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A NEW HYGROMIIDAE FROM THE TYRRHENIAN ISLANDS OF
CAPRAIA AND SARDINIA WITH NOTES ON THE GENERA *XEROMICRA*
AND *XEROTRICHA* (PULMONATA: HELICOIDEA) (**)
(STUDIES ON THE SARDINIAN AND CORSICAN MALACOFUNA, VIII)

KEY-WORDS: Hygromiidae, Sardinia, Corsica, Tuscan Archipelago, systematics, biogeography.

Abstract

A new genus, *Tyrrheniella*, is described for *T. josephi* n.sp., a hairy shelled species of the Hygromiidae recently discovered on an island of the Tuscan Archipelago (Islet of La Praiola, Capraia I.) and in Sardinia. The need to compare the new species with other species of the Sardinian malacofauna described in the past, has given us the opportunity to critically revise all the small hairy shelled species living in the Sardo-Corsican Complex and the Tuscan Archipelago. It has been confirmed that *Helix sardiniensis* PORRO and *Helix quisquiliae* PAULUCCI are both junior synonyms of *Xerotricha conspurcata* (DRAPARNAUD). A more careful study of the genital duct structure of *X. conspurcata* and *Xeromicra apicina* (LAMARCK) has made it clear that the two species belong to the same genus. Consequently *Xeromicra* must be regarded as a junior synonym of *Xerotricha*. A concise redescription of *X. conspurcata*, *X. apicina* and *Microxeromagna vestita* (RAMBOUR), their synonymic list and the new data for the Sardo-Corsican Complex are furnished.

Riassunto

Si descrive un nuovo genere per una nuova specie scoperta in un'isola dell'Arcipelago Toscano e in Sardegna. Il nuovo genere è caratterizzato anatomicamente da una breve vagina priva del complesso del sacco del dardo e delle ghiandole digitiformi ed è provvisto di una conchiglia di piccole dimensioni, con strato periostracale munito di «peli». La necessità di confronti con alcune specie descritte nel passato per la malacofauna della Sardegna, *Helix sardiniensis* PORRO e *Helix quisquiliae* PAULUCCI, ha fornito l'opportunità di rivedere criticamente l'intero gruppo di Hygromiidae con conchiglia piccola e pelosa viventi nel Complesso Sardo-Corsico e nell'Arcipelago Toscano. Si è così potuto accertare che i due taxa sopra ricordati devono essere considerati più giovani sinonimi di *Xerotricha conspurcata* (DRAPARNAUD).

L'acquisizione di più precise notizie sull'anatomia di *X. conspurcata* e di *Xeromicra apicina* (LAMARCK) ha permesso, inoltre, di accertare che queste due specie appartengono allo stesso genere, per il quale deve essere utilizzato il nome *Xerotricha*.

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Oltre ad una ridescrizione sintetica di *Xerotricha* e ad una breve discussione sulle sue presunte affinità con *Helicella* ed *Helicopsis*, vengono forniti la lista sinonimica e l'elenco dei materiali raccolti nel Complesso Sardocorso per *X. apicina*, *X. conspurcata* e *Microxeromagna vestita* (RAMBOUR).

Qui di seguito si riportano brevemente alcuni dei caratteri più significativi per il riconoscimento delle 4 specie.

Xerotricha conspurcata è caratterizzata dalla presenza di due coppie di stilofori su lati opposti della vagina e da una conchiglia con flammulature, lunghi peli e una microscultura reticolare della teleoconca.

Xerotricha apicina è provvista di uno schema del tratto genitale simile a quello di *X. conspurcata* da cui si distingue per le seguenti particolarità: complesso dei sacchi del dardo meno squadrato, pene prossimale più corto di quello distale, parete della papilla peniale piena. La conchiglia di questa specie è fornita di lunghi peli, ma rispetto a quella della specie precedente è più globosa, ha l'ombelico più largo e una microscultura della teleoconca non reticolare ma con creste longitudinali.

Microxeromagna vestita è caratterizzata dalla presenza di un complesso del sacco del dardo formato da una coppia di piccoli stilofori affiancati e disposti su un lato della vagina. La conchiglia è simile a quella di *X. conspurcata* ma con peli molto più piccoli e numerosi.

La nuova specie ha un tratto genitale privo di complesso del sacco del dardo e di ghiandole digitiformi. La conchiglia è priva di flammulature, presenta peli abbastanza corti, una microscultura della teleoconca costituita da solchi longitudinali e un ombelico più aperto rispetto a *X. conspurcata*.

Introduction

The recent identification of new taxa having small hairy shells similar to those in *Xerotricha*, *Xeromicra* and *Microxeromagna* (GIUSTI & MANGANELLI, 1988; MANGANELLI *et al.*, 1989) led us to revise our entire set of materials in order to check misinterpreted taxa. We happened thus to realize that the only specimen still existing in the collection of two found on 17.4.1976 on the islet of La Praiola (or «Scoglio dei Gabbiani», Capraia I.; Tuscan Archipelago), determined by GIUSTI (1976, 1977) as *Helicella (Xerotricha) conspurcata* (DRAPARNAUD), showed enough peculiarities to be distinguished from the shells of the DRAPARNAUD species known to live in large populations on the nearby island of Capraia and other islands of the Tuscan Archipelago.

Anatomical research on three specimens recently found on the islet of La Praiola, allowed us to identify a new species so clearly distinguished as to constitute a new genus.

Finally during a very recent trip to northern Sardinia we happened to find another population which, after anatomical study, was recognized to completely correspond to that of the islet of La Praiola so as to be included in the same species.

The need to compare the new species with other species of the Sardinian malacofauna described in the past (PORRO, 1838; PAULUCCI, 1882) gave us the opportunity to revise all the small hairy shelled species living in the Sardo-Corsican Complex and the Tuscan Archipelago, usually included in *Xerotricha*, *Xeromicra* or *Microxeromagna*.

TYRRHENIELLA new genus

Description:

SHELL: small, hairy, brown in colour, depressed or very low conical above, convex below. Spire of ca. $4\frac{1}{2}$ - $4\frac{3}{4}$ convex whorls with fairly deep sutures; last whorl angled at the periphery. Umbilicus open, deep and wide ca. $\frac{1}{5}$ of the maximum shell diameter. Mouth oblique, oval, lacking an internal rib; peristome not thickened, slightly reflexed only at its lower margin.

External surface of the protoconch with weak growth lines, some hair roots and microsculpture consisting of close thin longitudinal growth lines. External surface of the teleoconch with numerous growth lines. Periostracal layer giving rise to transverse rows of hairs and crossed by thin longitudinal grooves.

GENITAL DUCT: characterized by a short vagina without any trace of dart-sac complex or digitiform glands. The duct of the bursa copulatrix is short and of uniform diameter. The bursa copulatrix is large, bean-shaped and it has no relation at all to the diaphragm. The penis is slightly wider and shorter than the epiphallus. The flagellum is short, almost as wide as the proximal portion of the epiphallus. The penis is enveloped by a thin muscular sheath. The penial retractor terminates at the penial complex in coincidence with the beginning of the penial sheath. The penial papilla is reduced in size and has an apical opening bordered by more or less distinguished lobes which are continuous with the pleats that line the inner surface of the epiphallus walls. A pleat which arises just in front of the penial papilla immediately widens into a sort of knob which overhangs the penial papilla. The penial nerve apparently originates from the right cerebral ganglion. The right ommatophore retractor passes between penis and vagina. The mantle collar has no features which distinguish it from those of other Hygromiidae.

Derivatio nominis

The name of the new genus is inspired by the Tyrrhenian Sea, on whose islands it lives.

Comments

The new genus is poorly characterized in shell shape (but not in periostracal microsculpture) from other Hygromiidae having small hairy shells e.g. *Xerotricha*, *Microxeromagna*, etc.

This is why the first two specimens discovered were erroneously considered to belong to *X. conspurcata*. Although a trained eye can recognize

sufficient differences in periostracal microsculpture a decisive diagnosis is nevertheless possible only after anatomical study. The new genus differs from those listed above in a total lack of any kind of vaginal accessory structures (i.e. dart-sac complex or digitiform glands). The new taxon cannot have originated recently from such genera by simple loss of vaginal accessory structures because of the fact that apart the shell peculiarities, many other anatomical differences distinguish the new genus (penial sheath, structure of the penial papilla, shape of the penial flagellum).

Tyrrheniella appears to lie closer to other genera recently studied or described by ourselves, i.e. *Cyrnotheba* from Corsica (GIUSTI & MANGANELLI, 1987) and particularly *Schileykiella* from Sicily (MANGANELLI *et al.*, 1989) both totally lacking vaginal accessory structures.

Cyrnotheba, although geographically close (it lives in Corsica), is nevertheless easily distinguishable by its larger shell (max. diam.: 12 - 15.6 mm) having completely different periostracal microsculpture (GIUSTI & MANGANELLI, 1987: 136-137, Pl. 9, figs. A-E) both on the protoconch (with spiral rows of small tubercles) and on the teleoconch (with transverse rows of nail-like scales and a dense series of thin longitudinal crests).

Moreover *Cyrnotheba* shows a different structure of the penial complex which lacks a penial sheath (substituted by thin stripes of muscular tissue connecting the proximal with the distal penis) and having a different penial papilla which is long and formed by a central canal separated from the external walls by an empty space (GIUSTI & MANGANELLI, 1987: 137, Fig. 5A).

Schileykiella is more similar, its shell is small (max. diam.: 6.5 - 8 mm) and hairy. The hairs are nevertheless longer and more numerous and the teleoconch periostracum shows dense series of longitudinal crests. *Schileykiella* also has a ductus of the bursa copulatrix always with a flared initial portion and a different inner structure of the penis, which totally lacks a «hygromiid-like» penial papilla (MANGANELLI *et al.*, 1989: Figs. 1D, 2 A-B,E, 4 B-C). *Schileykiella* nevertheless has some peculiarities which recall the new genus: it has a penial sheath enveloping the penis and a penial «pseudopapilla» in the form of a solid knob which is reminiscent of that of *Tyrrheniella*. One can thus argue that *Schileykiella* is derived from *Tyrrheniella* with the loss of the penial papilla. This is clearly possible despite the long independent history of the two groups of species suggested by the acquisition of a different periostracal microsculpture. At the risk of being accused of splitting, we prefer not to include this species in the same genus (even as a different subgenus) because as we recently stressed (GIUSTI & MANGANELLI, 1987, 1988; MANGANELLI & GIUSTI, 1988; MANGANELLI *et al.*, 1989) similar degrees of reduction in the size and number of the structures usually annexed to the vagina can arise by convergence.

In the present case we clearly had to rely upon characters such as those of the penial papilla and periostracal microsculpture even though their value for systematics at genus level has not yet been defined.

For the other genera of the Hygromiidae (*sensu* SCHILEYKO, 1978a, 1978b) which apparently lie close or are very similar to *Tyrrheniella* mainly in their genital duct (*Gasulliella*, *Ciliella*, *Metafruticicola*, *Cretigena*, *Caucasocressa*, *Szentgalia*, *Ashfordia*) the arguments put forward in the discus-

sion to *Schileykiella* apply (see MANGANELLI *et al.*, 1989).

As in similar cases (GIUSTI & MANGANELLI, 1988; MANGANELLI *et al.*, 1989) the morphological data is insufficient to determine the subfamilial status of *Tyrrheniella*. More research is necessary to verify SCHILEYKO's (1978a, 1978b) and NORDSIECK's (1987) systematic schemes of the Hygromiidae and we therefore think it advisable to leave the new genus as an *incertae sedis* taxon (close to *Schileykiella*) in the Hygromiidae.

If a relationship (same tribe or subfamily) is eventually established between *Tyrrheniella* and *Schileykiella*, it could be explained by supposing that they both descended from a unique ancestral group of palaeoeuropean origin. The fragmentation of the western side of the Alpidic chain and consequent drift of microplates (Corsica-Sardinia, Calabro Peloritane complex) (GIUSTI & MANGANELLI, 1984) might have separated and dispersed the group to different sites: *Tyrrheniella* in Sardinia (and later the Tuscan Archipelago) and *Schileykiella* in Peloritane Sicily (later dispersed to central-western Sicily).

Type species:

Tyrrheniella josephi n. sp.

[Fig 1; Pl. 1, figs. A-B; Pl. 4, figs. A-E; Pl. 8, figs. A-C]

Helicella (Xerotricha) conspurcata, - GIUSTI, 1976. *Lav. Soc. ital. Biogeogr.*, (N.S.), 5: 303 [non DRAPARNAUD, 1801].

Helicella (Xerotricha) conspurcata, - GIUSTI, 1977. *Atti Soc. ital. Sci. nat. Mus. civ. Stor. nat. Milano*, 118: 283 [partim, non DRAPARNAUD, 1801].

Description

SHELL (Pl. 1, figs. A-B): small, hairy, brown in colour, depressed or very low conical above, convex - rounded below. Spire of $4\frac{1}{2}$ - $4\frac{3}{4}$ convex and regularly increasing whorls separated by fairly deep sutures; last whorl decisively angled at the periphery. Umbilicus open and wide ca. 1/5 of the maximum diameter. Mouth oblique, oval, lacking internal rib; peristome not thickened, slightly reflexed only at its lower margin and angled at its external margin.

External surface of the protoconch (Pl. 4, figs. A-C) with weak growth lines, some hair roots and microsculpture consisting of close and thin longitudinal grooves.

External surface of the teleoconch (Pl. 4, figs. A, D-E) with numerous growth lines. Periostracal layer thick giving rise to transverse rows of short often hook-shaped hairs (0.1 - 0.15 mm in length), the hairs show longitudinally elongated bases. Periostracal layer patterned with fine longitudinal grooves. These grooves apparently correspond to those on the mineralized portion and seem to be the continuation of the grooves on the protoconch. No trace of longitudinal crests was noticed on any of the available shells.

Dimensions: shell max. diam.: 5.5 - 5.8 mm; shell height: 3.2 - 3.5 mm.

GENITAL DUCT (Fig. 1). A circumvoluted first hermaphrodite duct arises from a plurilobate gonad and ends in the «talon» (i.e. fertilization chamber + seminal receptacle complex) which lies on the surface of the inner side of the albumen gland. The talon has a wide lateral fertilization chamber which embraces the middle portion of the seminal receptacle complex. The latter is slender and apically elongated. The ovispermiduct is wide, plurilobate and consists of prostatic and uterine portions. The prostatic portion continues anteriorly into a long slender vas deferens which ends in the proximal portion of the penial complex. The latter consists of a penial flagellum, an epiphallus (i.e. the part extending from the end of the vas deferens to the point of attachment of the penial retractor muscle) and a penis (i.e. the part extending from the point of attachment of the penial retractor to the genital atrium). The penial flagellum is short, initially almost as wide as the epiphallus and has a blunt tip.

The epiphallus is equal in length to the penis but less wide. The penis is enveloped by a thin muscular sheath which begins near the point of attachment of the penial retractor and ends near the genital atrium. The external walls of the distal penis are covered by a more or less evident layer of glandular tissue. The penial retractor muscle is usually short. Inside the penis there is a reduced penial papilla. The latter has an apical opening bordered by more or less distinguishable lobes which are continuous with the pleats that line the inner surface of the epiphallus walls. One side of the inner surface of the penis has a large pleat which widens into a sort of knob level with the penial papilla. The uterine portion of the ovispermiduct continues anteriorly into a long uterine canal (i.e. free oviduct) which leads to the vagina. The vagina is of equal length or shorter than the free oviduct. The ductus of the bursa copulatrix is twice the length of the vagina and is uniform in calibre. Its beginning is not flared. The bursa copulatrix (i.e. gametolytic gland) is large, bean-like in shape and adheres to the distal half of the ovispermiduct being fastened to it by thin bundles of tissue. It thus bears no relation at all to the diaphragm. The genital atrium is moderately long (as long as the vagina) and wide.

Fig. 1. *Tyrrheniella josephi* n.sp., Genital duct and mantle collar in specimens collected on La Praiola islet (Capraia I., Tuscan Archipelago) (A,C-D) and at Golfo degli Aranci (Northern Sardinia) (B,E). A-B: the genital duct. C-D: the penis (C) and the epiphallus (D) have been opened to show the small penial papilla whose apical lobes are continuous with the epiphallus pleats. E: the mantle collar.

