in Muséum National d'Histoire Naturelle, Paris, 23 paratypes in the collection of F. Carrozza and R. Rocchini.

Type locality. Off Italy, Tuscan Sea, in an amphora from ca 400 m depth.

Material examined. Only known from the type series, and: south of Crete, METEOR 1987, 17 January 1987, station 19, 34°42'N, 25°51'E, 1626-1433 m (from a sunken piece of wood), 1 shell (Senckenberg Museum, Frankfurt).

Etymology. From amphora (Latin), alluding to where it was found.

Description. Shell (Figs 1-3, 5-10) small, transparent, fragile, skeneimorph, with heterostrophic larval shell. The limit between protoconch I and II can not be separated (Figs. 11-15) and their combined diameter is 225 μm (±3 μm in 5 specimens measured). The initial part is sculptured by an irregularly formed net sculpture caused by rounded, irregularly shaped impressions, 2-3 μm diameter. This part is also distinctly depressed and twisted and unusually narrow. When the coiling becomes more normal, half a whorl from the teleoconch, the net sculpture fades out and the surface becomes perfectly smooth. In some specimens the initial part is covered by some kind of callus or deposit, concealing the sunken central part and the heterostrophy (Figs 13-15). The teleoconch has about 2.2-2.3 whorls in the largest specimens, and is sculptured by distinctly flexuous growth lines, more obvious around the large umbilicus. The whorls are very inflated, slightly flattened above the periphery and the suture is deep. The

diameter of the shell varies between 0.98 and 1.16 times its height. The peristome is rounded, its inner side distinctly straighter, with an indistinct corner at its apical part, giving the aperture an oblique, D-shaped appearance. In large specimens the last whorl is only very losely connected to the preceding one.

Dimensions. Holotype heigth 1.48 mm, diameter 1.47 mm; max. diameter of the species 1.6 mm.

Remarks. All specimens in the type lot were found in a small quantity of mud in an amphora. This probably means that they have been living there, perhaps attracted by the capacity of the amphora to trap suspended sediment or by presence of sulphides caused by oxygen deficit due to the stagnant water, or accompanying sulphide oxidizing bacteria. It is of interest to notice that the additional shell from the METEOR cruise was found on sunken driftwood, like the type species of the genus.

Many specimens had the inside partly covered by secondary growth of calcium carbonate (Figs 8, 10), deposited after the death of the snails which gives them an impression of belonging to a different, much more sturdily built species.

Some specimens had, as mentioned in the description, the nucleus of the larval shell concealed by some kind of deposit, giving a very deceptive impression of a normally coiled protoconch (Fig. 15). The deposit, however, seems to be formed gradually (Figs 13-14) and is only rarely complete as in Fig. 15. We can not give any explanation of this phenomenon.

The specimen from south of Crete was reported by JANSSEN (1989: 269) as *Lissospira* (?) sp. SEM examination of the shell and well preserved protoconch revealed no differences from the type specimens.

Hyalogyrina amphorae is similar to *Akritogyra conspicua* (Monterosato, 1880) (Skeneidae?, see WARÉN 1992), which also has been found in amphorae, but that species has a normally coiled, almost smooth protoconch of a diameter of about 265 μm (Fig. 16), a proportionally larger peristome which is not deformed by the preceding whorl and the shape of the shell is more depressed (Fig. 4) with whorls of perfectly round cross section (not flattened above the periphery).

Genus *Hyalogyra* Marshall, 1988

Hyaloqyra MARSHALL 1988: 982. Type species, *H. expansa* Marshall, 1988, bathyal, off New Zealand, on sunken driftwood.

Remarks. One additional species has been described from deep-water hydrothermal vents in the Fiji Basin (*Hyalogyra vitrinelloides* Warén & Bouchet, 1993).

Hyalogyra zibrowii Warén, sp. n.

