THE STATUS OF *ARION ALPINUS* POLLONERA 1887, AND RE-DESCRIPTION OF *ARION OBESODUCTUS* REISCHÜTZ 1973 (GASTROPODA, ARIONIDAE)

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Cesare Dalfreddo (1972–2009)
in memoriam

Abstract *In recent years two interpretations of* Arion alpinus *Pollonera 1887 have been proposed: a valid species with a central European distribution or a junior synonym of* Arion intermedius *Normand 1852. Study of the original description and topotypes collected in the only precise Piedmontese locality mentioned by Pollonera (1887), Rivarossa Canavese, demonstrate that the second is correct. To prevent Pollonera's species from continuing to be misinterpreted, a neotype of* A. alpinus *is designated from among these topotypes. The neotype clearly belongs to* A. intermedius *so the names are synonyms.*

Arion obesoductus *Reischütz 1973, sometimes considered a synonym of* A. alpinus*, was described from juvenile specimens from Austria. Although a new study of adult topotypical specimens is desirable, anatomical re-examination of a paratype revealed characters typical of* A. alpinus *auctt. non Pollonera 1887, namely a long oviduct and a flat epiphallus papilla. These characters are also evident in adult specimens from Italy. The name* A. obsesoductus *is thus reinstated for* Arion alpinus *auctt. non Pollonera 1887, a species of several countries in Central Europe.*

Key words Arion alpinus, Arion obesoductus, *neotype, taxonomy, alpine slugs*

INTRODUCTION

The name *Arion alpinus* was established by Pollonera (1887) for a species from the Alps of Piedmont and Lombardy and maybe also of France and Switzerland. In the last thirty years, this name has been applied to a small arionid with central European distribution, recorded from France, Italy, Switzerland, Austria, Germany, Slovenia, Croatia and the Czech Republic (Reischütz, 1980; Kerney *et al.*, 1983; Wolf & Rähle, 1987; Falkner, 1990, 1992; Wiktor, 1996; Schniebs & Reise, 1997; Turner *et al.*, 1998; Falkner *et al.*, 2002; Vaupotič & Velkrovrh, 2002; Bank, 2004; Dvořák *et al.*, 2006, 2007). According to these authors, *A. alpinus* belongs to the subgenus *Kobeltia* Seibert 1873, and is characterised by a rather long tripartite free oviduct having a median muscular "firm portion" and a distal "eversible portion" (sensu Davies, 1977; Backeljau & De Bruyn, 1990). The distinctness of this species was first ascertained after morphological study (Reischütz, 1980; Wiktor, 1996) and then confirmed after molecular study (Dvořák *et al.*, 2006, 2007).

The interpretation of Pollonera's species, as first suggested by Reischütz (1980), was questioned by Manganelli *et al.* (1995). In the 1990s, during preparation of a checklist of the Italian molluscan fauna, Manganelli and colleagues attempted to revise many species described from Italy, including *A. alpinus* of Pollonera (1887). They first looked for original material in what remains of Pollonera's collection at the Museo Regionale di Scienze Naturali di Torino. As the search for syntypes had no success, they studied the original description and the topotypes collected in the only precise Piedmontese locality mentioned by Pollonera (1887), i.e. Rivarossa Canavese (cf. page 313, explanation of Figs 25–26) (Fig. 1). As a result, they proposed *A. alpinus* as junior synonym of *A. intermedius* Normand 1852. In fact, a major feature of the species described by Pollonera (1887), the very short free oviduct ("ultima parte dell'ovidotto brevissima"; cf. page 306, line 7, and Figs 25–26, here reproduced as Fig. 2), also present in the topotypes from Rivarossa Canavese (Figs 3–9), is diagnostic of *A. intermedius* (cf. Davies, 1977; Manganelli & Giusti, 1988; Backeljau & De Bruyn, 1990; Barker, 1999).

Subsequent authors neglected (Wiktor, 1996; Schniebs & Reise, 1997; Turner *et al.*, 1998) or disputed (Falkner *et al.*, 2002) the conclusion of Manganelli *et al.* (1995). In particular, Falkner *et al.* (2002), examining topotypes from another

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Figure 1 Two views of a living specimen of *Arion intermedius* Normand 1852, from Rivarossa Canavese (Rivarossa, Torino), 32TLR9911, M. Bodon leg. 20.09.1992. This specimen, now kept in the malacological collection of the Museo Regionale di Scienze Naturali of Torino (M123), is here designated neotype of *Arion alpinus* Pollonera 1887. Its anatomical features are depicted in the Figs 3–9.