Explanations of the symbols used in Figs. 1-9: **AG** albumen gland, **BC** bursa copulatrix (gametolytic gland), **D** dart, **DBC** duct of the bursa copulatrix, **DG** digitiform glands, **DSC** dart-sac complex, **DP** distal penis, **DSS** sheath of the dart-sac complex, **E** epiphallus, **F** flagellum, **FO** free oviduct, **G** penial papilla (glans), **GA** genital atrium, **HD** hermaphrodite duct, **IS** inner stylophore, **OS** outer stylophore, **P** penis, **PK** penial knob, **PO** prostatic portion of the ovispermiduct, **PP** proximal penis, **PR** penial retractor muscle, **PS** penial sheath, **PV** proximal vagina, **PW** penial walls, **RCG** right cerebral ganglion, **SO** stylophores opening into the vagina, **T** talon, **UO** uterine portion of the ovispermiduct, **V** vagina, **VD** vas deferens.

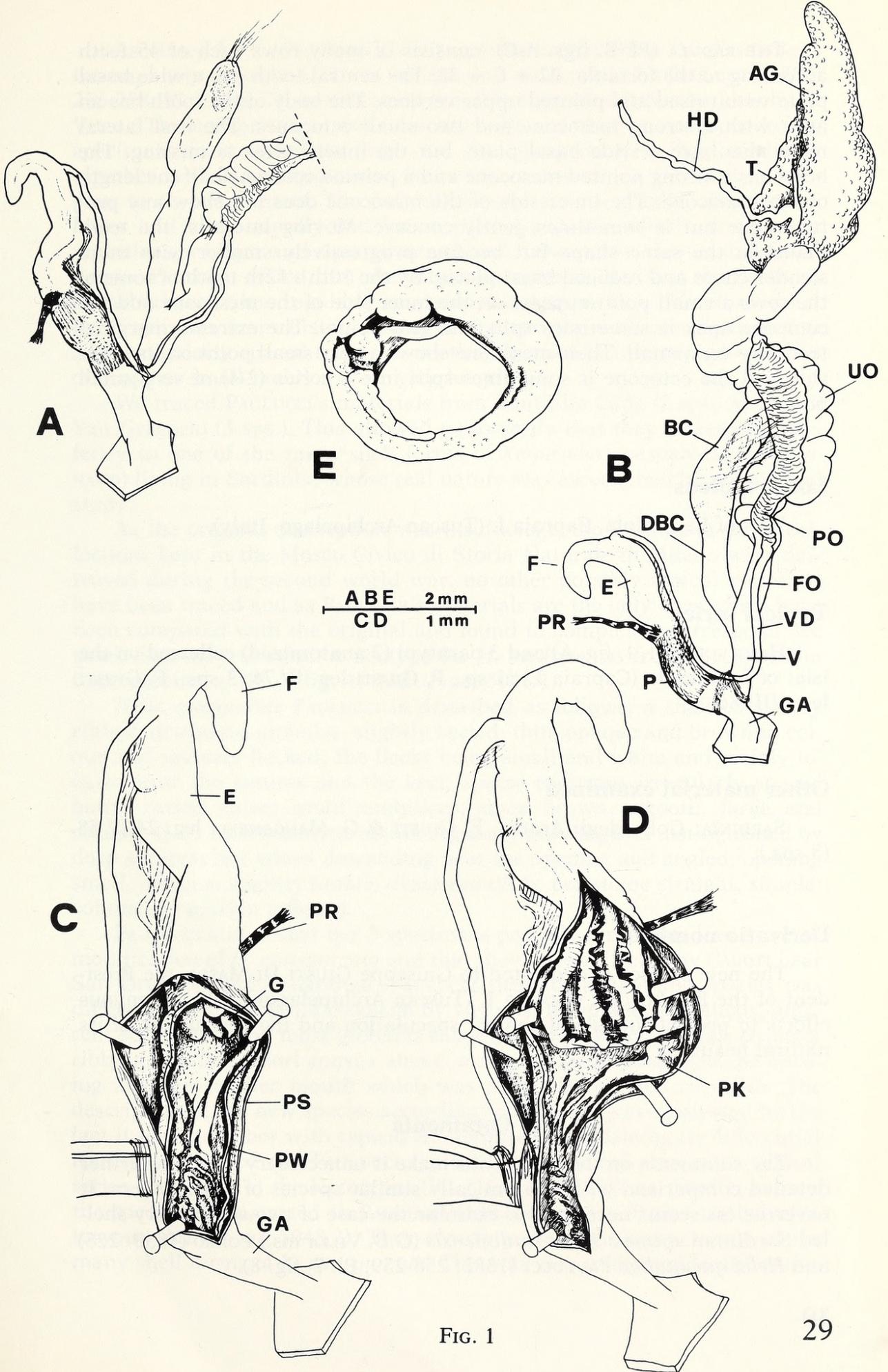


FIG. 1

THE RADULA (Pl. 8, figs. A-C): consists of many rows each of 45 teeth according to the formula: $22 + C + 22$. The central tooth has a wide basal plate with raised and pointed upper vertices. The body of the tooth has an apex with a strong mesocone and two small ectocones. The first lateral teeth also have a wide basal plate, but the inner vertex is missing. The body has a strong pointed mesocone and a pointed ectocone half the length of the mesocone. The inner side of the mesocone does not show any protuberance but is sometimes gently concave. Moving laterally, the teeth maintain the same shape but become progressively smaller with more slender cusps and reduced basal plates. By the 10th - 12th tooth of some of the rows a small point appears on the inner side of the mesocone and the ectocone apex is sometimes split into two points. The extreme marginal teeth are very small. Their mesocone shows a very small point on its inner side and the ectocone is sometimes split into a series (2-4) of very small points.

Locus typicus

Islet of La Praiola, Capraia I. (Tuscan Archipelago, Italy).

Typical series

Holotypus (Pl. 1, fig. A) and 3 paratypes (2 anatomized) collected on the islet of La Praiola (Capraia I.) (1 sp., F. GIUSTI leg. IV.76; 3 sps., F. GIUSTI leg. VIII.86).

Other material examined

SARDINIA: Golfo degli Aranci, F. GIUSTI & G. MANGANELLI leg. 24.IV.88 (5 sps.).

Derivatio nominis

The new species is dedicated to Giuseppe GIUSTI DI MASSA, the President of the Pro-Loce of Capraia I. (Tuscan Archipelago) for his strenuous efforts to protect the island against speculation and the destruction of its natural beauty.

Comments

The comments on the new genus make it unnecessary to add a further detailed comparison with anatomically similar species of other genera. It nevertheless seems necessary to examine the case of two small hairy shelled Sardinian species: *Helix sardiniensis* (G.B. VILLA ms.) PORRO (1838: 225) and *Helix quisquiliae* PAULUCCI (1882: 258-259, Pl. 7, fig. 8).

As stated by L. PFEIFFER (1859) and PAULUCCI (1882), the first one is incompletely described. It was revised and redescribed by PAULUCCI (1882: 256-258, Pl. 7, fig. 7) on materials possibly typical sent her on loan by A. VILLA. The comparisons made by her «showed that it corresponded to specimens from Sant'Elia Cape and San Gregorio near Cagliari living together with *H. conspurcata*». PAULUCCI continued: «it is strictly analogous to *H. conspurcata*. The only differences are the smaller dimensions, fewer and more rapidly and less regularly growing whorls, a narrower umbilicus, a larger and squarer mouth and, when fresh, shorter and fewer hairs». PAULUCCI added that the colour was similar but that the flecks on the whorls were less regularly spaced and less numerous. This allowed her to identify its main distinguishing character: the well raised transverse ribs, irregularly spaced from one another, frequently interrupted by series of drops or small nodules of varying length.

We traced PAULUCCI's materials from Sant'Elia Cape (2 sps.) and from San Gregorio (3 sps.). This allowed us to verify that they correspond perfectly to one of the many shell forms of *Xerotracha conspurcata* (DRAPARNAUD) living in Sardinia, whose real nature was ascertained by anatomical study.

As the original description was insufficient, the PORRO and VILLA collections kept in the Museo Civico di Storia Naturale di Milano were destroyed during the second world war, no other possibly typical materials have been traced and as PAULUCCI's materials are the only ones which have been compared with the original and found to completely correspond, we think necessary to select a neotype for *H. sardiniensis* from the Sant'Elia Cape specimens (Pl. 2, fig. A) (MZUF no. 5045/1).

Helix quisquiliae PAULUCCI is described as follows: a shell externally ribbed, depressed-globular, slightly keeled, thin, opaque and brown in colour and sparsely flecked; the flecks being small and white and mainly located near the sutures and the keel; sparse caducous irregularly spaced hairs; raised spire; small umbilicus; apex brown, smooth, large and obtuse; $4\frac{1}{2}$ - 5 whorls convex above, regularly growing and distinguished by deep sutures; last whorl descending near the opening and angled; opening small, oblique, slightly lunate, ovate-roundish; peristome straight, simple; columellar margin reflexed.

PAULUCCI stated that her 5 specimens possibly represented an extreme modification of *H. conspurcata* and that they were collected by CAROTI near San Gregorio and Villaputzu. PAULUCCI then wrote that the species was different from that of DRAPARNAUD by virtue of its smaller umbilicus, different spire structure, more globular shape, scarcity of white flecks, stronger ribbing, the last whorl convex above, markedly descending near the opening and the smaller mouth which was more oblique and roundish. The description of the new species according to PAULUCCI was motivated by the fact it lived together with typical *H. conspurcata* «retaining its differential traits». We traced the PAULUCCI typical materials and selected a typical series consisting of the lectotypus (Pl. 2, fig. B) (MZUF no. 5048/1) namely the specimen illustrated in PAULUCCI (1882, Pl. 7, fig. 8) and one paralectotypus (MZUF no. 5048/2). They clearly correspond again to one of the many shell forms of *X. conspurcata*. This was also confirmed by the anatomo-

mical study of many similar specimens collected in different places in Sardinia.

We also stress that specimens anatomically corresponding to *X. conspurcata* (Fig. 2H) collected at Ozieri (Northern Sardinia) together with typical specimens are sometimes without flecks and thus apparently very similar to our new species. Longer hairs (when present) and the smaller umbilicus help in an immediate diagnosis of empty shells (cf. Pl. 2, fig. C and Pl. 3, fig. A).

T. josephi n. sp. is very rare both in the type locality and in the surroundings of Golfo degli Aranci (Sardinia). On La Praiola it has been found living under stones partly covered by litter of maquis vegetation. In Sardinia it lives under stones in grassy places always on rocky (gneiss) sites exposed the North near the sea. This suggests that the night sea mist supplies the humidity that enables it to survive the long dry summer period.

It also seems possible that *T. josephi* n. sp. lives in Corsica. Be this as it may, the species is possibly a palaeoendemism of the Sardo-Corsican complex autonomously dispersed (as hypothesized for many other taxa; see GIUSTI, 1976) in the distant past to the Tuscan Archipelago. Its apparent absence on the island of Capraia (as on other islands of the Archipelago) can be explained by competition on with later immigrants such as *X. conspurcata* which reached Capraia but not the nearby islet of La Praiola.

The genus group taxa *Xeromicra* and *Xerotricha*

In 1892 DI MARIA di MONTEROSATO, among many other taxa of the «*Xerophila*», also described two new «groups»: *Xeromicra* (: 23, line 8, type species: *H. apicina* LAMARCK) and *Xerotricha* (: 23, line 13, type species: *H. conspurcata* DRAPARNAUD).

The main steps in the history of the two taxa are: PILSBRY (1895) considered *Xerotricha* and *Xeromicra* to correspond to the subgenus *Candidula* of *Helicella*; KOBELT (1904) considered them to represent distinct subgenera of *Xerophila*; GERMAIN (1929, 1930) and HESSE (1934) considered *Xerotricha* to be a subgenus of *Helicella* and *Xeromicra* as a synonym of *Helicella* (s.str.); ORTIZ DE ZARATE LOPEZ (1950), considers *Xerotricha* as a subgenus of *Helicella* and without writing anything about *Xeromicra* listed *H. apicina* among the *Helicella* (*Xerotricha*); ZILCH (1960) confirmed *Xerotricha* as a subgenus of *Helicella* and specified *Xeromicra* as junior synonym of *Xerotricha*. After this act, which according to art. 24 and Recommendation 24A of ICZN (1985) corresponds to a first revision of simultaneously published names, many authors referred to *H. apicina* as belonging to genus *Helicella*, subgenus *Xerotricha*.

GITTENBERGER in KERNEY & CAMERON (1980) reopened the case on the basis of the discovery that the dart-sac complex of *H. apicina* was actually formed by two pairs of stylophores, one on each side of the vagina. The inner stylophore of each pair is dartless and so reduced as to be almost invisible. As a consequence GITTENBERGER considered *Xeromicra* to be a subgenus of *Helicopsis*, a genus already known to have two pairs of stylophores on opposite sides of the vagina, although characterized by less reduced and clearly visible inner stylophores.

GIUSTI & CASTAGNOLO (1982) confirmed the anatomical data on *Xeromicra*, but on the basis of the differences in scheme of the dart-sac complex, distinguished *Xeromicra* as a separate genus. Although accepted by some (SCHILEYKO *in litt.*) this opinion has been ignored by other colleagues who continue to regard *Xeromicra* as a subgenus of *Helicopsis* (HOLYOAK, 1983; KERNEY *et al.*, 1983).

All that has happened since 1980 was evidently based on the conviction that *Xerotricha* is really a subgenus of *Helicella* or even a junior synonym (APARICIO & RAMOS, 1987) by virtue of its dart-sac complex composed of two single stylophores on opposite sides of the vagina. This is not so! Our researches have clearly demonstrated that *H. conspurcata* has a dart-sac complex with two pairs of stylophores on opposite sides of the vagina, perfectly corresponding to that of *H. apicina*. As a consequence, *Xerotricha* is not only a distinct genus but also includes (as inferred in the past by some) *Xeromicra* as a synonym.

***Xerotricha*, DI MARIA DI MONTEROSATO, 1982**

Type species: *Helix conspurcata* DRAPARNAUD, 1801 (typus by monotypy)

Synonyms: *Xeromicra* DI MARIA di MONTEROSATO, 1892.

Type species: *Helix apicina* LAMARCK, 1822 (typus by monotypy).

Description

Shell small (max. diam. 5-9 mm; height: 3-5 mm), more or less depressed above, convex below with a low spire of 4 - 6 convex whorls, the last sometimes with a slight shoulder at the periphery, divided by more or less deep sutures. Umbilicus open from small to 1/4 the width of the shell. Mouth oval or rounded, lacking an internal rib. Shell more or less thickened, opaque, brown or greyish-white in colour, sometimes with faint frequently interrupted spiral bands. Transverse ribbing marked and irregular, sometimes giving rise to white flecks. External surface of the protoconch cut by thin longitudinal grooves with traces of hair roots. External surface of the teleoconch with more or less numerous and elongated periostracal hairs, frequently lost in adult specimens; periostracal surface reticulated (*X. conspurcata*) or with longitudinal crests (*X. apicina*).

Genital duct characterized by a short proximal vagina; dart-sac complex formed by two couples of stylophores disposed on approximately opposite sides of the vagina, outer stylophores large, containing slightly curved darts of circular section near the base and oval or rhombic thereafter; the dart tip is wingless or with small traces of wings on only two of the opposite sides (those corresponding to the major axis); between each outer stylophores and the vagina a reduced and poorly visible inner stylophore is present. The two inner stylophores show a compressed inner cavity and are totally dartless; the cavity of the inner stylophores like that of the outer ones opens in the concavity of a tongue-like structure; the two tongue-like structures arise from the external walls of the outer stylophores and

extend into the distal vagina forming a sort of slit encircling the apical portion of the darts. The dart-sac complex is not enveloped in any kind of sheath. The proximal vagina is almost totally embraced by the two groups of stylophores and opens in the centre of the dart-sac complex cavity almost at the level where the two tongue-like structures begin. Digitiform glands present.