Type material. Holotype and 7 paratypes (4 partly broken) in Muséum National d'Histoire Naturelle, Paris. Type locality. Mediterranean France, Iles d'Hyères, northwestern part of Ile de Bagaud, 43°00.9'N, 06°21.6'E, in a dark cave with walls covered by manganese oxides, at 7 m depth, 10 m from the opening (innermost part) in mud rich in *Posidonia* fibres.

Etymology. Named after Dr HELMUT ZIBROWIUS, Marseille, who collected the bottom sample that contained the new species.

Description. Shell (Figs 17-19) small, transparent, fragile, skeneimorph, with paucispiral protoconch. The protoconch (Fig. 19) consists of about 0.75 whorls and its diameter is ca 265 μm. It is smooth, except some distal incremental lines, and its initial part is rather small and

depressed. The distal part is somewhat abruptly expanded. The teleoconch (Figs 17-18) has about 2.1 whorls in the largest specimens, and is sculptured by distinctly flexuous growth lines, slightly more obvious around the umbilicus. The whorls are not very convex, slightly flattened above the periphery and the suture is shallow. The diameter of the shell corresponds to 1.3 times its height. The peristome is rounded, its inner side distinctly straighter, with an indistinct corner at its apical and basal parts, giving the aperture an obliquely elongate, D-shaped cross section. Its profile is more radial than tangential, prosocline and its basal and central parts distinctly flexuous.

Dimensions. Holotype heigth 1.00 mm, diameter 1.30 mm; this is also the known maximum diameter of the species.

Remarks. The systematic placement in *Hyalogyra* is tentative; the species is known from shells only and examination of the radula is necessary for correct allocation. The protoconch gives some indication that it may be a heterobranch in the vicinity of the families Cornirostridae and Hyalogyrinidae by having a comparatively small and slightly depressed initial part and rapidly expanding width at the distal part. In archaeogastropods the initial part usually is more inflated, but this character is not very easy to use. *Hyalogyra zibrowii* resembles *Xenoskenea pellucida* (Monterosato, 1874), but has a slightly larger protoconch (250 µm in *pellucida*), taller spire and the aperture is almost circular in *X. pellucida*.

Hyalogyra zibrowii was found in a sample of mud together with the following species:

Dacrydium hyalinum (Monterosato, 1875) (common, this is unusually shallow)

Arca scabra (Poli, 1795) (many small, unusually shallow)

Manzonia crassa (Kanmacher, 1798) (two living, normally under stones in slightly anoxic condition)

Xenoskenea pellucida (Monterosato, 1874) (shells, known to live in mud in *Zostera* beds)

Gibbula vimontiae (Monterosato, 1884) (living, normally among decaying *Posidonia* leaves)

Scissurella costata d'Orbigny, 1824 (common, normally living under rocks)

There were also shells of several species obviously derived from the *Posidonia* bed in front of the cave. *Dacrydium hyalinum* is a common inhabitant of submarine caves (Zibrowius pers. comm.), which otherwise is rare and usually in deeper water. Together the list above gives an impression of an unusual assemblage of species, but still the cave faunas of the Mediterranean are too poorly known to allow any general conclusions.

Acknowledgements

We thank P. Bouchet and S. Gofas (Paris) who read and commented the manuscript. We also thank H. Zibrowius (Marseille) who allowed us to describe the new species of *Hyalogyra* and generously contributed information on its habitat. S. Gofas sorted and identified the mollusc material from the cave. C. Hammar (Stockholm) prepared all SEM prints.

REFERENCES

BOUCHET, P. & S. GOFAS, 1983. - "*Terebra*" *cosentini* Philippi, 1836, an American columbellid species. *Nautilus*; **97**: 26-28.

BOUCHET, P. & M. TAVIANI, 1989 - Atlantic deep-sea gastropods in the Mediterranean: New Findings. *Boll. Malacologico*, Milano; **25**: 137-148.

