A *LIBURNICA* SPECIES FROM SOUTHERN ITALY (GASTROPODA: PULMONATA: HELICIDAE)

GIUSEPPE MANGANELLI[1], ANDREA BENOCCI[2] & FOLCO GIUSTI[1]

[1]Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, Università di Siena, Via Mattioli 4, 53100 Siena, Italy
[2]Museo di Storia Naturale dell'Accademia dei Fisiocritici, Piazzetta S. Gigli 2, 53100 Siena, Italy

Abstract *A species of the ariantine helicid genus* Liburnica *is reported for the first time from southern Italy. It is very similar to* Liburnica setosa*, the type species of the genus, in shell and anatomical features (namely: continuous detached peristome; occasional small faint denticle in basal peristome; penial papilla with lateral slit-like pore almost as long as the papilla itself; digitiform glands that branch at ca. 1/3 of their length).*

A potential name for this species is Helix setulosa *Briganti, 1825 from a site (Salvitelle) very close to where it was collected (Gole del Fiume Platano). Briganti's figures are not very clear, but they depict shells with a continuous peristome, angled at its innermost point, as in* Liburnica *species. Unfortunately, no sure syntypes and no topotypes were available and more research is therefore necessary to verify this hypothesis.*

From a biogeographical point of view, the finding of the genus Liburnica *in southern Italy is interesting because it constitutes another case of a taxon with significant disjunct distribution involving Apennine Italy and the Balkan Peninsula.*

Key words *Land snails, Mediterranean, anatomy, taxonomy, biogeography*

INTRODUCTION

Only two ariantine helicids occur in Apennine Italy according to the catalogue of Italian malacofauna by Alzona (1971), the checklist of pulmonates of the Italian fauna by Manganelli *et al.* (1995), the guide to European non-marine molluscs by Welter-Schultes (2012) and the updated framework of the systematics of the subfamily by Groenenberg *et al.* (2016). They are *Chilostoma cingulata* (Studer, 1820) and *Campylaea planospira* (Lamarck, 1822). The former is an Alpine-Apennine rock-dwelling species present only with some very scattered relict populations as far as the Matese mountains (northern sector of the southern Apennines). The latter is an Apennine-Sicilian non-rock-dwelling species widespread from southernmost Piedmont and Liguria to Calabria, Sicily and some peri-Sicilian archipelagoes.

In 1986 some specimens of a third ariantine helicid were collected at Gole del Fiume Platano, on the border between Campania and Basilicata. Undetermined when they were collected, they recently returned to mind when we realized that they could belong to a species of *Liburnica* Kobelt, 1904 (type species: *Helix setosa* Férussac, 1832), a genus never previously recorded in Italy. We assessed this hypothesis by studying shell and anatomical features of the specimens from Gole del Fiume Platano and then by comparing them with those of *Liburnica setosa*. Our colleagues Andrzej Lesicki and Joanna Pieńkowska from Adam Mickiewicz University (Poznan, Poland) made an attempt to extract their DNA but the fragments were too degraded.

The aims of the present paper are: 1) to describe the specimens from Gole del Fiume Platano; 2) to attempt a taxonomic identification; 3) to discuss the biogeographical setting.

Contact author : manganelli@unisi.it

MATERIAL EXAMINED

All material is kept in F. Giusti collection (FGC) at Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, Università di Siena, Via Mattioli 4, 53100 Siena, Italy.

Liburnica cf. setulosa (Briganti, 1825)
Gole del Fiume Platano (municipality of Romagnano al Monte, province of Salerno and municipality of Vietri di Potenza, province of Potenza), UTM reference 33TWE39, F. Giusti, G. Manganelli & L. Manganelli leg. 15.10.1986 (5 shells, 2 specimens – FGC 27214).

Liburnica setosa (Férussac, 1832)
Paklenica National Park, UTM reference 33TWK30, M. Zatini leg. 8.1988 (1 specimen – FGC 36990).

Figures 1–2 Shells of *Liburnica* cf. *setulosa* (Briganti, 1825) from Gole del Fiume Platano, F. Giusti, G. Manganelli & L. Manganelli leg. 15.10.1986 (F. Giusti collection no. 27214).