The bursa copulatrix duct is of medium length and the initial portion is not flared. Epiphallus longer than the penis, with 3-4 internal pleats. The penis is distally enlarged (where it contains the penial papilla) then narrows (corresponding to the penial papilla apex). The penial apex then continues in a dilatated portion, possibly of the genital atrium, whose upper walls appear to contain glandular tissue and have an internal system of plicae. The penial papilla is almost cylindrical in shape and has an apical opening; its structure in transverse section is variable: *X. conspurcata* shows a central canal continuous with the proximal penis, separated from the external walls of the papilla (which are continuous with the internal walls of the distal penis) by a wide empty space crossed by 3 (near the papilla base) or one (near the papilla apex) tissue bridges; in *X. apicina* the space between the central canal and the external walls is completely filled with tissue. The penial walls level with the basal portion of the papilla show a yellow band indicative of differentiation (perhaps glandular tissue). Strands of tissue starting from where the penial retractor ends and ending almost at the level of the yellow band (in *X. apicina*) or ending just before the penis enters the genital atrium (in *X. conspurcata*) appear to externally wrap the penis in the manner of a sort of very reduced penial sheath. The penial flagellum is short, usually half the length of the epiphallus. The penial nerve seems to arise from the right cerebral ganglion. The right ommatophore retractor is independent of penis and vagina.

Comments

As stressed elsewhere (GIUSTI & MANGANELLI, 1987) the only known characters upon which a classification scheme of the Helicoidea can be based appear at present to be those of the genital apparatus. Like many others and perhaps even more so, these characters unfortunately lend themselves to subjective interpretation and the construction of subjective classification schemes, particularly for systematics above the rank of genus. This is the main reason why, in our most recent papers on groups of the Hygromiidae we have abstained from translating our phylogenetic analyses and hypotheses into taxonomical conclusions, limiting ourselves

Fig. 2. *Xerotricha conspurcata* (DRAPARNAUD). Genital duct and mantle collar in specimens from Valletta Logulentu (Sassari, Sardinia) (A-F) and Ozieri (Sardinia) (G). A: two darts. B-C: a genital duct with two opposite views of the dart-sac complex. D: a penis opened with the penial papilla and two of its sections. E: the mantle collar. F: the digitiform glands. G: the genital duct of the *X. conspurcata* collected at Ozieri with fleckless shell resembling *T. josephi* (shells in Pl. 2, fig. C and Pl. 3, fig. A). Note in D, the «yellow band» (arrow) of the penial wall level with the penial papilla and in B, C, D, G, the gladular area on the genital atrium walls. Symbols as in Fig. 1.

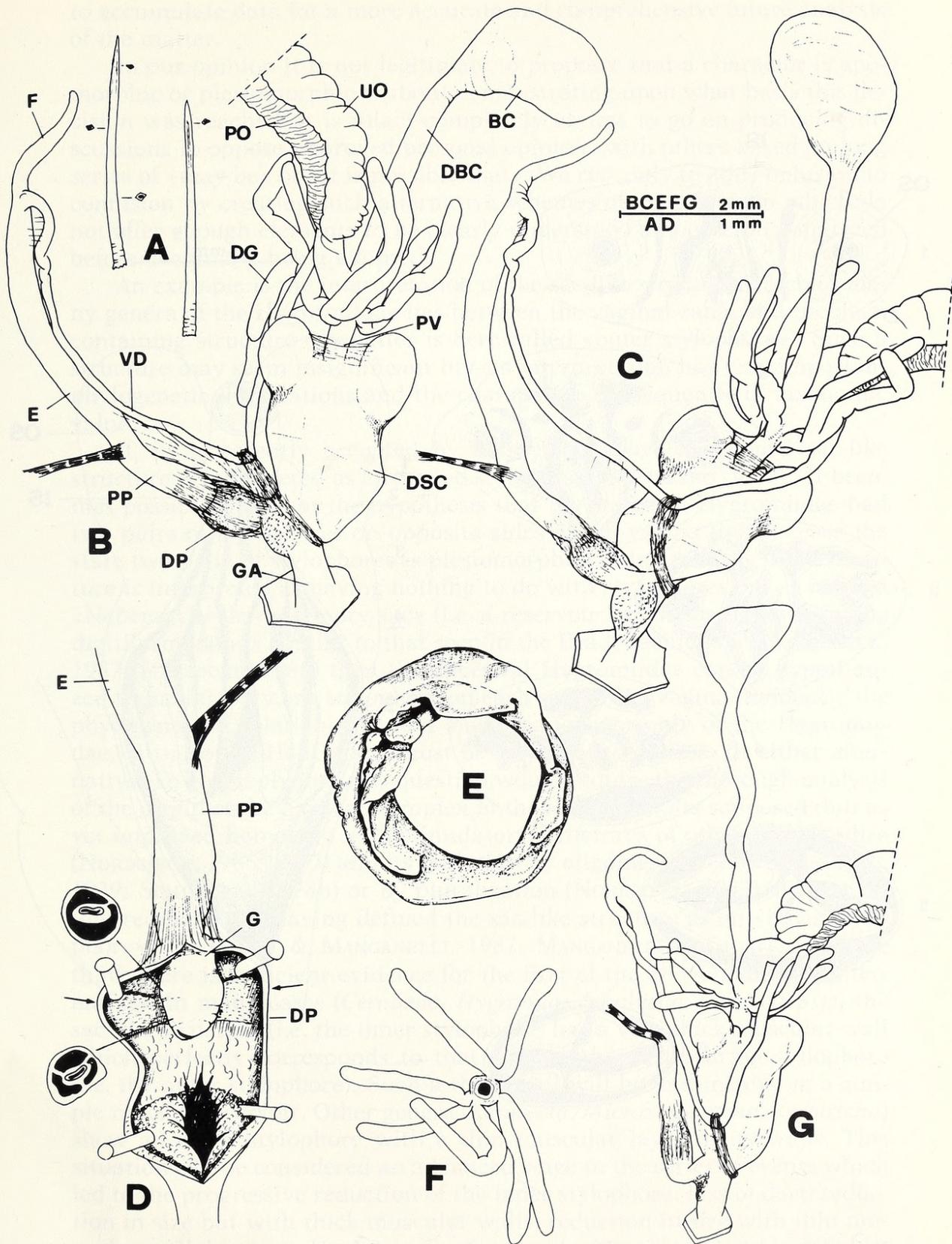


FIG. 2

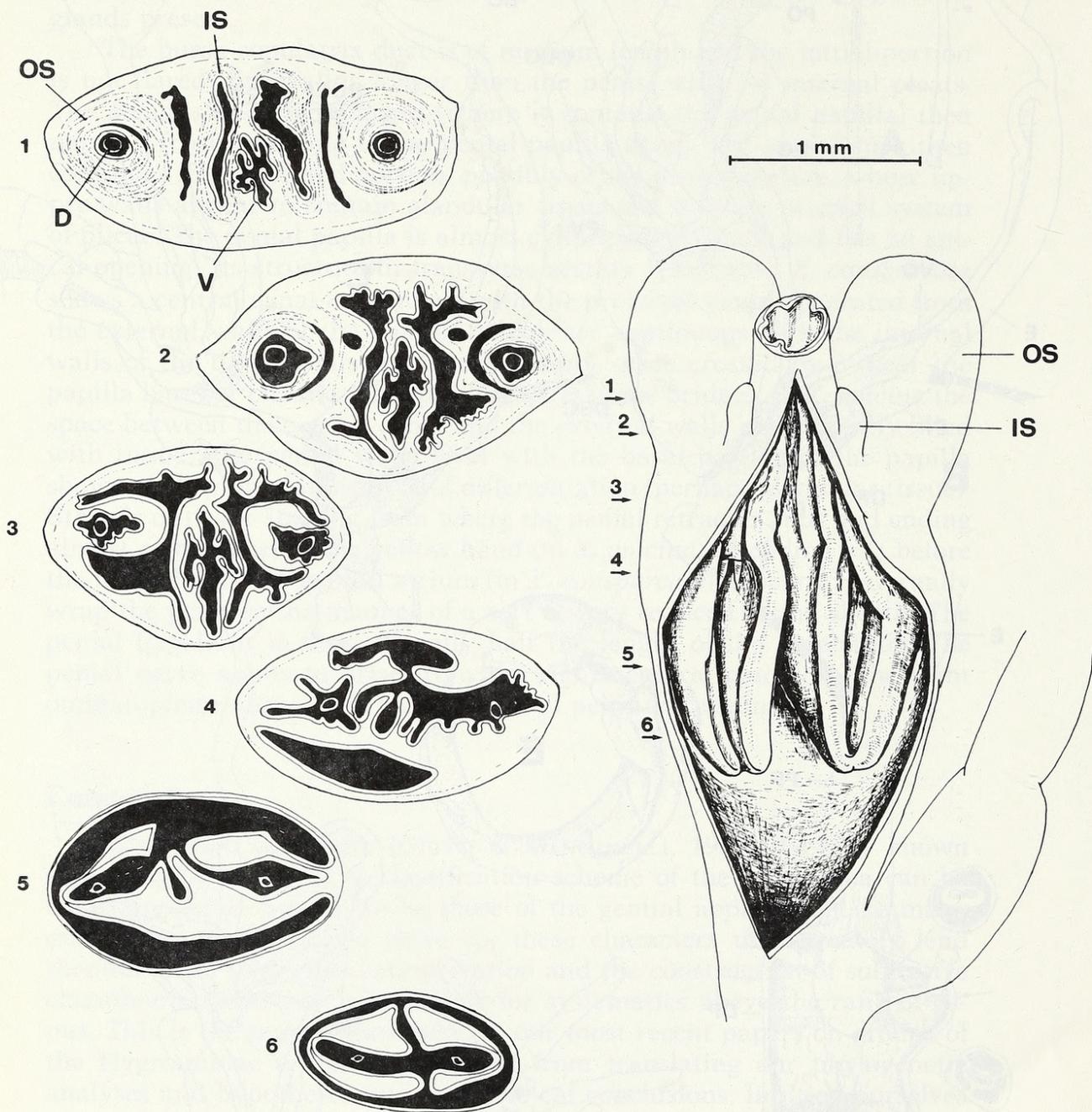


Fig. 3. *Xerotricha conspurcata* (DRAPARNAUD). Structure of the dart-sac complex in specimens from Valletta Logulentu (Sassari, Sardinia). On the right the vagina opened to show the two large tongue-like structures into which the stylophores open and the dart tip protrudes. On the left six transverse sections of the dart-sac complex (levels indicated). Symbols as in Fig. 1.

to accumulate data for a more accurate and comprehensive future analysis of the matter.

In our opinion it is not legitimate to propose that a character is apomorphic or plesiomorphic without demonstrating upon what basis this decision was reached. It is in fact completely useless to go on producing discussions to oppose unproved personal opinions with others based on long series of «may be» or «it is possible that». We risk only to add confusion to confusion by creating such alternative schemes of classification which do not offer enough elements to be clearly understood and carefully analyzed before eventually being adopted.

An example is the interpretation of the sac-like structure which in many genera of the Hygromiidae lies between the vaginal canal and the dart-containing structure (the latter is here called «outer stylophore»). Such a structure may seem insignificant but its interpretation has very important phylogenetic implications and the character is consequently of taxonomic value.

If, as is recently accepted by many, the above mentioned sac-like structure is interpreted as a reduced stylophore (SCHILEYKO, 1978b) it becomes possible to accept the hypothesis that the ancestral Hygromiidae had two pairs of stylophores on opposite sides of the vagina (in this case the state two pairs of stylophores is plesiomorphic). If instead, the same structure is interpreted as having nothing to do with stylophores but as being a «Nebensack» or «accessory sac» (i.e. a reservoir for mucus secreted by the digitiform glands similar to that seen in the Bradybaenidae; cf. NORDSIECK, 1987; HAUSDORF, 1988) then the ancestral Hygromiidae can be hypothesized as having only one stylophore on each side of the vagina. Evidently the phylogenetical relationships and classification not only of the Hygromiidae, but also the Helicoidea, must be carefully adapted to fit either alternative. To go deeply into this question would require the thorough analysis of the origin of the dart-sac complex in the Helicoidea, its supposed (but as yet unproved homology with stimulatory structures of other Sigmurethra (NORDSIECK, 1985, 1987) and its evolution by oligomerization (VON IHERING, 1929; SCHILEYKO, 1978b) or by pluralization (NORDSIECK, 1987). As may be inferred from our having defined the sac-like structure as an «inner stylophore» (see GIUSTI & MANGANELLI, 1987; MANGANELLI & GIUSTI, 1988) we think there is sufficient evidence for the first of the above two cited alternatives. In many cases (*Cernuella*, *Hygromia*, *Zenobiella*, *Cernuellopsis*) the sac-like structure (i.e. the inner stylophore) has a very thick muscular wall which perfectly corresponds to that seen in the dart-bearing stylophore (i.e. the outer stylophore). Such a thick wall will be unthinkable in a simple mucous reservoir. Other genera (*Xerosecta*, *Microxeromagna*, *Xerotricha*) show an inner stylophore with a thin muscular layer in its walls. This situation can be considered an advanced stage in the series of events which led to the progressive reduction of the inner stylophore: loss of dart, reduction in size but with thick muscular walls, reduction in size with thin muscular walls, great reduction in size so as to become almost unidentifiable, total loss. Inversion of the phenomenon is clearly impossible. The fact that the sac-like structure has never been found to contain a dart (NORDSIECK, 1987: 13) does not prove that it is not a reduced stylophore. Vaginal struc-

tures regarded by all as reduced stylophores (the appendicula of *Monacha*, *Euomphalia* and *Trochoidea*) have never been found to contain darts! We can thus imagine that representatives of the ancestral group of the Hygro-miidae (the Trichiinae sensu SCHILEYKO) in which four stylophores each with dart were present, are now totally extinct.

In the light of the above interpretation *Xerotricha* appears to have a dart-sac complex formed by two pairs of stylophores on opposite sides of the vagina. The two inner stylophores are externally visible only from one of the larger sides of the dart-sac complex, although they extend internally almost symmetrically on the two opposite sides of the vagina, and are laterally compressed by the large outer stylophores (Figs. 2-5, 9A-B). The cavity of the inner stylophores is lined by a monostratified epithelium of cylindrical cells which totally corresponds to that lining the cavity and the pleats of the outer stylophore. The same cavity opens in the groove of the two large tongue-like structures opposite which accomodates the tip of the darts secreted by the outer stylophores. The tongue-like structures have long tips having independent apices. The dart-sac complex of *Helicella* (Figs. 6-7, 9C) differs by virtue of more developed outer stylophores and the extreme reduction of the inner stylophores which are no longer externally visible. All that remains of them is probably two small cavities located between the outer stylophores and the terminal portion of the vaginal canal.

In transverse sections of the dart-sac complex of *Helicella itala* an elliptical septum (missing in *Xerotricha*) can be seen on each side. These are the extension of the internal wall of the outer stylophore and separate the dart cavity from the small inner cavity (reduced inner stylophores). Tongue-like structures are also present in this species, but are connected right up to the tip to form a continuous pleated tube into which the vaginal canal opens.

Xerotricha differs from *Helicella* not only in the above described characters of the dart-sac complex, but because the penial nerve apparently originates from the right cerebral ganglion (from right pedal ganglion in *Helicella*) (see also HAUSDORF, 1988)¹. It is worth emphasizing that this character is still difficult to evaluate because, as stated by FRANC (1968: 473), although the penial nerve emerges from the right cerebral ganglion, it originates in the right pedal ganglion.

Another difference between *Xerotricha* and *Helicella* is the presence in the former of a glandular portion situated on the genital atrium wall near the end of the penis.

From the above discussion it appears that *Xerotricha* and *Helicella* are closely related, but as this is another of the border-lines cases to which we

¹ In the light of our research the differences between *Xerotricha* and *Helicella* pointed out by ORTIZ DE ZARATE LOPEZ (1950) seem inconsistent or of little value.

Fig. 4. *Xerotricha apicina* (LAMARCK). Genital duct with some of its portions in specimens collected at Cardo (Corsica). A-B: a genital duct with two opposite views of the dart-sac complex. C: the dart. D: the digitiform glands. E: a penis opened with the penial papilla and one of its sections. Note in A, B, E, the glandular area on the genital atrium walls and in E, the «yellow band» of the penial walls (arrow). Symbols as in Fig. 1.