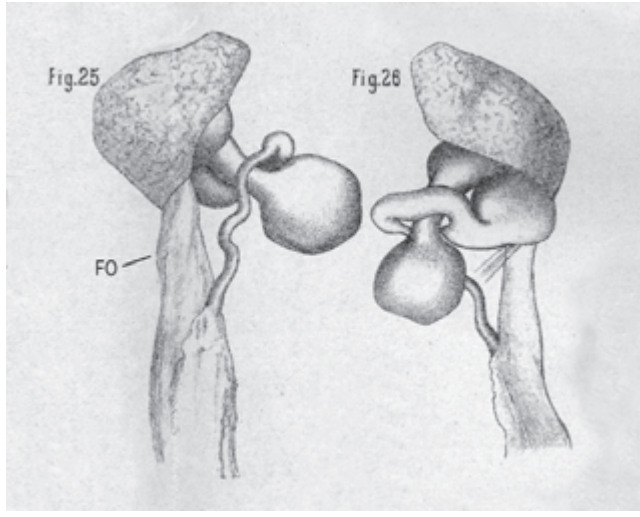


Figure 2 Pollonera's (1887) original figures of the distal genitalia of *Arion alpinus* (now a junior synonym of *A. intermedius*).

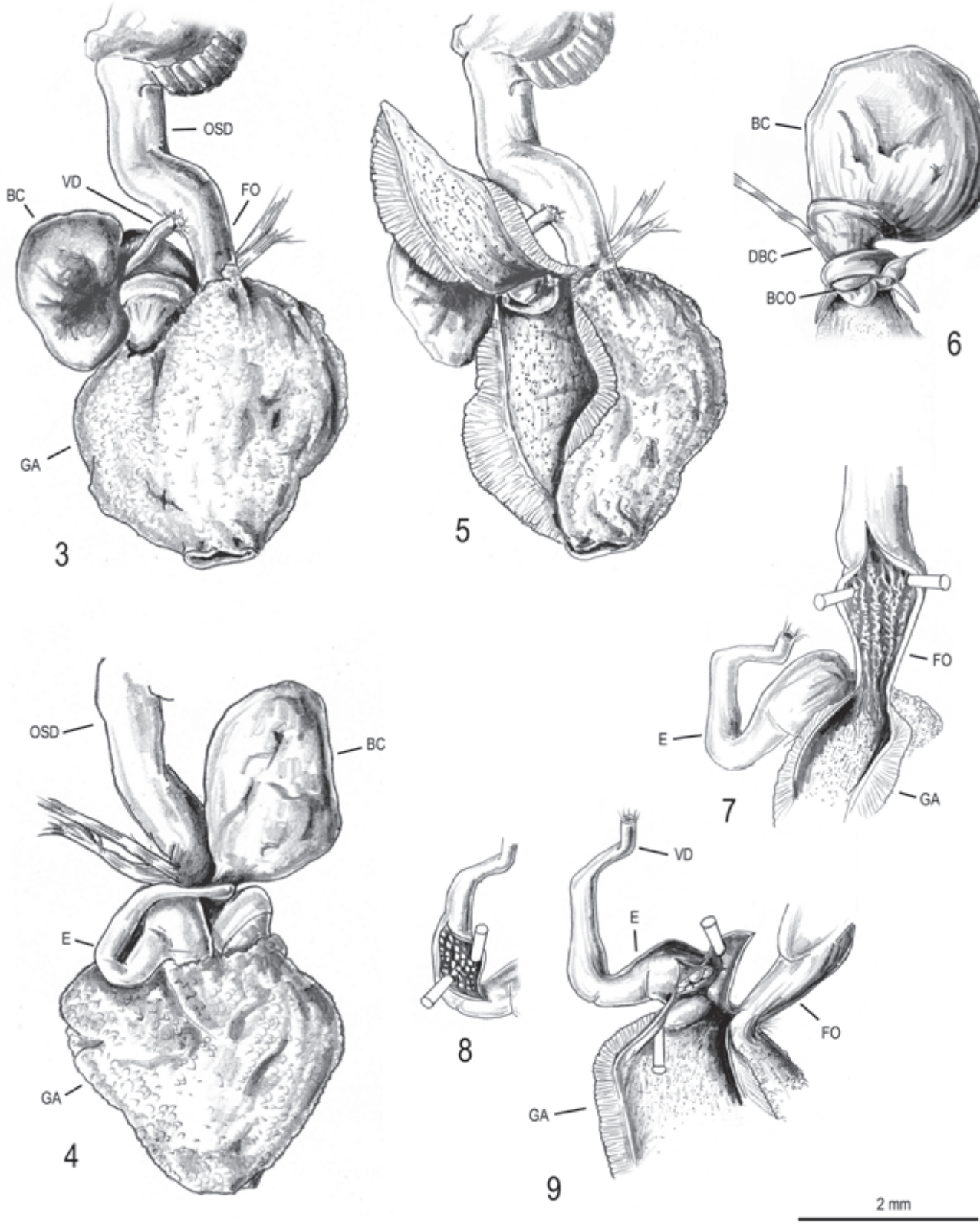
Piedmontese locality (Santuario di Oropa), found that they indeed corresponded to the species identified as *A. alpinus* by most authors. Unfortunately no published anatomical description of these specimens is available.