The *Liburnica* from Gole del Fiume Platano

The shell (Figs 1–2) is dextral, medium in size, subdiscoidal, tectiform above, opaque, pilose (especially in juveniles), yellowish in colour with three brown bands, the outermost of which is more evident than the other two; the shell consists of about five regularly expanding whorls, separated by deep sutures; the last whorl is slightly angled at the periphery and its final part (near the aperture) descends slightly and is flared; the protoconch has a finely pustulate surface; the teleoconch has a thick periostracal layer with

collabral growth lines and broad rows of small hairs disposed in quincunx (ca. 8–10 per square millimeter on the third whorl in juveniles), manifesting as scars in adults; the umbilicus is medium-sized (ca. 1/5–1/6 of max shell diameter), deep and usually partly covered by the well reflexed columellar margin of the peristome; the aperture is large, oblique and oval with a whitish, detached, thickened, well reflexed, continuous peristome angled at the innermost point.

The body and foot are brownish in colour; the pulmonary wall has black stripes and spots, one spot close to the pneumostomal opening being larger; the left lateral lobe of the mantle border is small and distant from the left dorsal lobe.

The genitalia (Figs 3–5) have the typical scheme of the ariantine helicids (see Groenenberg *et al.*, 2016). The male distal genitalia include flagellum, epiphallus and penis. The flagellum is long (14.9mm); the epiphallus is slender and similar in length to the penis (5.5mm), with the penial retractor inserted distally at about half its length; the penis is club-like and contains a conical, pointed penial papilla with a lateral slit-like aperture along its entire length; the epiphallus opens into the penis at the base of the penial papilla. The female distal genitalia comprise free oviduct, bursa copulatrix, bursa copulatrix duct and diverticulum, vagina, digitiform glands and dart sac. The diverticulum of the bursa copulatrix duct is almost double the length (22.4mm) of the bursa copulatrix duct (15.2mm); the two digitiform glands (mucous glands or accessory glands according to other authors) arise close to the base of the dart sac and branch in two at about 1/3 of their length (16.4–17.3mm). The penial nerve originates from the cerebral ganglion; the right tentacle retractor passes between penis and vagina.