BOUCHET, P. & A. WARÉN, 1993 - Revision of the Northeast Atlantic Bathyal and Abyssal Mesogastropoda. *Boll. Malacologico*, Milano; Supplement **3**: 579-840

CESARI, P., F. GIUSTI, & A. MINELLI, 1987 - Recent monoplacophorans in the Mediterranean Sea: Findings of *Neopilina zografi* (Dautzenberg & Fischer, 1896) off the Isles of Capraia, Gorgona, Corsica and Sardinia (Mollusca, Monoplacophora). *Boll. Malacologico*, Milano; **23**: 107-118.

HAYAMI I. & T. KASE 1993 - Submarine cave bivalvia from the Ryukyu Islands: systematics and evolutionary significance. *University Museum, University of Tokvo, Bulletin* **35**: 1-133.

JANSSEN, R. 1989 - Benthos-Mollusken aus dem Tiefwasser des ostlichen Mittelmeeres, gesammelt wahrend der "METEOR"-Fahrt 5 (1987). *Senckenbergiana Maritima*; **20**: 265-276.

KASE T. & I. HAYAMI 1992 - Unique submarine cave mollusc fauna: composition, origin and adaptation. *J. Moll. Stud.*; **58**: 446-449.

MARSHALL, B.A. 1988 - Skeneidae, Vitrinellidae and Orbitestellidae (Mollusca: Gastropoda) associated with biogenic substrata from bathyal depths off New Zealand and New South Wales. *Journal of Natural History*; **22**: 949-1004.

PONDER, W.F. 1991 - Marine valvatoidean gastropods -- implications for early heterobranch phylogeny. *J. Moll. Stud.*; **57**:21-32.

VACELET J. & N. BOURY-ESNAULT, 1995 - Carnivorous sponges. *Nature* **373**: 333 -335.

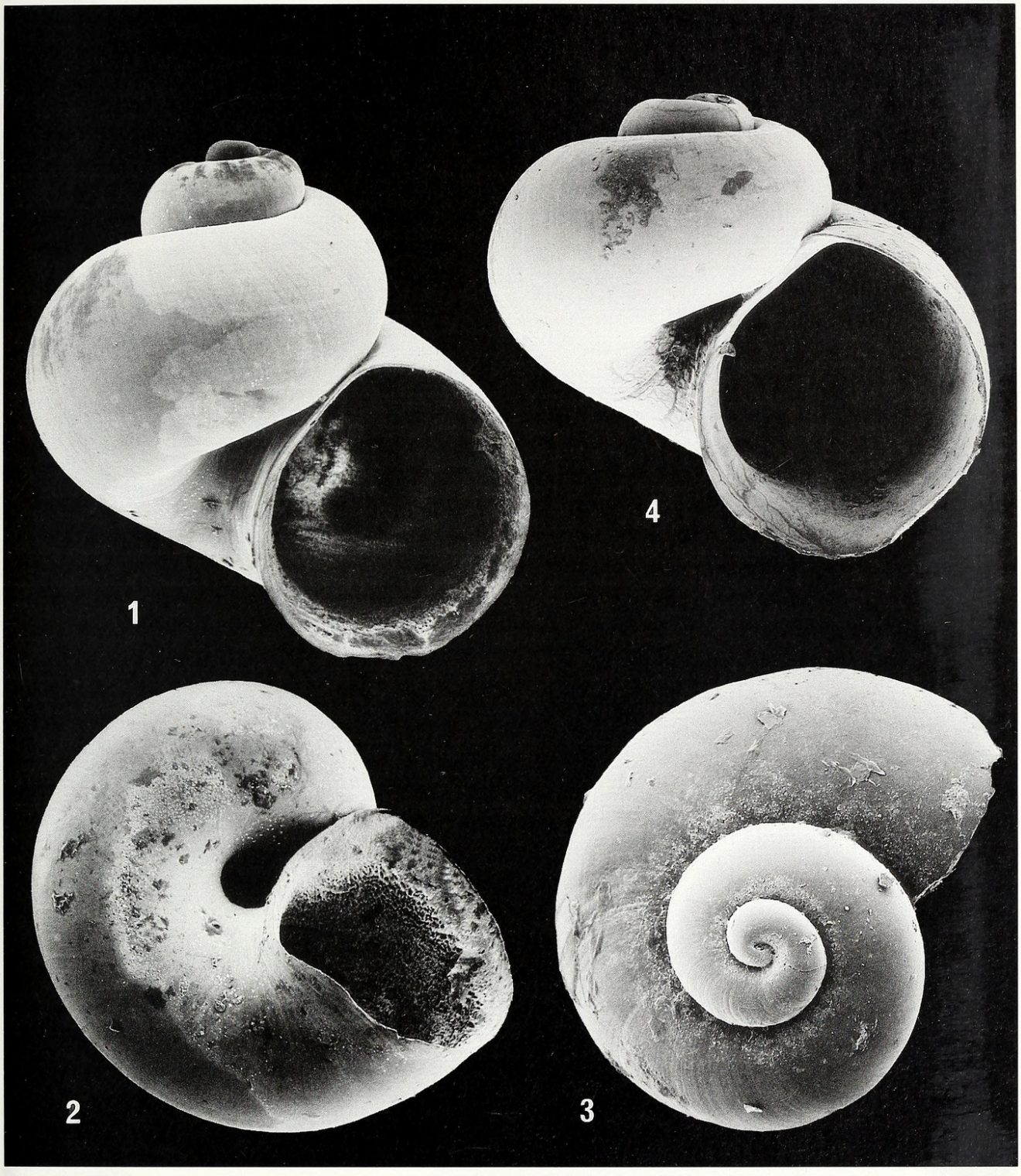
VACELET J., N. BOURY-ESNAULT & J.-G. HARMELIN, 1994 - Hexactinellid cave, an unique deep-sea habitat in the scuba zone. *Deep-Sea Research* part I **41**: 965-973.