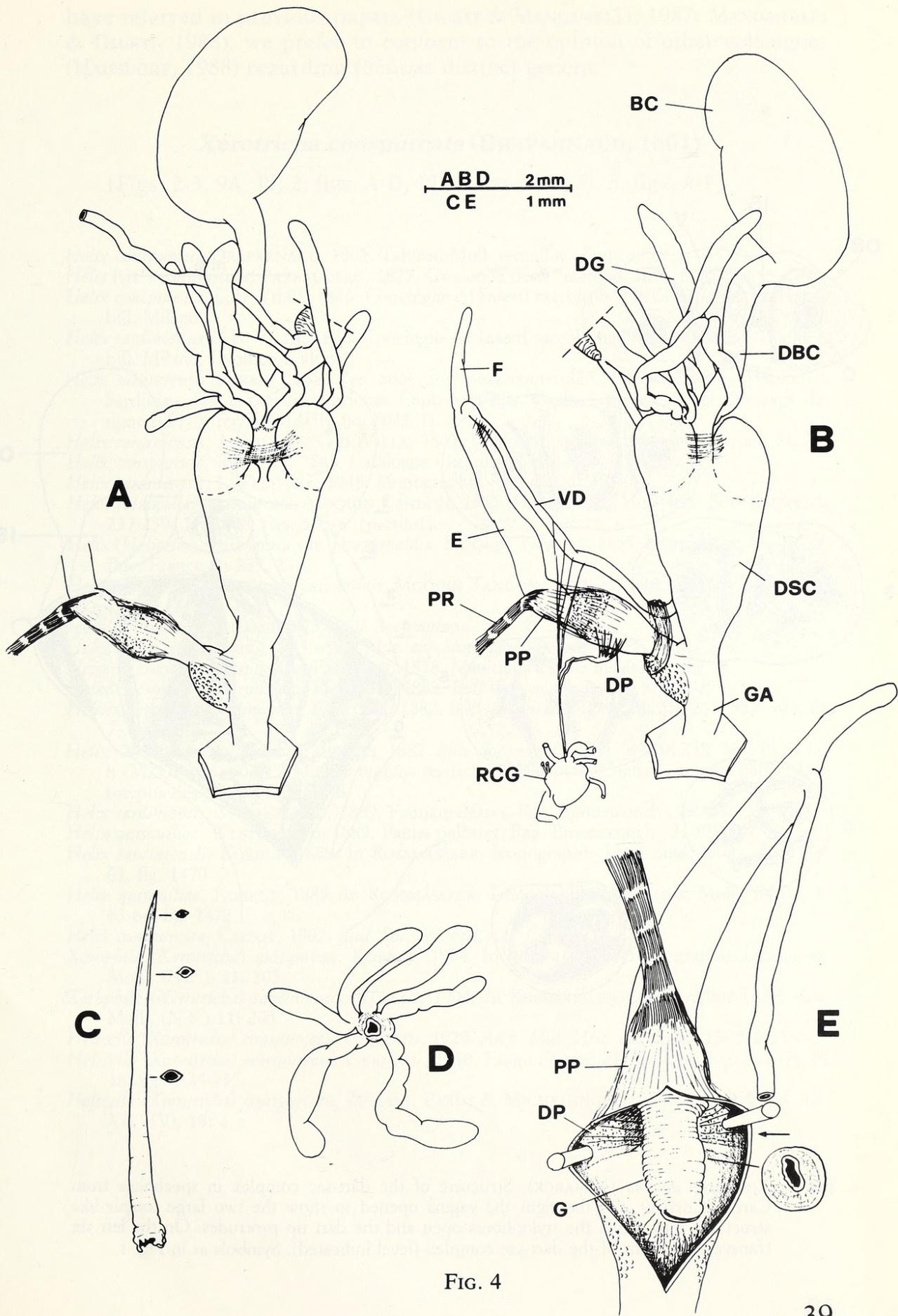


FIG. 4

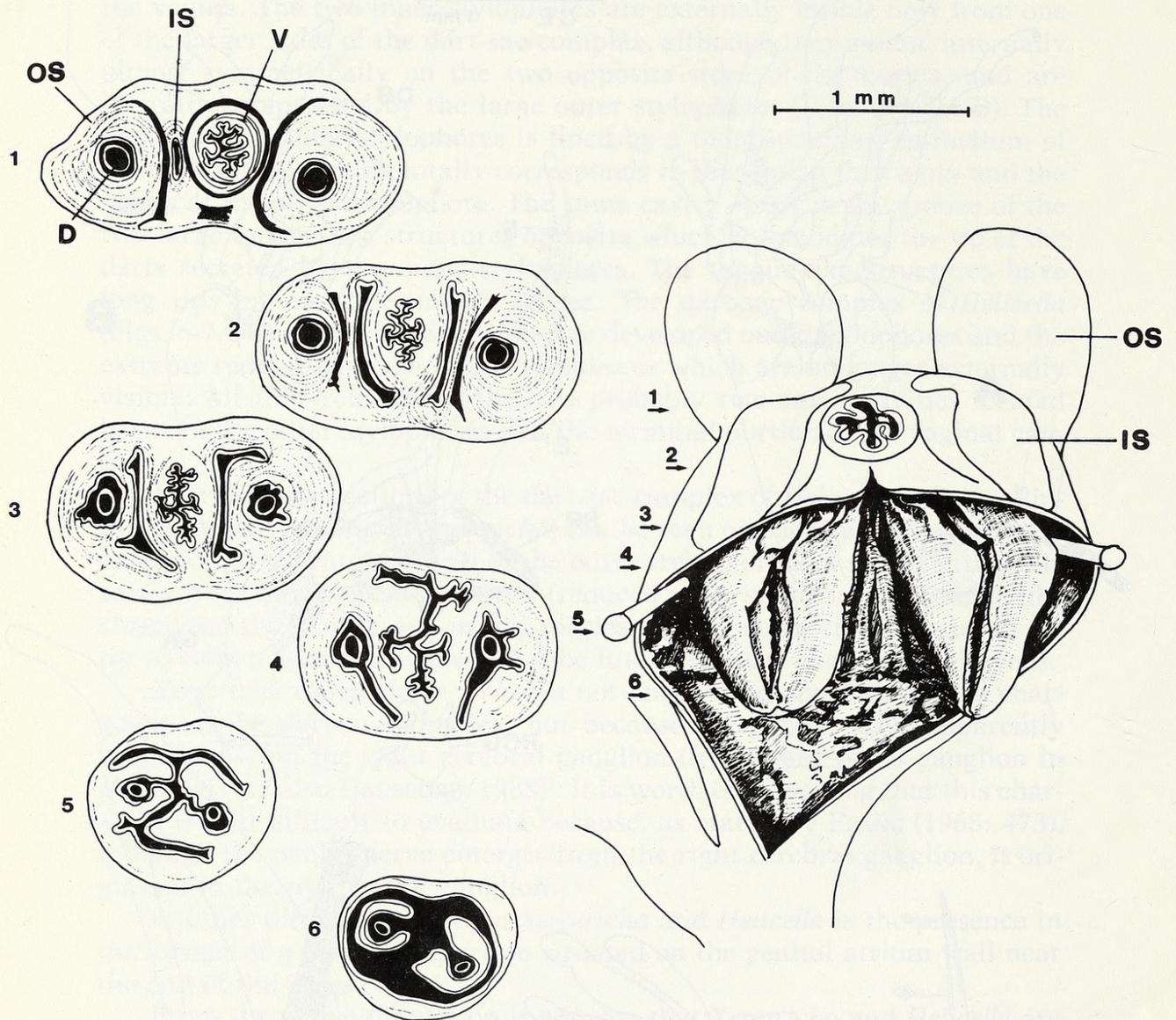


Fig. 5. *Xerotricha apicina* (LAMARCK). Structure of the dart-sac complex in specimens from Cardo (Corsica). On the right the vagina opened to show the two large tongue-like structures into which the stylophores open and the dart tip protrudes. On the left six transverse sections of the dart-sac complex (level indicated). Symbols as in Fig. 1.

have referred in previous papers (GIUSTI & MANGANELLI, 1987; MANGANELLI & GIUSTI, 1988), we prefer to conform to the opinion of other colleagues (HAUSDORF, 1988) regarding them as distinct genera.

***Xerotricha conspurcata* (DRAPARNAUD, 1801)**

[Figs. 2-3, 9A; Pl. 2, figs. A-D; Pl. 3, figs. A-C; Pl. 5, figs. A-F]

- Helix conspurcata* DRAPARNAUD, 1801. Tableau Moll. terr. fluv. France: 93.
Helix (sic!) *conspurcata*, PAYRAUDEAU, 1827. Catalogue descr. method. Ann. Moll. Corse: 101.
Helix conspurcata, G.B. VILLA, 1836. Conchiglie ed Insetti raccolti nell'Isola di Sardegna. Handbill, Milano.
Helix sardiniensis G.B. VILLA, 1836. Conchiglie ed Insetti raccolti nell'Isola di Sardegna. Handbill, Milano. [Nomen nudum!]
Helix sardiniensis PORRO, 1838. *Rev. zool. Soc. Cuvierenne*: 225. Locus typicus: «Habitat in Sardinia». Locus typicus restrictus: Capo Sant'Elia, Cagliari, present paper; Neotype designed, Pl. 3, fig. A (MZUF, no. 5045/1).
Helix sardiniensis, A. VILLA & G.B. VILLA, 1841. Dispositio systematica Conchyliarum: 54.
Helix conspurcata, REQUIEN, 1848. Catalogue Coquilles Corse: 46.
Helix sardiniensis, L. PFEIFFER, 1848. Monographia Hel. viv., 1: 39-40.
Helix (*Helicella*) *conspurcata*, MOQUIN TANDON, 1855. Histoire nat. Moll. terr. fluv. France, 2: 237-239; 3: Pl. 18, figs. 1, 3-6. [partim!].
Helix (*Helicella*) *conspurcata* var. *Draparnaldia*, MOQUIN TANDON, 1855. Histoire nat. Moll. terr. fluv. France, 2: 237, 238.
Helix (*Helicella*) *conspurcata* var. *minor*, MOQUIN TANDON, 1855. Histoire nat. Moll. terr. fluv. France, 2: 237, 238.
Helix conspurcata, ADAMI, 1873. *Bull. Soc. malacol. ital.*, 2: 220.
Helix conspurcata, ISSEL, 1873. *Ann. Mus. civ. Stor. nat. Genova*, 4: 275.
Helix (*Xerophila*) *conspurcata*, PAULUCCI, 1878. Matériaux Faune malacol. Italie: 6.
Helix (*Xerophila*) *conspurcata*, PAULUCCI, 1882. *Bull. Soc. malacol. ital.*, 8: 255-256, 367.
Helix (*Xerophila*) *sardiniensis*, PAULUCCI, 1882. *Bull. Soc. malacol. ital.*, 8: 256-258, 355, 367, Pl. 7, fig. 7.
Helix (*Xerophila*) *quisquiliae* PAULUCCI, 1882. *Bull. Soc. malacol. Ital.*, 8: 258-259, 367, Pl. 7, fig. 8 (MZUF, no. 5048/1). Locus typicus restrictus: Villaputzo, Cagliari, present paper; Lectotypus designed, Pl. 2, fig. B.
Helix sardiniensis, WESTERLUND, 1889. Fauna paläarct. Reg. Binnenconch., 2: 305.
Helix quisquiliae, WESTERLUND, 1889. Fauna paläarct. Reg. Binnenconch., 2: 305.
Helix sardiniensis, KOBELT, 1889. In ROSSMÄSSLER: Iconographie Land.-suss. Moll., (N.F.), 8: 63, fig. 1470.
Helix quisquiliae, KOBELT, 1889. In ROSSMÄSSLER: Iconographie Land.-suss. Moll., (N.F.), 8: 63-64, fig. 1472.
Helix conspurcata, CAZIOT, 1902. *Bull. Soc. Sci. hist. nat. Corse*: 210.
Xerophila (*Xerotricha*) *quisquiliae*, KOBELT, 1904. In ROSSMÄSSLER: Iconographie Land.-suss. Moll., (N.F.), 11: 205.
Xerophila (*Xerotricha*) *sardiniensis*, KOBELT, 1904. In ROSSMÄSSLER: Iconographie Land.-suss. Moll., (N.F.) 11: 205.
Helicella (*Xerotricha*) *conspurcata*, GERMAIN, 1929. *Arch. Mus. Hist. nat. Lyon*, 13: 316-318.
Helicella (*Xerotricha*) *conspurcata*, GERMAIN, 1930. *Faune France*, 21: 281-282, Fig. 211 (?), Pl. 18, figs. 234-235.
Helicella (*Xerotricha*) *conspurcata*, ZULLINI, PARISI & MICHELANGELI, 1968. *Rend. Accad. naz. XL*, (IV), 18: 6.

- Helicella (Xerotricha) conspurcata*, ALZONA, 1971. *Atti Soc. ital. Sci. nat. Mus. civ. Stor. nat. Milano*, **111**: 171.
- Helicella (Xerotricha) sardiniensis*, ALZONA, 1971. *Atti Soc. ital. Sci. nat. Mus. civ. Stor. nat. Milano*, **111**: 172.
- Helicella (Xerotricha) quisquiliae*, ALZONA, 1971. *Atti Soc. ital. Sci. nat. Mus. civ. Stor. nat. Milano*, **111**: 172.
- Xerotricha conspurcata*, GIUSTI & CASTAGNOLO, 1983. *Lav. Soc. ital. Biogeogr.*, (N.S.), **8**: 234.
- Helicella (Xerotricha) conspurcata*, HOLYOAK, 1983. *J. Conchol.*, **31**: 245-246.

Material examined:

CORSICA: Ajaccio, HAGENMÜLLER leg. (n), MHNM; Aleria, 30.XI.83 (7); Bastia, 29.XI.83 (1); Bastia, PINTER leg. 10.VIII.77 (1); Bocognano, 2.XII.83 (2); Bonifacio, 1.XII.83 (11); Bonifacio, BODON leg. 27.III.84 (1); Bonifacio, HAGENMÜLLER leg. (n), MHNM; Bonifacio, PINTER leg. 8.VIII.77 (n); Bravone, 30.XI.83 (6); Castifao, BODON leg. 31.IV.84 (6); Castiglione, Sabara cave, 22.VII.79 (1); Francardo, 7.IV.70 (n), 2.XII.83 (3); Ghisonaccia, 30.XI.83 (2); Novella, BODON leg. 25.III.84 (4); Omessa, Serra a la Figa, BODON leg. 26.III.84 (2); Olmeto, 1.XII.83 (7); Pianottoli Calderello, 2.XII.83 (7); Pioggiola, 9.IV.70 (3); Porto Vecchio, HAGENMÜLLER leg. (n), MHNM; Propiano, TAITI & CAMPANILI leg. (1); Saint Florent, 8-9.IV.70 (2), 3.XII.83 (6); Saint Florent, BODON, leg. 9.IV.84 (2).