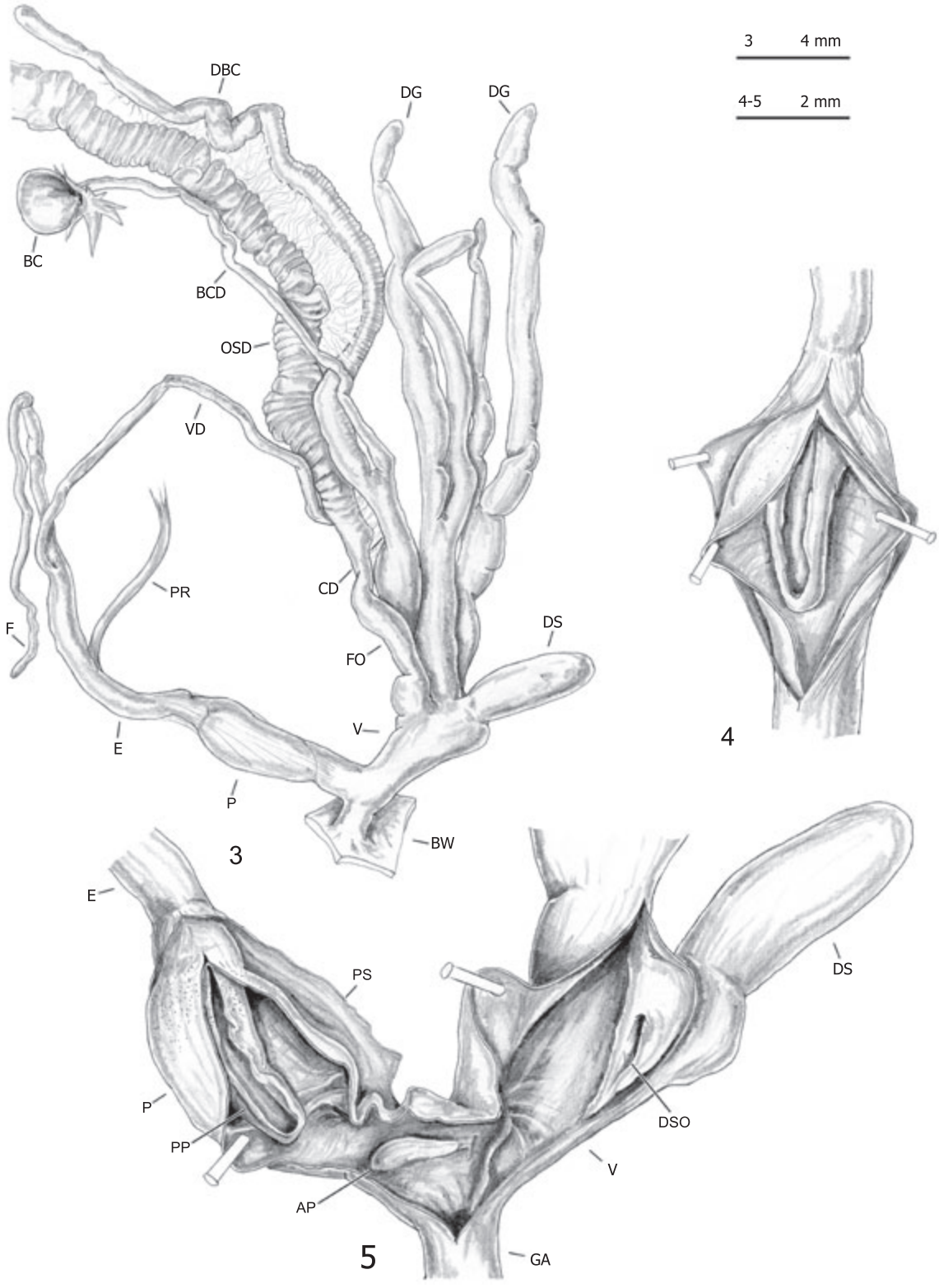
Discussion

Specimens from Gole del Fiume Platano (Figs 1–5) and those of *Liburnica setosa* (Figs 6–7) share shell and anatomical features (continuous detached peristome; occasionally a small faint denticle in the basal peristome; penial papilla with lateral slit-like pore almost as long as papilla itself; digitiform glands that branch at ca. 1/3 of their length; for *Liburnica setosa* see also: Knipper, 1939: Fig. 30 a-b; Subai, 2002: Figs 1–2).

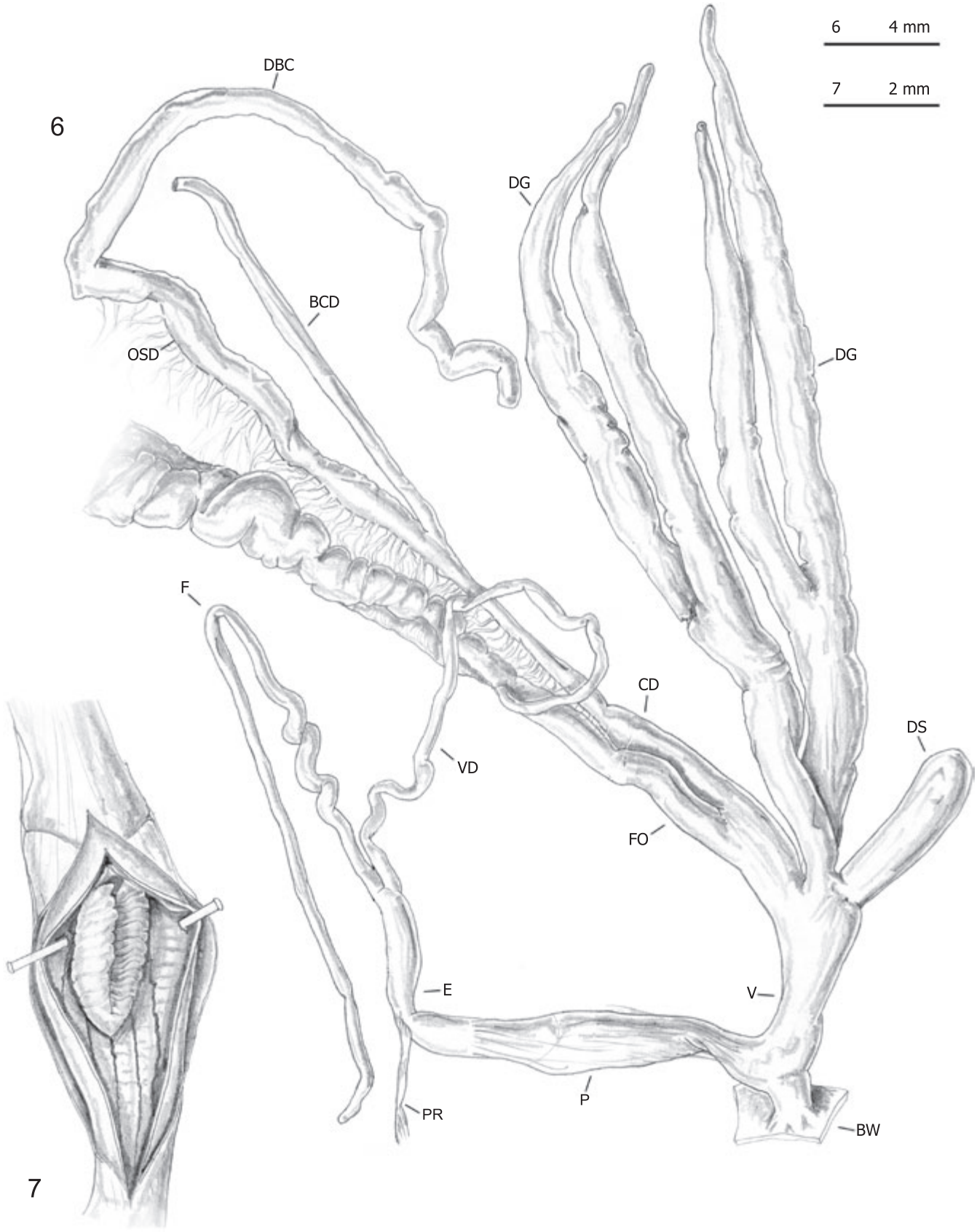
The present finding is the first report of a species of *Liburnica* in southern Italy. *Liburnica* is a genus of the ariantine helicids that is widespread in the Balkan Peninsula from Croatia eastward to central Serbia and southward to northwestern Greece (Subai, 2002). It has two subgenera: *Liburnica* (s.str.) with about 16 species and *Superba* Subai & Fehér (2006) with four species (Bank & Neubert, 2017). Its speciography is still inadequate. Some taxa have been investigated with molecular tools (Groenenberg *et al.*, 2016), but few populations per clade/taxon were considered and no rigorous anatomical or shell research using statistical analysis has been conducted on populations studied by molecular methods. The species that seem most similar to those from Gole del Fiume Platano are: *Liburnica setosa* from Croatian coastlands and archipelagoes and *Liburnica setigera* (Rossmässler, 1836) from south Dalmatian to central Albanian coastlands. More research is of course necessary to establish their relationship with the species from Gole del Fiume Platano. So, in the absence of more detailed anatomical examination based on a larger number of specimens of both species and in the absence of molecular studies, we prefer to regard the latter as distinct.