WARÉN, A. 1992 - New and little known "skeneimorph" gastropods from the Mediterranean Sea and the adjacent Atlantic Ocean. *Boll. Malacologico*, Milano; **27**: 149-248.

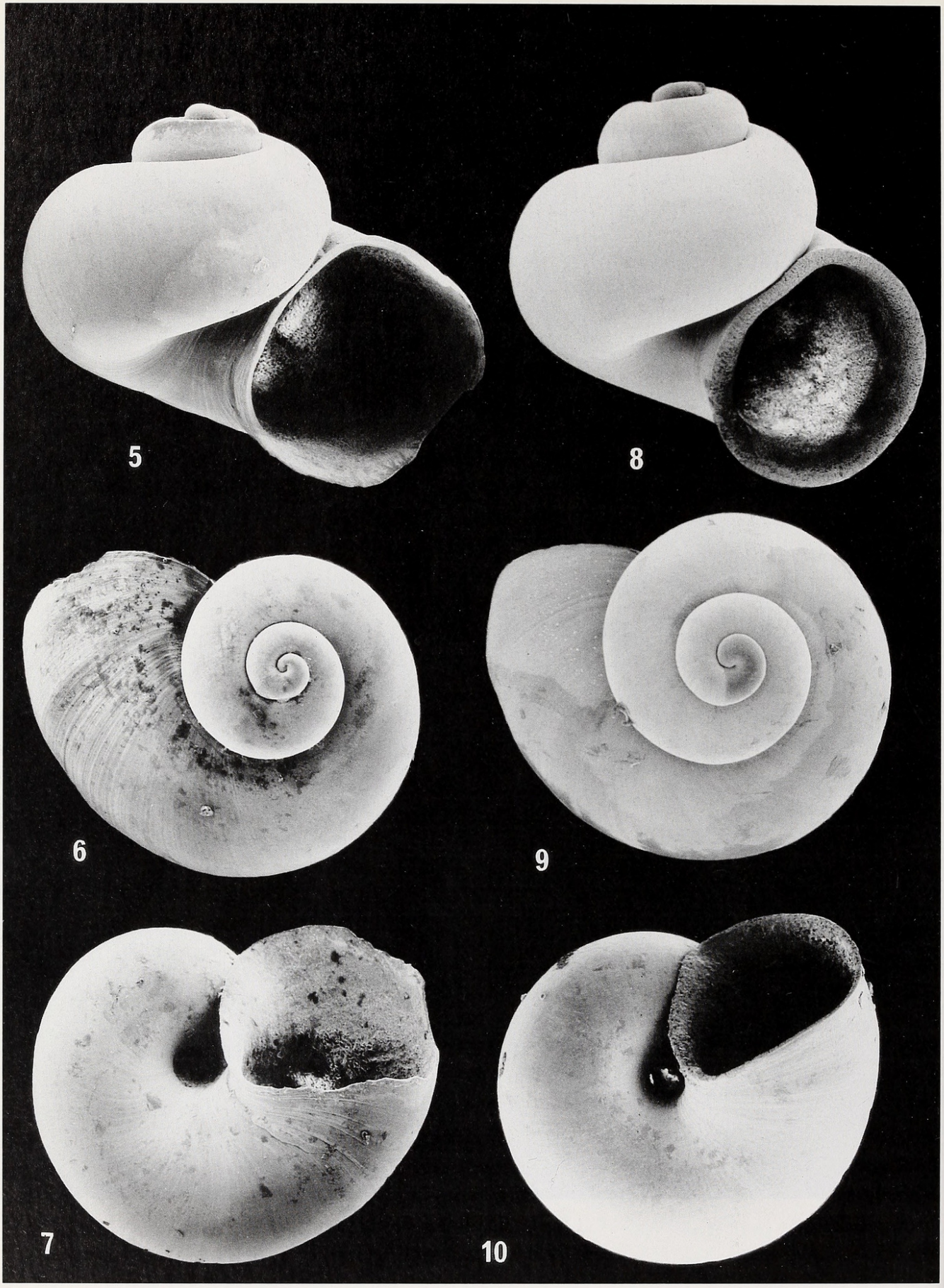
WARÉN, A. 1992 - New and little known Mollusca from Iceland and Scandinavia. Part 3. *Sarsia* **81**: 197-245

WARÉN, A. & P. BOUCHET, 1993 - New, records, species, genera, and a new family of gastropods from hydrothermal vents and hydrocarbon seeps. *Zoologica Scripta*; **22**: 1-90.