SARDINIA: Asuni, CASTAGNOLO leg. 1.V.87 (n); Bosa, San Pietro Extramuros, PINTER leg. 6.VII.81 (1); Buggeru, 20.XI.86 (3); Cagliari, PIRAS & PUDDU leg. 3.IX.71 (1); Cagliari, Sant'Elia Cape, CAROTI leg. V.1879 (2 sps., one of which has been selected as neotype for *Helix sardiniensis* PORRO) PAULUCCI 1882 det. as *H. sardiniensis*, PAULUCCI Coll., MZUF no. 5045/1-2; Cagliari, Colle di Torremannu, PUDDU leg. 7.II.72 (7); Cagliari, Torre Pisana, PINTER leg. 29.VIII.81 (1); Cagliari, San Gregorio, CAROTI leg. V.1879 (3) PAULUCCI 1882 det. *H. quisquiliae*, PAULUCCI Coll., MZUF no. 5046/1-3; Cagliari, San Gregorio, CAROTI leg. V.1879 (3) PAULUCCI 1882 det. *H. sardiniensis* PAULUCCI Coll., MZUF no. 5047/1-3; Cagliari, Vipera Cave, PINTER leg. 3.IV.78 (n); Cala Gonone, 2.V.69 (5); between Caletta and Siniscola, LANZA leg. 22.IV.79 (11); Caprera I., 24.V.85 (6); Desulo, 1.IV.78 (3); Domusnovas, PINTER leg. 3.IV.78 (3); 29.VIII.81 (2); Dorgali, Bardia Mount, PINTER leg. 29.III.78 (9); Giardinelli I., CESARACCIO & MUZZU leg. 15.III.87 (2); Ierzu, PINTER leg. 1.VII.81 (n); between Isili and Nurallao, PINTER leg. 30.VI.81 (n); Laconi, 2.V.75 (1); Laconi, PINTER, leg. 2.VII.81 (8); Lago Coghinias, 28.III.77 (1); La Maddalena I., 24.IX.85 (n); La Maddalena I., MINELLI leg. 23.IX.85 (1); Lanusei, NIENHUIS leg. 11.I.72 (7); Molara I., COBOLLI & LUCARELLI leg. 28.IX.85 (1); Molarotto I., 28.IX.85 (1); Monastir, PINTER leg. 29.VIII.81 (1); Olbia, 31.III.77 (3); Orosei, CEI leg. VII.83 (2); Ozieri, 26.III.76 (1); 31.III.77 (2), 23.IV.85 (n); Perdasdefogu, Angurtidorgeddu Cave, PUDDU leg. 24.VII.71 (1); Perdaxius, 22.III.76 (n); Portorotondo, 23.XI.86 (1); Pula, ruins of Nora, PINTER leg. 7.VII.81 (1); between Pula and Sarroch, 24.III.76 (5); Sa Duchessa, 21.III.76 (5); Santa Maria I., 26.IX.85 (5); Santa Maria I., MINELLI leg. 26.IX.85 (5); Sant'Antioco I., Cannai, 1.V.75 (6); Sant'Isidoro Teulada, 24.III.76 (1); Sassari, 19.XI.86 (n); Sassari, Valletta Logolentu, 19.XI.86 (n); Siniscola, 23.XI.86 (1); Su Gologone, PINTER leg. 3.VII.81 (n); Tavolara I., 27.IX.85 (3); Tertenia, Ponte Corongiu, 4.IV.78 (1); Ulassai, PINTER leg. 1.VII.81 (2); Villaputzu, CAROTI leg. V.1879 (lectotypus and paralectotypus of *H. quisquiliae* PAULUCCI) PAULUCCI 1882 det. as *H. quisquiliae*, PAULUCCI Coll., MZUF no. 5048/1-2; Villico Mount, 26.III.77 (4).

Fig. 6. *Helicella itala* (LINNAEUS). Genital duct and mantle collar in specimens collected at Nieva de Cameros (La Roja, Spain), C.E. PRIETO leg. 27.X.84. A: the genital duct. B: the mantle collar. C: the talon. D: two darts. E: a vagina opened to show its inner structure. F: a penis opened to show the penial papilla and the inner structure of the penial walls with a section of the epiphallus and of the proximal penis on the left and three different sections of the penial papilla on the right. Note also the band of glandular tissue in the walls level with the penial papilla (arrow). Symbols as in Fig. 1.

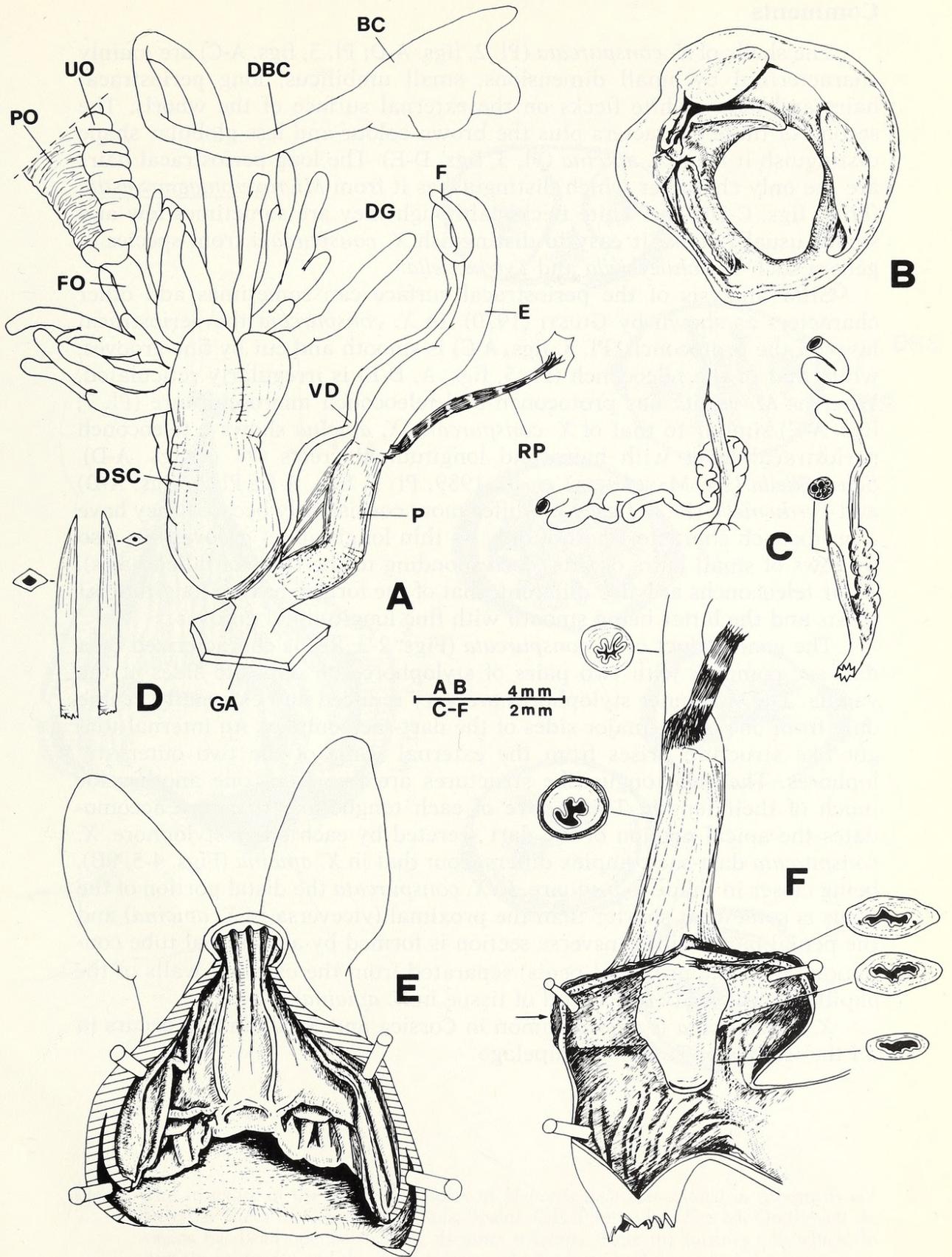


Fig. 6

Comments

The shells of *X. conspurcata* (Pl. 2, figs. A-D; Pl. 3, figs. A-C) are mainly characterized by small dimensions, small umbilicus, long periostracal hairs and many white flecks on the external surface of the whorls. The second of these characters plus the brown colour and less globular shape distinguish it from *X. apicina* (Pl. 3, figs. D-E). The long periostracal hairs are the only character which distinguishes it from *Microxeromagna vestita* (Pl. 1, figs. C-D). The white flecks (although they are sometimes few and small) usually make it easy to distinguish *X. conspurcata* from species of genera such as *Schileykiella* and *Tyrrheniella*.

SEM analysis of the periostracal surface can sometimes add other characters as shown by GIUSTI (1970). In *X. conspurcata* the periostracal layer of the protoconch (Pl. 5, figs. A-C) is smooth and cut by fine grooves, while that of the teleoconch (Pl. 5, figs. A, D-F) is irregularly reticulated. Whereas *M. vestita* has protoconch and teleoconch microsculpture (Pl. 7, figs. A-E) similar to that of *X. conspurcata*, *X. apicina* shows a teleoconch periostracal layer with hairs and longitudinal crests (Pl. 6, figs. A-D). *Schileykiella* (see MANGANELLI *et al.*, 1989, Pl. 3, figs. A-D; Pl. 4, figs. A-D) and *Tyrrheniella* (Pl. 4, figs. A-E) differ more consistently because they have a protoconch characterized not only by thin longitudinal grooves but also by rows of small hairs or pits (corresponding to the roots of fallen hairs). Their teleoconchs are also different, that of the former having longitudinal crests and the latter being smooth with fine longitudinal grooves.

The genital duct of *X. conspurcata* (Figs. 2-3, 9A) is characterized by a dart-sac complex with two pairs of stylophores on opposite sides of the vagina. The two inner stylophores are very reduced and externally visible only from one of the major sides of the dart-sac complex. An internal tongue-like structure arises from the external walls of the two outer stylophores. The two tongue-like structures are free from one another for much of their length. The groove of each tongue-like structure accommodates the apical portion of the dart secreted by each outer stylophore. *X. conspurcata* dart-sac complex differs from that in *X. apicina* (Figs. 4-5, 9B), being closer in shape to a square. In *X. conspurcata* the distal portion of the penis is somewhat shorter than the proximal (viceversa in *X. apicina*) and the penial papilla in transverse section is formed by an internal tube continuous with the proximal penis) separated from the external walls of the papilla by an empty space (full of tissue in *X. apicina*).

X. conspurcata is very common in Corsica and Sardinia and occurs in all the islands of Tuscan Archipelago.

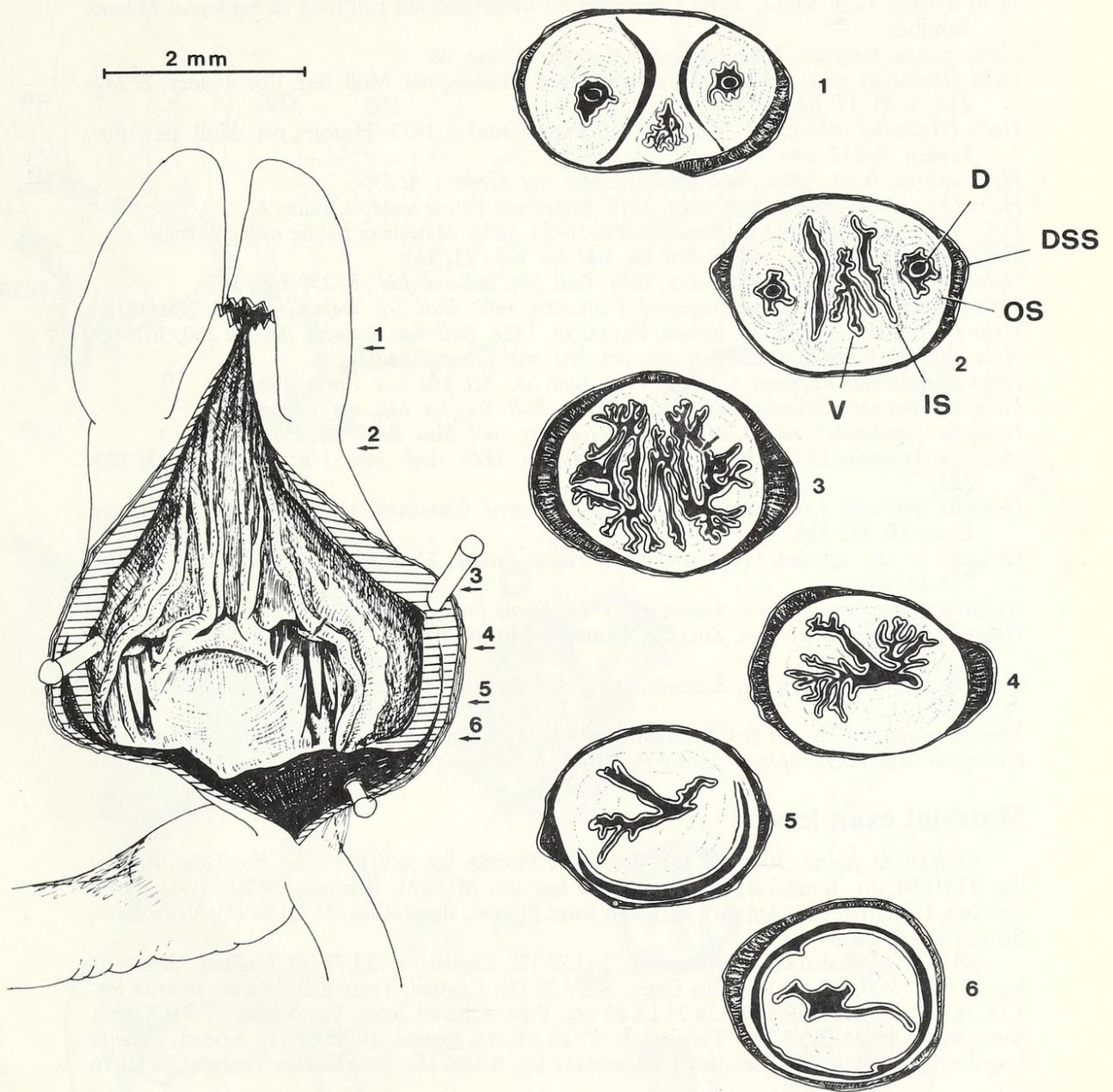


Fig. 7. The structure of the dart-sac complex of *Helicella itala* (LINNAEUS) in specimens collected at Nieva de Cameros (La Roja, Spain), C.E. PRIETO leg. 27 x 84. On the left the vagina has been opened to show its inner structure. Note the furrows into which the dart tip protrudes and the small tongue which separates the cavity of the arrow outer from that of the inner stylophore. On the right six different sections (levels indicated) Symbols as in Fig. 1.

Xerotricha apicina (LAMARCK, 1822)

(Figs. 4-5, 9B; Pl. 3, figs. D-E; Pl. 6, figs. A-E]

- Helix apicina* LAMARCK, 1822. Histoire nat. animaux. sans vert., 6 (2): 93.
Helix apicina, G.B. VILLA, 1836. Conchiglie ed Insetti raccolti nell'Isola di Sardegna. Milano, handbill.
Helix apicina, Requien, 1848. Catalogue Coquilles Corse: 46.
Helix (Helicella) apicina, MOQUIN TANDON, 1855. Histoire nat. Moll. terr. fluv. France, 2: 232-234; 3: Pl. 17, figs. 29-35.
Helix (Helicella) apicina var. *Requieni* MOQUIN TANDON, 1855. Histoire nat. Moll. terr. fluv. France, 3: 232, 234.
Helix apicina, ISSEL, 1873. Ann. Mus. civ. Stor. nat. Genova, 4: 275.
Helix (Xerophila) apicina, PAULUCCI, 1878. Matériaux Faune malacol. Italie: 6.
Helix (Xerophila) apicina var. *Requieni*, PAULUCCI, 1878. Matériaux Faune malacol. Italie: 6.
Helix apicina, MAGRETTI, 1879. Atti Soc. ital. Sci. nat., 21: 461.
Helix (Xerophila) apicina, PAULUCCI, 1882. Bull. Soc. malacol. ital., 8: 259-260, 367.
Helix (Xerophila) apicina var. *Requieni*, PAULUCCI, 1882. Bull. Soc. malacol. ital., 8: 260, 367.
Helix (Xerophila) apicina var. *hirsuta*, PAULUCCI, 1882. Bull. Soc. malacol. ital., 8: 260, 367.
Helix Apicina, CAZIOT, 1902. Bull. Soc. Sci. hist. nat. Corse: 208-209.
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Helicella (Helicella [Xeromicra]) apicina var. *Requieni*, GERMAIN, 1929. Arch. Mus. Hist. nat. Lyon, 13: 322-323.
Helicella (s. str.) *apicina*, GERMAIN, 1930. Faune France, 21: 284-285, Fig. 212, Pl. 17, figs. 213-214.
Helicella apicina var. *requieni*, GERMAIN, 1930. Faune France, 21: 285.
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Xeromicra apicina, GIUSTI & CASTAGNOLO, 1983. Lav. Soc. ital. Biogeogr., (N.S.), 8: 234.
Helicopsis (Xeromicra) apicina, HOLYOAK, 1983. J. Conchol., 31: 246.

Material examined:

CORSICA: Aleria, 30.XI.83 (3); Bonifacio, PINTER leg. 8.VIII.77 (6); Bonifacio, BODON leg. 27.III.84 (6); Bonifacio, HAGENMÜLLER leg. (n), MHNM; Bravone, 30.XI.83 (3); Porto Vecchio, HAGENMÜLLER leg. (n), MHNM; Saint Florent, BODON leg. 31.III.84 (1); Venzolasca, BODON leg. 29.III.84 (1).