A potential name for this species from southern Italy is *Helix setulosa* Briganti, 1825, which was established for specimens from Salvitelle (province of Salerno; UTM reference 33TWE39), a locality very close to Gole del Fiume Platano. Although Briganti's figures are not very clear (he depicted two shells, one of an adult and one of a subadult in two views with details of periostracal hairs), the peristome seems continuous and angled at its innermost point in the umbilical view of the shell of the adult specimen (Fig. 8). This suggests a similarity with the species from Gole del Fiume Platano.

Helix setulosa was first regarded as a senior synonym of *Helix setosa* "Zi[e]gl[er]., Cri[stofori]. et J[an]." by Beck (1837), then as a junior synonym of *Helix setosa* "Fér[ussac]." by Costa (1838–1839) or *Helix setosa* "Ziegler" by Pfeiffer (1848, 1859, 1868, 1876) and Tryon & Pilsbry (1888), and finally as a species of the group of *Helix planospira* Lamarck, 1822 or a subordinate taxon of the latter species by Bourguignat (1860), Kobelt (1876), Paulucci (1880), Westerlund (1889) and Pilsbry (1895). The latter is the current interpretation of Briganti's species (Forcart, 1965;



Figures 3–5 Genitalia (gonad, first hermaphrodite duct and albumen gland excluded; Fig. 3) and internal structure of the distal genitalia (Figs 4–5) of a specimen of *Liburnica* cf. *setulosa* (Briganti, 1825) from Gole del Fiume Platano, F. Giusti, G. Manganelli & L. Manganelli leg. 15.10.1986 (F. Giusti collection no. 27214).
Acronyms: AP atrial pilaster, BC bursa copulatrix, BCD duct of bursa copulatrix, BW body wall, CD common duct, DBC diverticulum of duct of bursa copulatrix, DG digitiform glands, DS dart sac, DSO dart sac opening, E epiphallus, F flagellum, FO free oviduct, GA genital atrium, OSD ovispermiduct, P penis, PP penial papilla, PR penial retractor, PS penial sheath, V vagina, VD vas deferens.