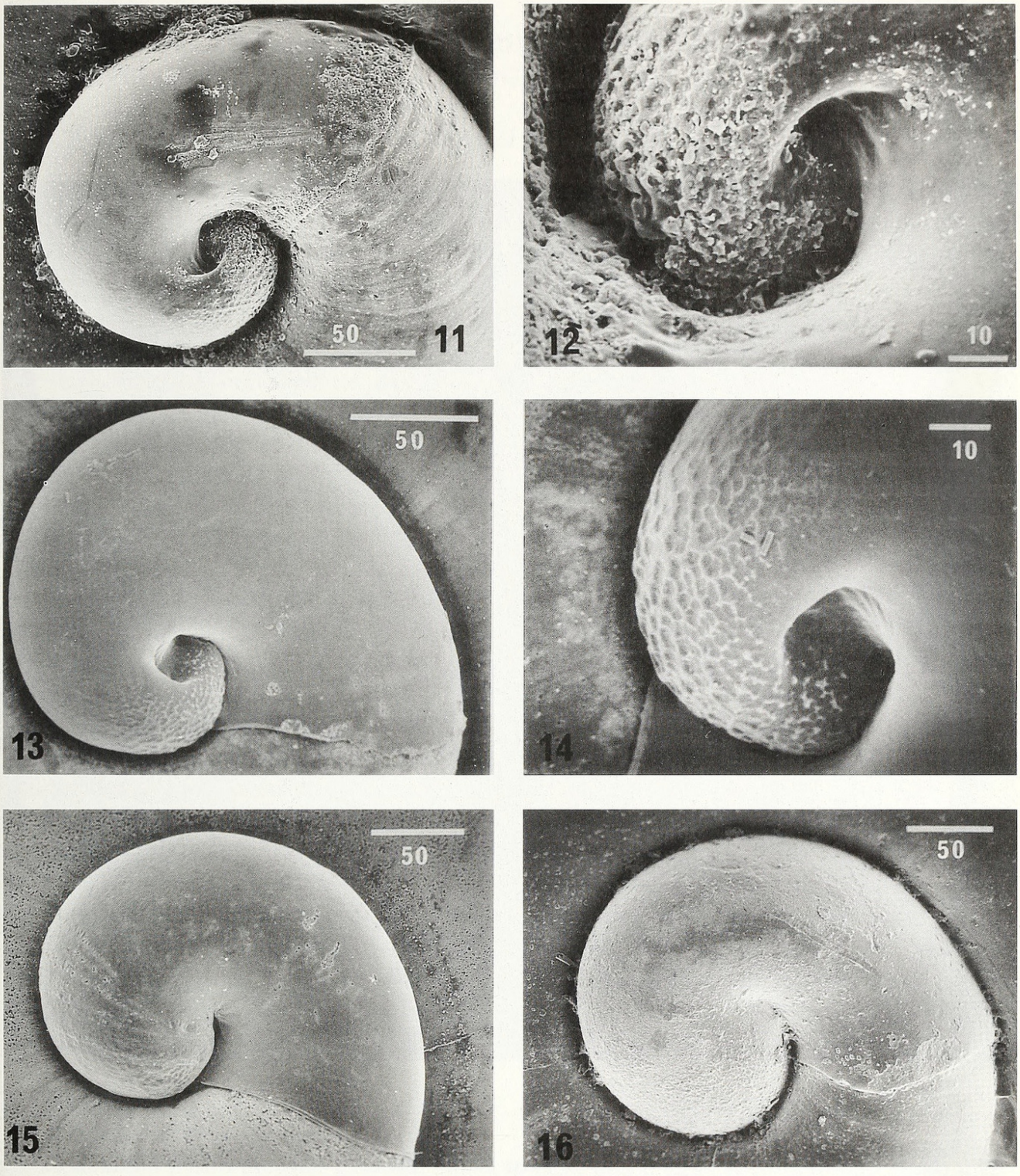
WARÉN, A., S. GOFAS, & C. SCHANDER, 1993 - Systematic position of three European heterobranch gastropods. *Veliger*; **36**: 1-15.