SARDINIA: Arbatax, NIENHUIS leg. 26.I.72 (7); Cagliari, 16.XI.72 (5); Cagliari, NIENHUIS leg. 14.I.72 (3); Cagliari, Sant'Elia Cape, 30.IV.75 (2); Cagliari, Torre dell'elefante, PINTER leg. 4.IV.78 (n); La Maddalena I., 24-25.IX.85 (4); Pula, ruins of Nora, PINTER leg., 7.VII.81 (n); Santa Maria I., 26.IX.85 (n); Tavolara I., 27.IX.85 (1); Sassari, 19.XI.85 (1); Sassari, Valletta Logolentu, 19.XI.86 (3); Tavolara I., PORCELLI leg. 8.4.86 (3); Sant'Isidoro Teulada, 24.III.76 (2).

Fig. 8. *Helicopsis striata* (MÜLLER). Genital duct and mantle collar in specimens collected at Öland, parish Persnäsa (Jordhamn, Sweden), J. JEPSON leg. 22.V.83. (Göteborgs Naturhistoriska Museum Gen. Kat. nr. 83-16785). A: the genital duct (gonad, hermaphrodite duct and part of the ovispermiduct excluded). B: two opposite views of the distal genital duct (the digitiform glands have been removed). C: the vagina has been opened to shows its inner structure. D: the distal penis with the penial papilla. Note the basal pore through which the cavity of the proximal penis communicates with that of the distal penis (arrow). E: the mantle collar. F: the penis has been opened to show the penial papilla and the inner structure of the proximal penis. H: a section of the proximal penis. G: two sections of the penial papilla. Symbols as in Fig. 1.

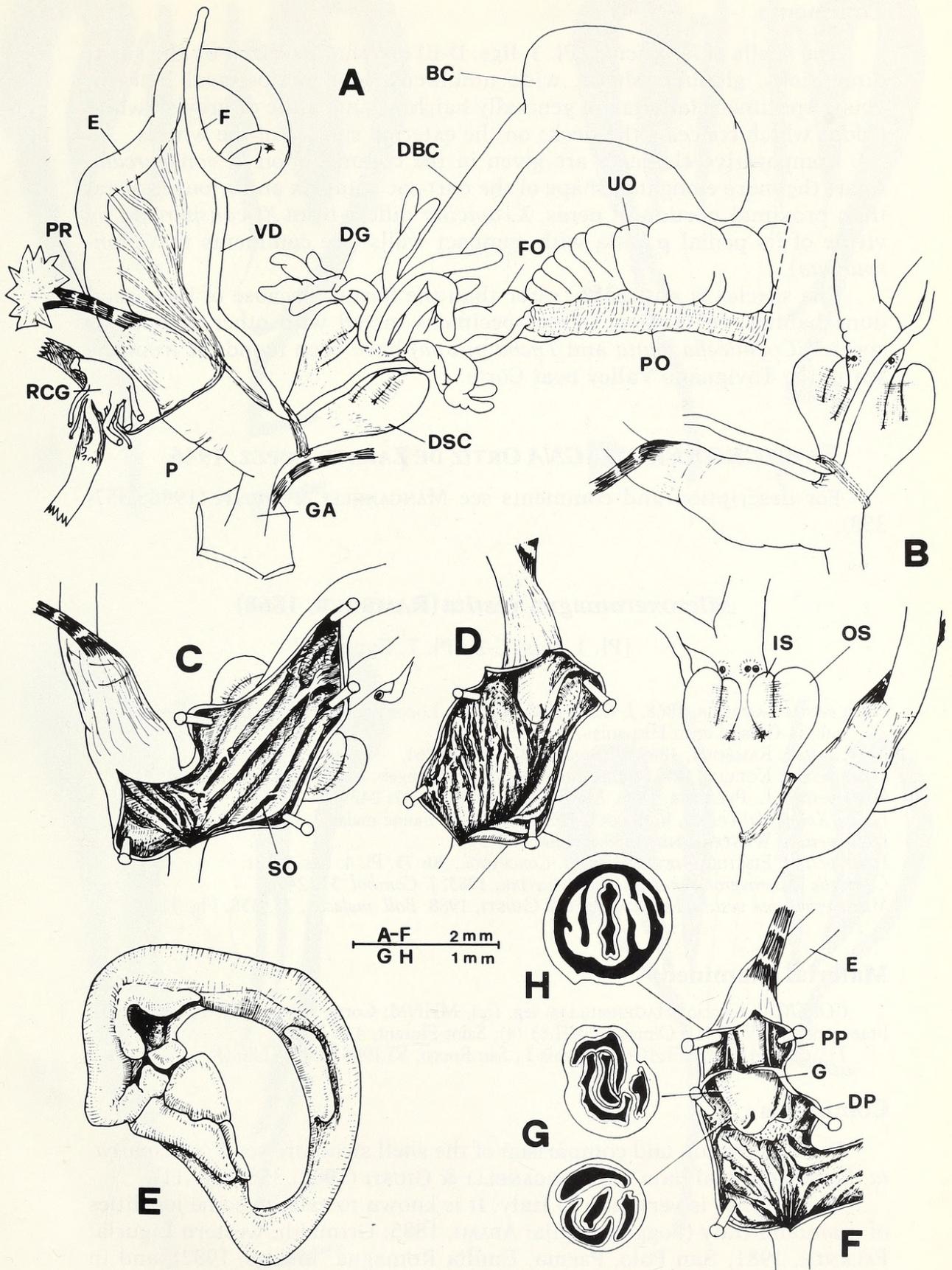


Fig. 8

Comments

The shells of *X. apicina* (Pl. 3, figs. D-E) are characterized by the small dimensions, globular shape, wide umbilicus, long periostracal hairs in young specimens (adults are generally hairless) and white or greyish-white colour which conceals the flecks on the external surface of the whorls.

Comparative elements are given in the comments on *X. conspurcata*. Apart the more elongated shape of the dart-sac complex and a longer distal than proximal portion of penis, *X. apicina* differs from *X. conspurcata* by virtue of its penial papilla with compact walls (see comments to *X. conspurcata*).

The species is noticeably rarer than the former because of its coastal dune habitat. In Corsica, living specimens mixed with other dunicolous species (*Cochlicella acuta* and *Theba pisana*) have been found far from the sea in the Tavignano Valley near Corte.

MICROXEROMAGNA ORTIZ DE ZARATE LOPEZ, 1946

For description and comments see MANGANELLI & GIUSTI (1988: 357-358).

Microxeromagna vestita (RAMBOUR, 1868)

[Pl. 1, figs. C-D; Pl. 7, figs. A-E]

Helix vestita RAMBOUR, 1868. *J. Conchyliol.*, **16**: 267. Locus typicus: «Habitat in Gallia meridionali, in Corsica et in Hispania».

Helix vestita, RAMBOUR, 1869. *J. Conchyliol.*, **17**: 259-261.

Helix vestita, KOBELT, 1871. *Catalog europäisch. Faunengeb. lebenden Binneconchyl.*: 23.

Helix vestita, L. PFEIFFER, 1876. *Monographia Hel. viv.*, **7**: 242.

Helix (Xerophila) vestita, PAULUCCI, 1878. *Materiaux Faune malacol. Italie*: 6.

Helix vestita, WESTERLUND, 1889. *Fauna*, **2**: 305.

Helix vestita, FISCHER PIETTE, 1950. *J. Conchyliol.*, **90**: 73, Pl. 4, figs. 59-61.

Cerneuella (Microxeromagna) vestita, HOLYOAK, 1983. *J. Conchol.* **31**: 245.

Microxeromagna vestita, MANGANELLI & GIUSTI, 1988. *Boll. malacol.*, **23**: 358, Fig. 11.

Material examined:

CORSICA: Ajaccio, HAGENMÜLLER leg. (n.), MHNM; Corte, PINTER leg. 11.VIII.77 (1); Francardo, 26.IV.88 (1); Olmeto, 1.XII.83 (4); Saint Florent, 4.IV.70 (2).

TUSCAN ARCHIPELAGO: Capraia I., San Rocco, VI.1986 (9), 2.XI.86 (3).

Comments

For description and comparison of the shell structure see *X. conspurcata*; for anatomical data see MANGANELLI & GIUSTI (1988: 358, Fig. 11).

This species is very rare in Italy. It is known to exist in some localities of mainland Italy (Foggia, Puglia: ADAMI, 1885; Grimaldi, western Liguria: FALKNER, 1981; San Polo, Parma, Emilia Romagna: MIENIS, 1982), and in various sites in Corsica; it has never been found in Sardinia and was only recently discovered in the Tuscan Archipelago.

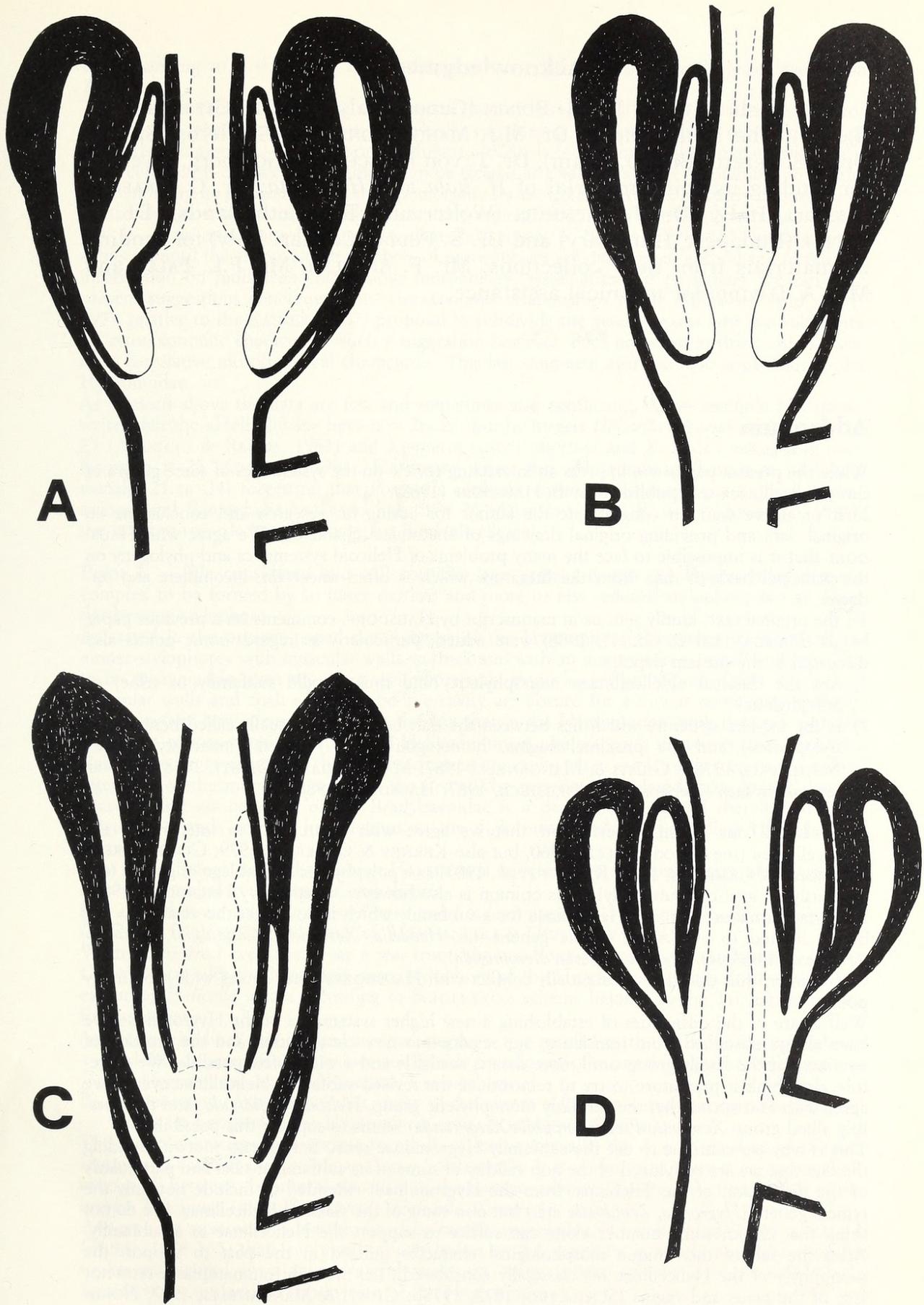


Fig. 9. The scheme of the dart-sac complex in *Xerotricha conspurcata* (A), *X. apicina* (B), *Helicella itala* (C) and *Helicopsis striata* (D) (Different magnifications).

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Addendum

While the present paper was in press an interesting review on the systematics of some genera of the «Helicellinae» was published by B. HAUSDORF (1988).

First of all we want to congratulate the author for basing his research and conclusions on original data and providing original drawings of anatomical characters. We agree with HAUSDORF that it is impossible to face the many problems of Helicoid systematics and phylogeny on the principal basis of data from the literature which is often uncertain, incomplete and updated.

To the original text, kindly sent us in manuscript by HAUSDORF, comments on a previous paper by us (MANGANELLI & GIUSTI, 1988) were added, particularly as regards some points also discussed in the present paper:

- 1) Are the classical «Helicellinae» monophyletic (and thus a valid subfamily or tribe) or polyphyletic?
- 2) Is the sac-like structure which lies between the dart-bearing sac (usually called here «outer stylophore») and the proximal vagina, homologous to a reduced «inner stylophore» (SCHILEYKO, 1978b; GIUSTI & MANGANELLI 1987; MANGANELLI & GIUSTI, 1988) or to an «accessory sac» (NORDSIECK, 1987; HAUSDORF, 1988)?

Point 1. All our recent papers show that we agree with SCHILEYKO in interpreting the «Helicellinae» (see not only ZILCH, 1960, but also KERNEY & CAMERON, 1979; GITTENBERGER in KERNEY & CAMERON, 1980; KERNEY *et al.*, 1983) as a polyphyletic assemblage of genera (and obviously an artificial subfamily). This opinion is also however accepted by HAUSDORF (1988). He in fact, utilizes the name Helicellinae for a subfamily which is no longer the «classical» one but is limited to only some of the genera (i.e. *Helicella*, *Xerotricha*, *Candidula*, *Cernuella*, *Xerosecta*, *Xerolenta*, *Pseudoxerophila*, *Xeromunda*).

Our opinion thus does not substantially conflict with HAUSDORF's and agrees with it on many points.

Well aware of the difficulties of establishing a new higher systematics of the Hygromiidae, we have always abstained from translating our results into new classification and the creation of new taxa of the family-group until more data is available and a wider view possible. We therefore also think it premature to try to reintroduce the revised subfamily Helicellinae even if we agree with HAUSDORF that the certainly monophyletic group, *Helicella-Candidula* (and the possibly allied group *Xerolenta-Pseudoxerophila-Xeromunda*) seems to support this possibility.

This is why we continue to use the subfamily Hygromiinae sensu SCHILEYKO (notwithstanding the fact that we are convinced of the non validity of some of its subfamilial taxa and particularly of the distinction of the Trichiinae from the Hygromiinae) extended to include not only the typical genera (*Hygromia*, *Zenobiella* etc.) but also some of the classical Helicellinae. We do not think that chromosome number alone can suffice to support the Helicellinae as a subfamily. After the fall of the unique morphological character utilized in the past to support the monophyly of the Helicellinae (as classically considered), i.e. the right ommatophore retractor free of the penis and vagina (SCHILEYKO, 1972, 1978b; GIUSTI & MANGANELLI, 1987; NORDSIECK, 1987), HAUSDORF bases his reevaluation of the Helicellinae on the fact that the genera selected by him as members of the subfamily appear to show a haploid number of chromosomes

corresponding to $n = 26, 27$, higher than that ($n = 21, 23, 24$) in the Hygromiinae (sensu Auct.).