Summarizing, two different interpretations of Pollonera's species have been proposed, one based on putative topotypes (Santuario di Oropa) and the other on true topotypes (Rivarossa Canavese). The problem is to determine which of the two interpretations matches or best agrees with the original concept of this species. External morphology, mucus colour and body size are not diagnostic between *A. intermedius* and other *Kobeltia* species (Backeljau & De Bruyn, 1990). The only decisive element is genital anatomy which exhibits at least one feature undoubtedly diagnostic of *A. intermedius*: the short free oviduct in the species described by Pollonera. To prevent the name *A. alpinus* from continuing to be misinterpreted, we therefore designate the topotypical specimen collected at Rivarossa Canavese as the neotype. With the present designation, *A. alpinus* definitively becomes a junior synonym of *A. intermedius.* The neotype is deposited in the malacological collection of the Museo Regionale di Scienze Naturali in Turin with catalogue number MRSN 123 and the diagnostic features of its distal genitalia are illustrated in Figs 3–9.

Another indication that *A. alpinus* is a synonym of *A. intermedius* is the status of the older *Arion hortensis* var. *aureus* Lessona 1881. This taxon, based on a semi-albino specimen collected by Pollonera just at Rivarossa Canavese, was already referred to *A. alpinus* as a variety by Pollonera (1889a, 1889b) and Hesse (1926), as a subspecies by Alzona (1971) and to *A. intermedius* as a junior synonym by Bank (2004).

The misidentified species does not remain unnamed because its synonymy includes at least one available name: *Arion obesoductus* Reischütz 1973 (cf. Bank, 2004). Although this species was described on juvenile specimens (cf. Reischütz, 1973), anatomical re-examination of a paratype (SMF) reveals characters typical of *Arion alpinus* auct. (a long free oviduct and a flat epiphallus papilla). Consequently we adopt this name, though a new study of adult topotypical specimens should be conducted.

We cannot exclude that meticulous search in the past literature produces some older name. For the present, we can only exclude that *Arion cottianus*, a small arionid described by Pollonera (1889a) from Piedmont (type locality: "Bardonecchia, nella Valle della Doria Riparia"), corresponds to *Arion alpinus* auct. Type material



Figures 3–9 Distal genitalia (Figs 3–4), genital atrium sliced off to show outlet of bursa copulatrix duct (Fig. 5), bursa copulatrix and its duct (Fig. 6), internal structure of distal free oviduct (Fig. 7), internal structure of epiphallus (Fig. 8) and epiphallus papilla (Fig. 9) of a specimen of *Arion intermedius* Normand 1852, from Rivarossa Canavese (Rivarossa, Torino), 32TLR9911, M. Bodon leg. 20.09.1992, here designated neotype of *Arion alpinus* Pollonera 1887. Acronyms: BC bursa copulatrix, BCO outlet of duct of bursa copulatrix, DBC duct of bursa copulatrix, E epiphallus, FO free oviduct, GA genital atrium, OSD ovispermiduct, VD vas deferens.

no longer exists and topotypes are not available although we looked for them. Gavetti *et al.* (2008) suggested that it may correspond to *A. distinctus* Mabille 1868. In fact, its anatomy (particularly the very long free oviduct apparently lacking an eversible portion; Pollonera, 1889b: Fig. 23) matches that of *A. distinctus*, a species recorded from the French Alps, unlike *A. alpinus* auct. which is only present further north (cf. Dvořák *et al*., 2007: Fig. 4).