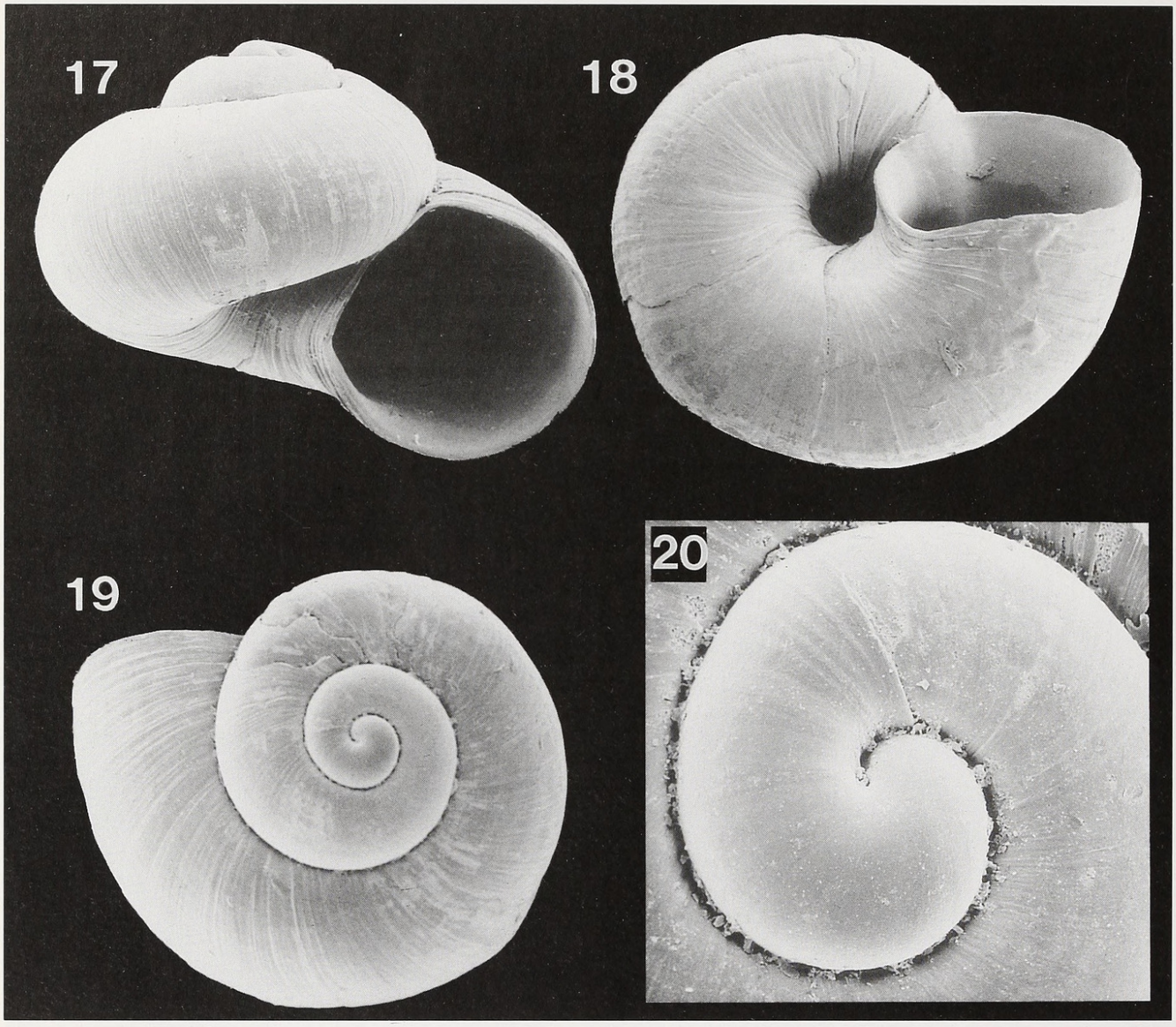
Figures 1-3. *Hyalogyrina amphorae* Warén, Carozza & Rocchini, sp. n. holotype, diameter 1.47 mm.
4. *Akritogyra conspicua* (Monterosato), Corsica, off Calvi, 120 m depth, diameter 1.45 mm.



Figures 5-10. *Hyalogyrina amphorae* Warén, Carozza & Rocchini, sp. n. variation, Tuscan Sea, 400 m, paratypes. 5-7. Unusually broad specimen, diameter 1.43 mm. 8-10. Compact specimen, diameter 1.51 mm. The protoconch in Fig. 9 is seemingly paucispiral.



Figures 11-16. *Hyalogyrina amphorae* Warén, Carozza & Rocchini, sp. n. protoconch morphology and deposition of calcium carbonate. 11-12. Paratype. 13-14. Another paratype with centre of protoconch starting to get covered. 15. Protoconch with centre completely covered. *Akritogyra conspicua* (Monterosato), protoconch. Scale lines in μm.



Figures 17-20. *Hyalogyra zibrowii* Warén, sp. n., holotype. 16-18. Front, basal and apical view, diameter 1.30 mm. 19. Protoconch, diameter 265 μm.