Figures 6–7 Genitalia (gonad, first hermaphrodite duct and albumen gland excluded; Fig. 6) and internal structure of the penis (Fig. 7) of a specimen of *Liburnica setosa* (Férussac, 1832) from Paklenica National Park, M. Zatini leg. 8.1988 (F. Giusti collection no. 36990).

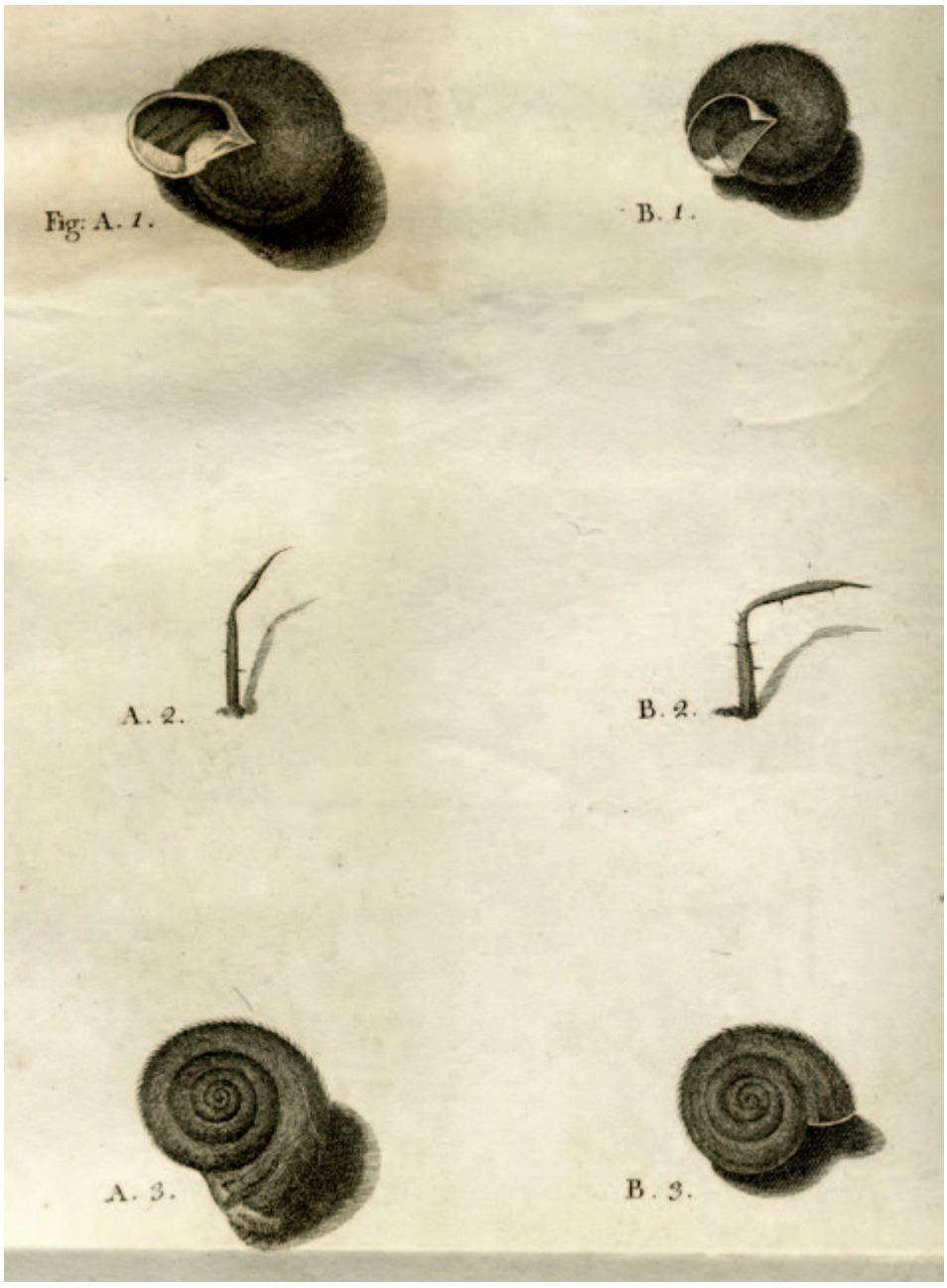


Figure 8 Modified reproduction of plate 1 by Briganti (1825). He depicted two shells, one of an adult and one of a subadult in two views with details of periostracal hairs. Although the figures are not very clear, the peristome seems continuous and angled at its innermost point in the umbilical view of the shell of the adult specimen (Courtesy of Biblioteca Nazionale, Naples).