This statement appears insufficient. Chromosome numbers are still poorly known in the Hygromiidae and, from what is known, remarkably variable (as happens in many other families of terrestrial Pulmonates) (PATTERSON & BURCH, 1978). It is thus impossible to state with sufficient certainty if chromosome number can be treated as a valid character to establish phylogeny by identifying its plesiomorphic and apomorphic states. Consequently it is clearly impossible to regard chromosome number as diagnostic for a suprageneric taxon (see also NORDSIECK, 1987: 15). It seems opportune here to cite what PATTERSON & BURCH (1978: 185) wrote on the subject: «until the chromosome numbers of more species are determined and related to reliable information on molluscan comparative morphology, systematics and phylogeny, we can only present suggestions concerning the cytotaxonomic relationships in the Mollusca». And also (: 197), relative to the RAINER (1967) proposal to subdivide the genus *Cepaea* into two subgenera on cytotaxonomic characters: «such a suggestion however, does not seem justified unless there exist correlative morphological characters». This last statement also seems to apply fully to the Hygromiidae.

As stressed above the data are few and sometimes also conflicting. As an example HAUSDORF writes that the «Helicellinae» have $n = 26, 27$, but he forgets *Helicella stiparum* which has $n = 25$ (APARICIO & RAMOS, 1987) and *Xerosecta* (s.str.) *cespitem* and *X.* (s.str.) *reboudiana* both having $n = 25$ (APARICIO, 1981). HAUSDORF writes that «Hygromiinae» have $n = 23$ (occasionally 21 or 24) forgetting that *Portugala inchoata*, *Pyrenaearia poncebensis* (typical Hygromiinae) and *Euomphalia brigantina* have $n = 26$ (APARICIO, 1981; RAMOS & APARICIO, 1985), the number regarded as diagnostic for the Helicellinae!

Point 2. - We considered and still consider (see present paper) the Hygromiidae dart-sac complex to be formed by an inner dartless and more or less reduced stylophore and an outer dartbearing stylophore.

As stated in the present paper many genera of the Hygromiidae have what we here call the «inner-stylophore» with muscular walls so thick and with an inner cavity so small and tube-like, to be recognizable from the outer stylophore only in no longer containing a dart. Such thick muscular walls and such a small tube-like cavity are absurd for a mucus containing accessory sac. Moreover how are we to explain the fact that in the Hygromiidae (with the only apparent exception of some presently supposed Helicodontinae), the secreting structures (true digitiform glands) are never associated the supposed accessory cavity when the latter is seen to represent a reservoir for the mucus secreted by the first? Why is it not considered more logical that the peculiar dart-sac complex of the Bradybaenidae is a derived feature and therefore that the associated glands are not homologous to the digitiform glands of the typical Helicidae and Hygromiidae?

Few notes, before concluding, about HAUSDORF's criticism of our interpretation of the peculiar dart-sac complex in the genus *Cernuellopsis*.

It is clear that we consider *Cernuellopsis* to be at least apparently anatomically close to *Cernuella*. This in fact explains its name (cf. MANGANELLI & GIUSTI, 1988: 335).

We hypothesized (we did not say it was true!) the non-homology of the two stylophores seen in *Cernuellopsis* with the inner and outer stylophore of the Hygromiinae (sensu SCHILEYKO; thus excluding *Helicella* which according to SCHILEYKO, s scheme belongs to the Trichiinae) on the following basis:

- A) the longitudinal axis of the proximal vagina is not parallel to those of the two stylophores and the «inner» stylophore does not lie side by side with the proximal vagina (as happens in the Hygromiinae sensu SCHILEYKO: *Cernuella* etc.);
- B) the concavity of the empty dart cavity of the «inner stylophore» does not face the proximal vagina (as happens in the Hygromiinae sensu SCHILEYKO: *Cernuella*, etc.).

These two characters thus appear to recall, at least externally, the 1 + 1 situation of the stylophores in some of the Trichiinae (sensu SCHILEYKO). It is evident that there is no correspondence at all between the internal structure of the dartsac complex of *Cernuellopsis* and that of the known Trichiinae (sensu SCHILEYKO: *Helicella*, *Xerotricha*, etc.).

Any way we stressed this hypothesis to be merely speculative. We concluded (MANGANELLI & GIUSTI, 1988 335) that: «an eventual conclusion on the argument is clearly premature and has to be anticipated by a more careful study on many genera and by a verification of the SCHILEYKO's subfamilial subdivision of the Hygromiidae».

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Explanation of the plates

- Plate 1. Shells of *Tyrrheniella josephi* n.sp. (AB) and *Microxeromagna vestita* (RAMBOUR) (CD) from La Praiola Islet (Capraia I., Tuscan Archipelago) (A, holotypus) and Golfo degli Aranci (Sardinia) (B), Olmeto (Corsica) (C) and Corte (Corsica) (D).
- Plate 2. *Xerotracha conspurcata* (DRAPARNAUD). Neotypus of *Helix sardiniensis* from Sant'Elia Cape (Cagliari, Sardinia) (A) (Museo di Zoologia dell'Università di Firenze no. 5045/1), Lectotypus of *Helix quisquiliae* from Villaputzu (Sardinia) (B) (Museo di Zoologia dell'Università di Firenze no. 5048/1) and two shells collected respectively at Ozieri (Sardinia) (C) and San Teodoro (Sardinia) (D).
- Plate 3. Shells of *Xerotracha conspurcata* (DRAPARNAUD) (A-C) and *Xerotracha apicina* (LAMARCK) (D-E) from Ozieri (Sardinia) (A), Lago Coghinas (Sardinia) (B), Laconi (Sardinia) (C), Bonifacio (Corsica) (D-E). Note the fleckless and hairless shell of *X. conspurcata* from Ozieri.
- Plate 4. The external shell surface in a specimen of *Tyrrheniella josephi* n.sp. collected at Golfo degli Aranci (Sardinia). A: a view of the first whorls. B: detail of the protoconch. C: the protoconch. D: where the periostracal layer has been removed the longitudinal grooves of the mineralized layer are visible. E: a detail of the last whorl with two hairs and longitudinal grooves on the periostracal layer (A x 25; B x 350; C x 80; D x 340; E x 240).
- Plate 5. The external shell surface in a specimen of *Xerotracha conspurcata* (DRAPARNAUD) collected at Valletta Logulentu (Sassari, Sardinia). A: a view of the first whorls. B: the protoconch. C: a detail of the protoconch. D: a detail of the reticular microsculpture of the teleoconch at high magnification. E-F: a detail of the last whorl with growth lines, hairs and the reticular microsculpture (A x 25; B x 90; C x 350; D x 1850; E x 170; F x 540).
- Plate 6. The external shell surface in specimens of *Xerotracha apicina* (LAMARCK) from Cagliari (Sardinia) (A-C) and Santa Maria I. (La Maddalena Archipelago, Sardinia) (D-E). A: a view of the first whorls. B: a detail of the protoconch. C-E: details of the teleoconch whorls with growth lines, hairs and the longitudinal crests (A x 40; B x 150; C x 75; D x 150; E x 320).
- Plate 7. The external shell surface in a specimen of *Microxeromagna vestita* (RAMBOUR) collected at San Rocco (Capraia I., Tuscan Archipelago). A: a view of the shell. B: where the periostracal layer has been removed the longitudinal grooves of the mineralized layer are visible. C: the protoconch. D: a detail of the reticular microsculpture on the teleoconch at high magnification. E: a detail of the last whorl (A x 20; B x 130; C x 100; D x 1900; E x 450).
- Plate 8. The radula of a specimen of *Tyrrheniella josephi* n.sp. collected at Golfo degli Aranci (Sardinia). A: central tooth (c) and first lateral teeth. B: 7th-15th lateral teeth. C: extreme marginal teeth (A-C x 1000).

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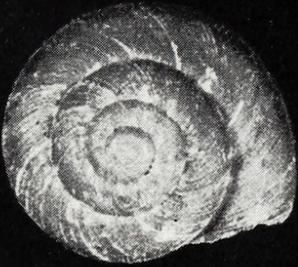
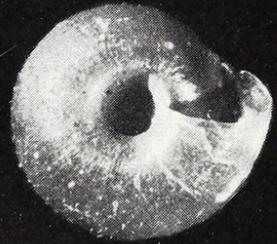
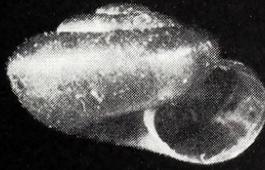
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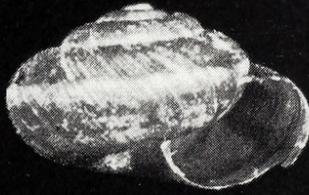
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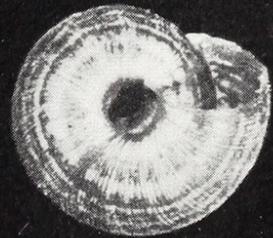
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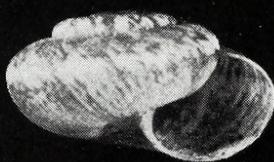
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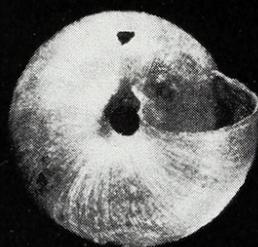
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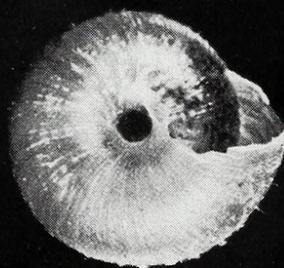
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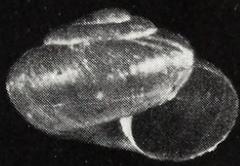
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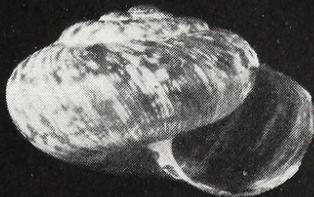
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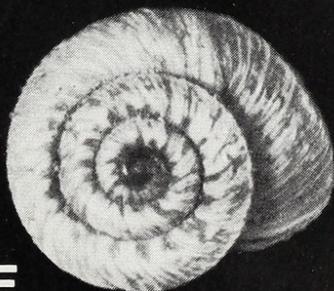
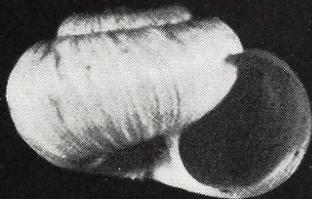
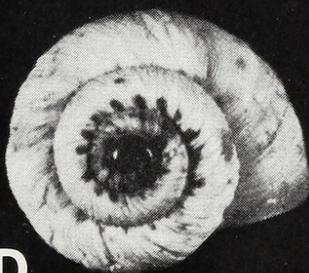
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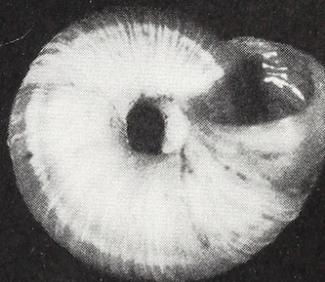
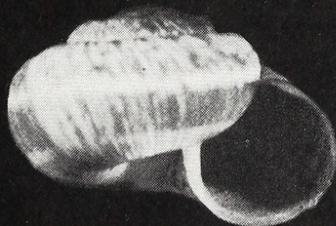
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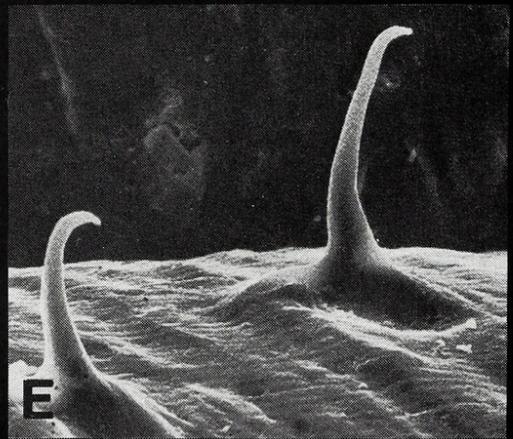
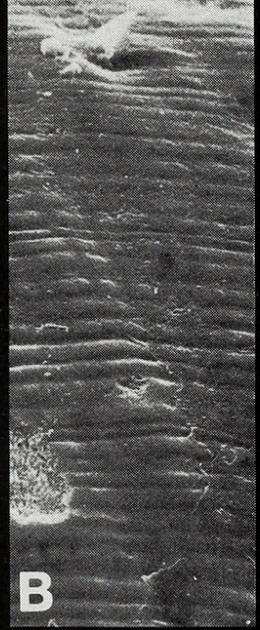
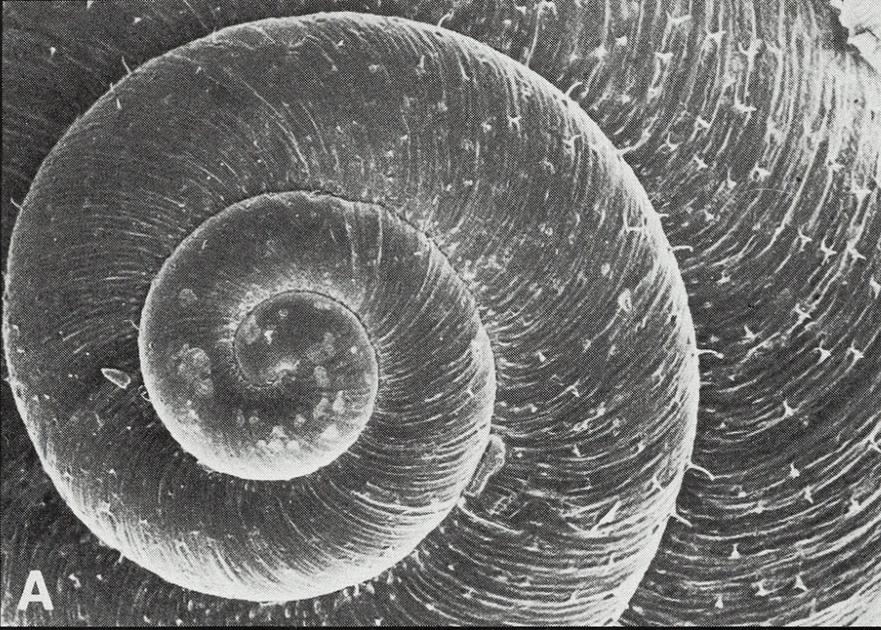
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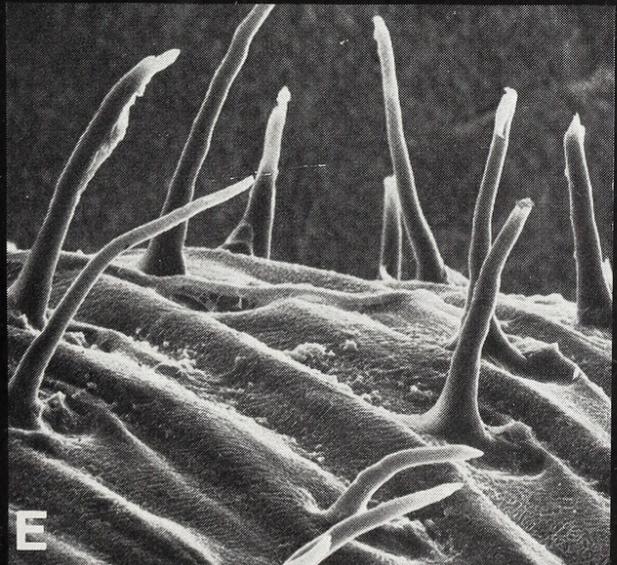
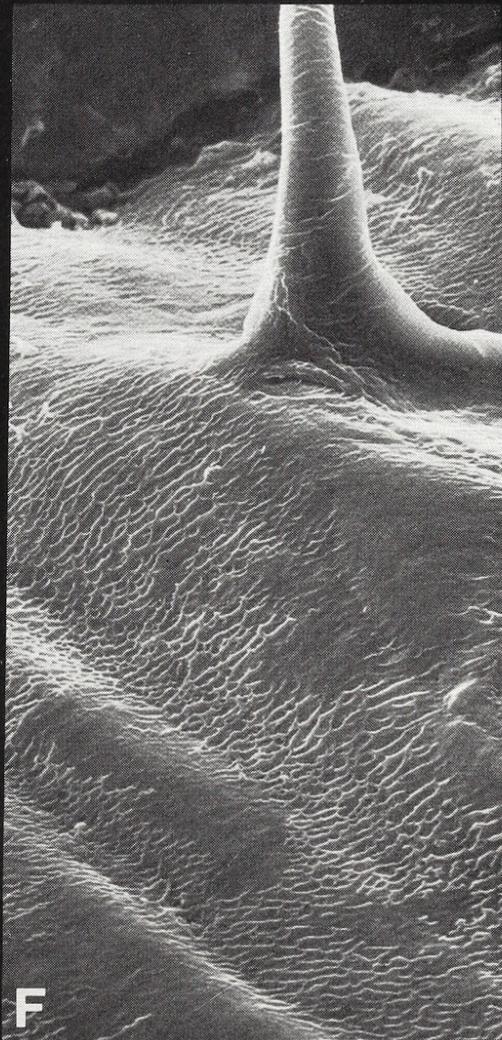
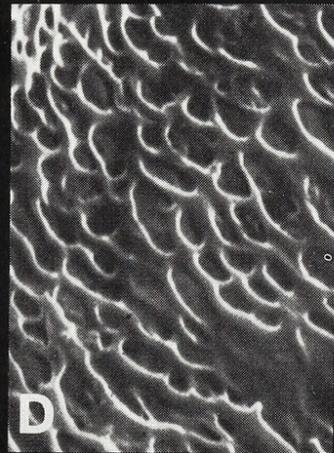
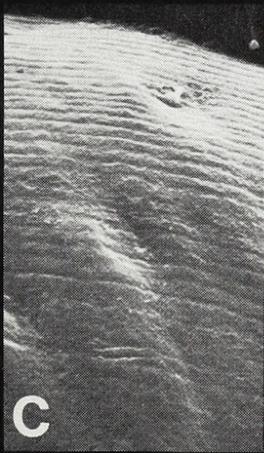
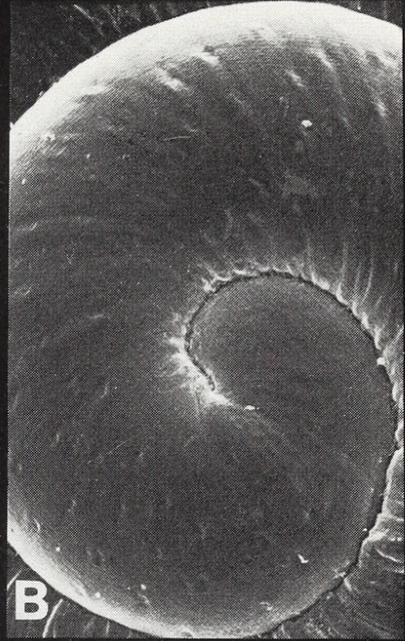