Alzona, 1971; Giusti, 1973; Manganelli *et al.*, 1995, 2018).

Early revisers inferred relationships between *Helix setulosa* and *Helix setosa* probably based on the hairy shell. The turning point was marked by Bourguignat (1860, p. 195) when he stated that *Helix setulosa* was a senior synonym of *Helix septila* "Ziegler" (Rossmässler, 1835, p. 2–3, Pl. 6 fig. 89), a taxon of the *Helix planospira* group from the "römisches Gebiet". A similar opinion was shared by Kobelt (1876) and Paulucci (1880).

We looked for syntypes of Briganti's species at the Museo Zoologico of University of Naples but without success. According to Nicola Maio, formerly curator of the museum, there is no specimen of Vincenzo Briganti (father) or Francesco Briganti (Vincenzo's son) in the museum. On the contrary, in Bourguignat's collection at

the Muséum d'Histoire Naturelle de Genève (Switzerland), there is a specimen of *Campylaea planospira* labelled "*Helix setulosa* Briganti, type, Localité Naples", reported in the Museum catalogue as the holotype (MHNG-MOLL-117303). This specimen was probably sent to Bourguignat by Briganti's son Francesco in 1858, together with a specimen of *Helix straminea*, the other species described by Briganti (1825) (see Bourguignat, 1883). However, it cannot be the holotype of *Helix setulosa*, because Briganti examined at least two specimens, none of which was selected as "type" in his paper. It is not even certain that it is a syntype: it does not come from the type locality (Salvitelle) but from Naples and does not entirely match Briganti's description and figures (it has a simple interrupted peristome, whereas the shell figured by Briganti seems to have a continuous peristome angled at its innermost point).

Since no sure syntypes and no topotypes are available, the interpretation of Briganti's species can only for the moment rely on the original description and figures. Briganti's figures are not very clear, but the possibility that they correspond to the species from Gole del Fiume Platano cannot be excluded. Although more research is necessary to verify this hypothesis, for the time being we use Briganti's name (*Liburnica* cf. *setulosa*) to designate the *Liburnica* species from southern Italy.

The genus *Liburnica* is another case of a taxon with a significant disjunct distribution involving Apennine Italy and the Balkan Peninsula. Such disjunct distributions (sometimes extending northward from the Balkan sector to northeastern Italy) concern an array of different organisms, for example plants such as the Bosnian pine *Pinus heldreichii* H. Cristi, 1863 and the Hungarian oak *Quercus frainetto* Ten., vertebrates such as the leopard snake *Zamenis situla* (Linnaeus, 1758) and the forest dormouse *Dryomys nitedula* (Pallas, 1779), and of course molluscs such as *Medora dalmatina* (Rossmässler, 1834) and *Aegopis verticillus* (Lamarck, 1822). These ranges, named "Transadriatic" or "Transionian", are a classic subject of Italian biogeographic research (Pasa, 1953; La Greca, 1962). Some of the molluscan taxa with this distributional pattern are Greek or Balkan species found in a few Italian localities and their presence in Italy is presumably due to anthropochorous dispersal, e.g. *Bulgarica denticulata* (Olivier, 1801) occurring on the northern Adriatic coast (Albano *et al*., 2013). Other taxa have true Transadriatic and Transionian distributions not due to transport by humans. These cases often regard genera with vicariant species (or species with vicariant subspecies), e.g. *Radomaniola callosa* (Paulucci, 1881) in the central Apennine (Italy) and other *Radomaniola* species in Dalmatia, *Schistophallus carotii* (Paulucci, 1878) in Calabria and other *Schistophallus* species in Greece, Bulgaria and Ukraine. In other cases, the same "morphospecies" seems to be present on both sides of the Adriatic or Ionian seas, e.g. *Litthabitella chilodia* (Westerlund, 1886), *Acicula disjuncta* Boeters, Gittenberger & Subai, 1989.

It is not easy to explain these disjunct distributions. Some may have arisen by northward contraction of wider distributions, others by dispersal along the Dinarid-Alpine-Apennine corridor (or vice versa) and others by vicariance.

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