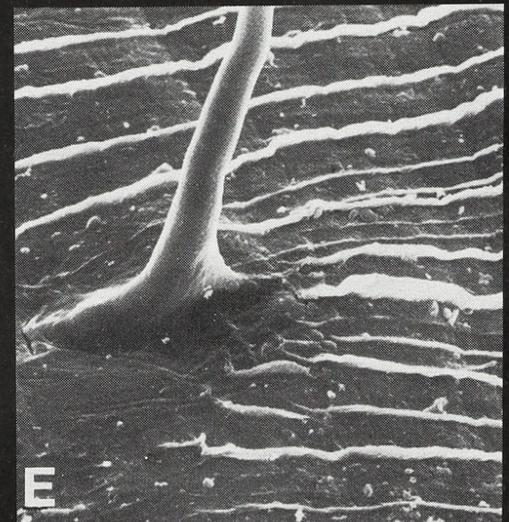
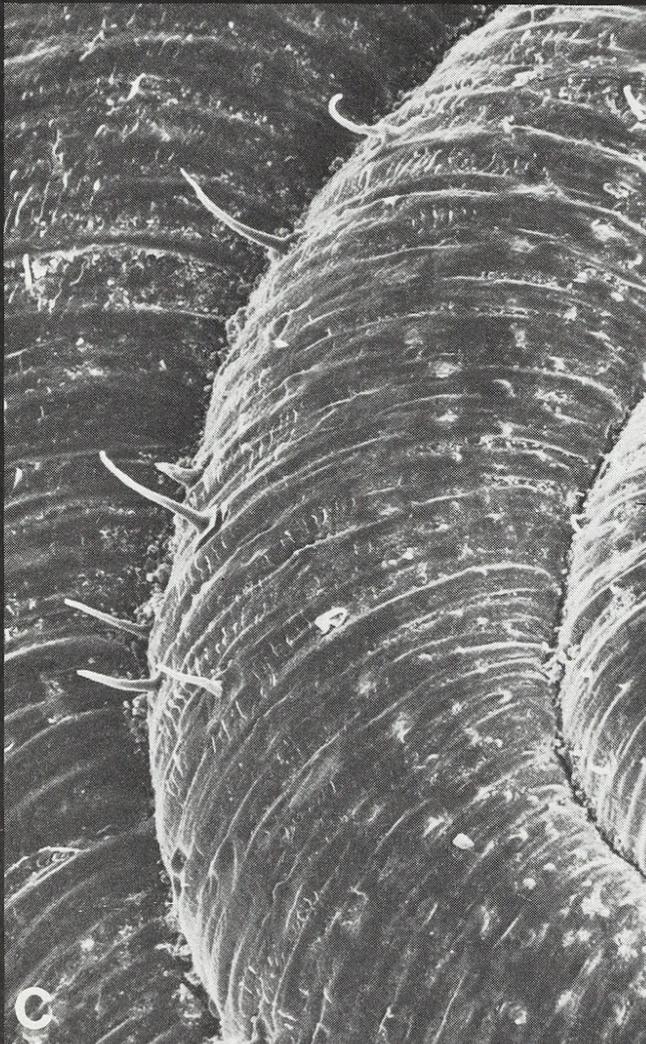
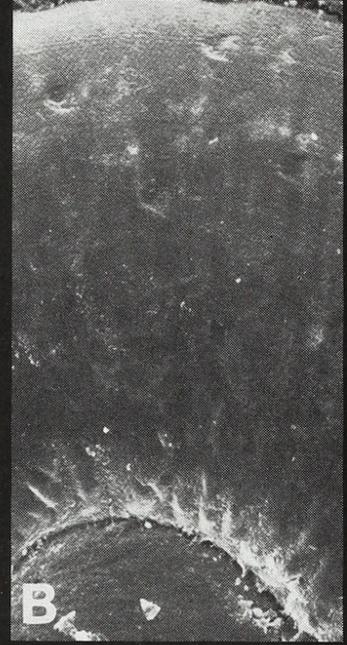
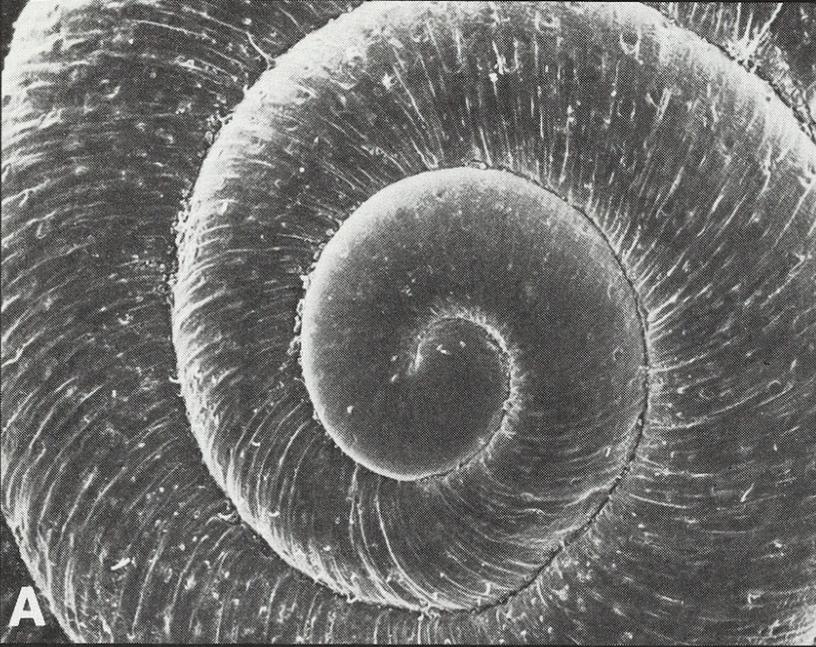
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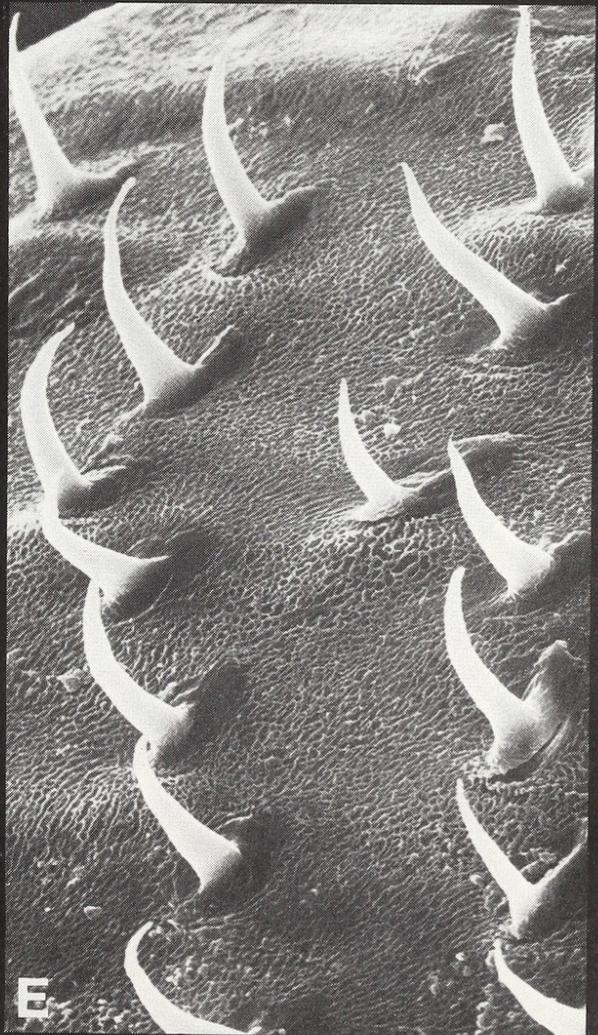
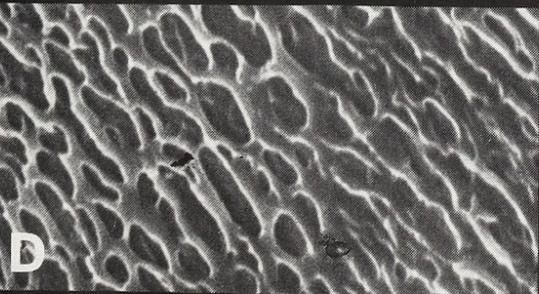


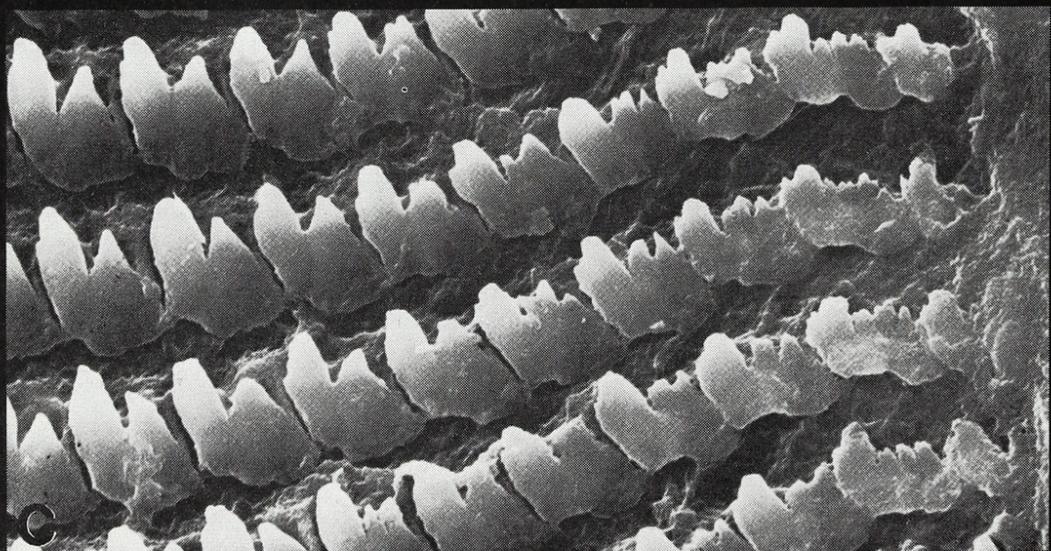
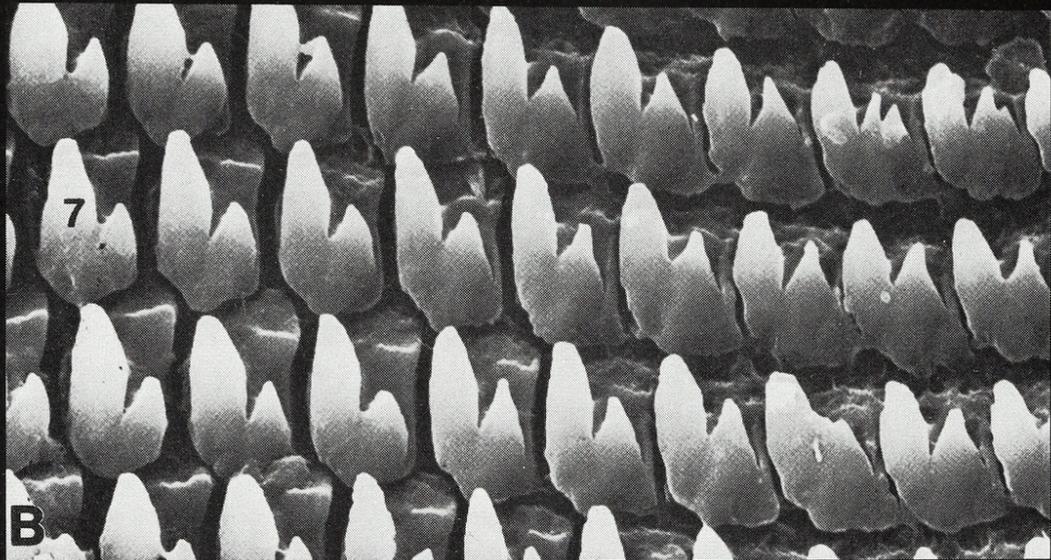
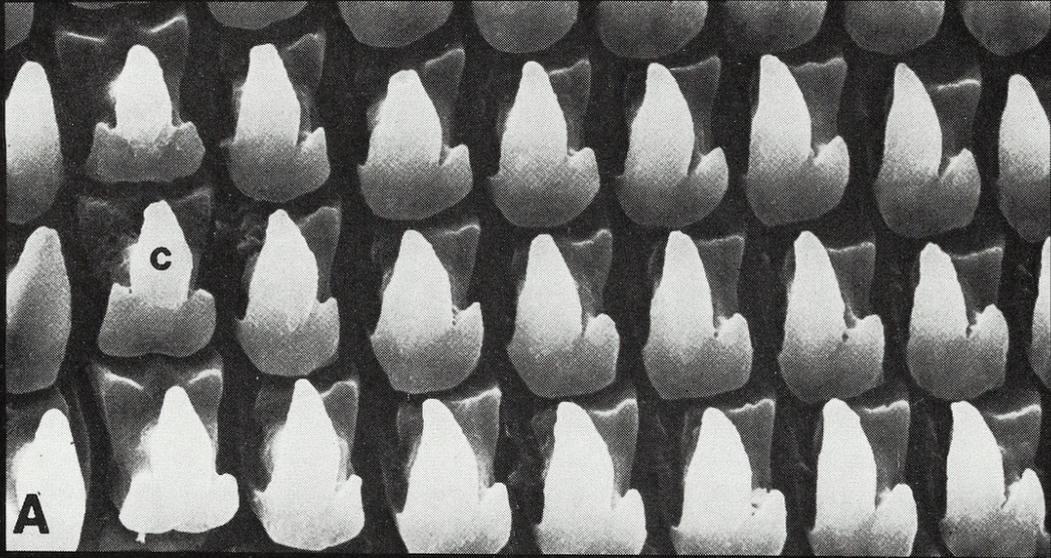
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