Re-description of *Arion obesoductus* Reischütz 1973

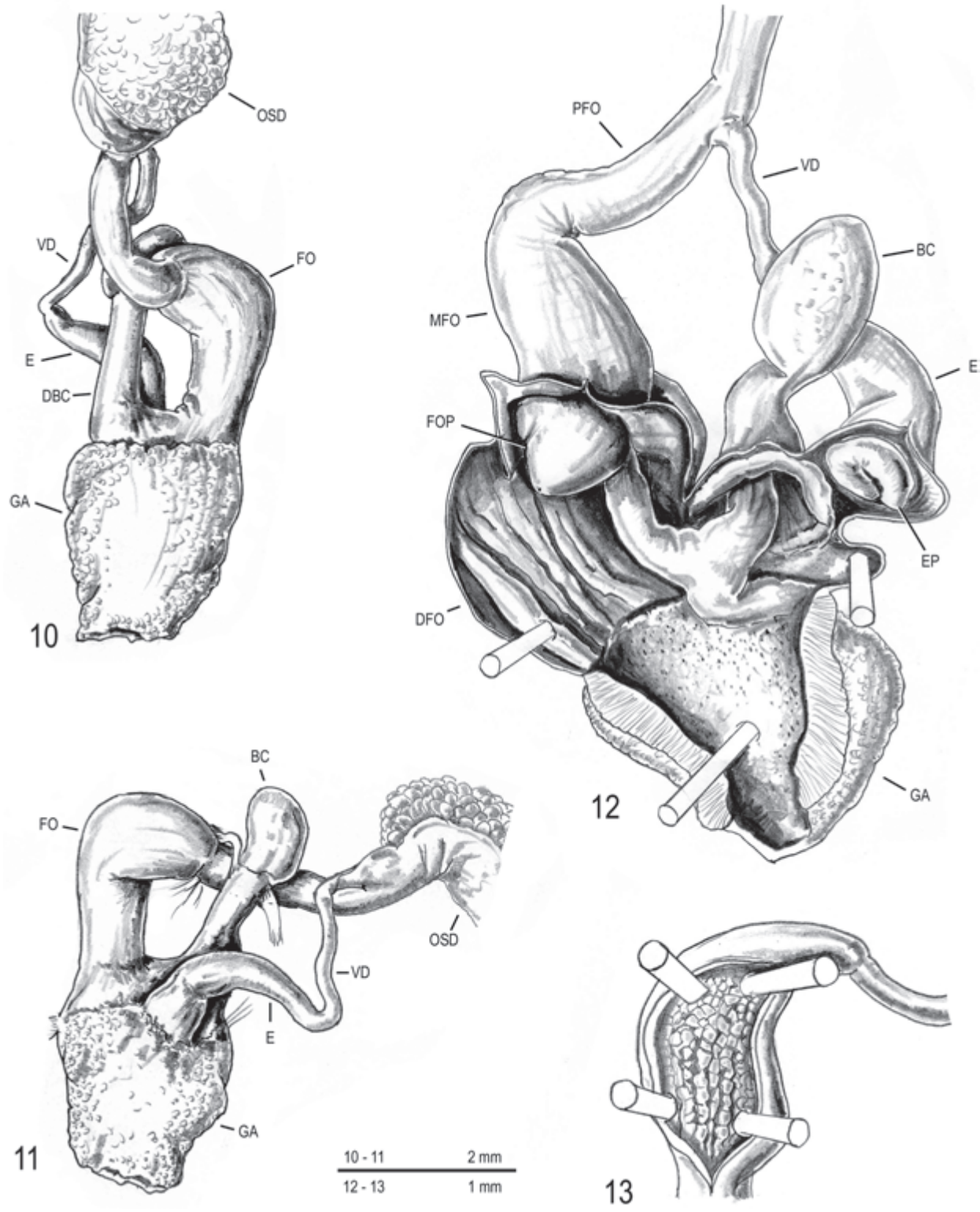
Diagnosis A small *Arion* species of the subgenus *Kobeltia* with tripartite free oviduct, very similar to *A. distinctus*: both species have similar internal structures in the proximal genital atrium, but differ by virtue of their epiphallus papilla: flattened in *A. obesoductus*, conical in *A. distinctus*.

Description (Figs 10–15) Body, in motion ca. 15–25 mm long; variable in colour: shades of brownish yellow to greenish brown with one brownish band on sides and clypeus; foot yellow (Falkner, 1990: Fig. 3 on page 199). General scheme of genitalia as in species of subgenus *Kobeltia* with tripartite free oviduct. Free oviduct long, divided into three portions, proximal, median and distal, more or less similar in length. Proximal portion slender and thin walled; median portion ("firm portion" according to Davies, 1977; Backeljau & De Bruyn, 1990) wide and thick walled; distal portion wide and thin walled. Median portion distally containing conical papilla (open at tip which protrudes into distal portion). Distal portion ("eversible portion" according to Davies, 1977; Backeljau & De Bruyn, 1990) with two or more parallel pleats, arising at base of conical papilla, forming sort of necklace around it, and continuing side by side, without converging, toward outlet of free oviduct into genital atrium; larger pleat continues on genital atrium uniting with pleat emerging from duct of bursa copulatrix. Bursa copulatrix oval, with short duct. Vas deferens short, slender. Epiphallus as long as vas deferens, progressively widening before joining atrium and with internal rows of small polygonal papillae. Epiphallus outlet into genital atrium bordered by roundish flattened papilla, open at centre and with groove on one side. Outlets of free oviduct, bursa copulatrix duct and epiphallus into proximal genital atrium disposed side by side. Genital atrium large, with thick glandular walls.

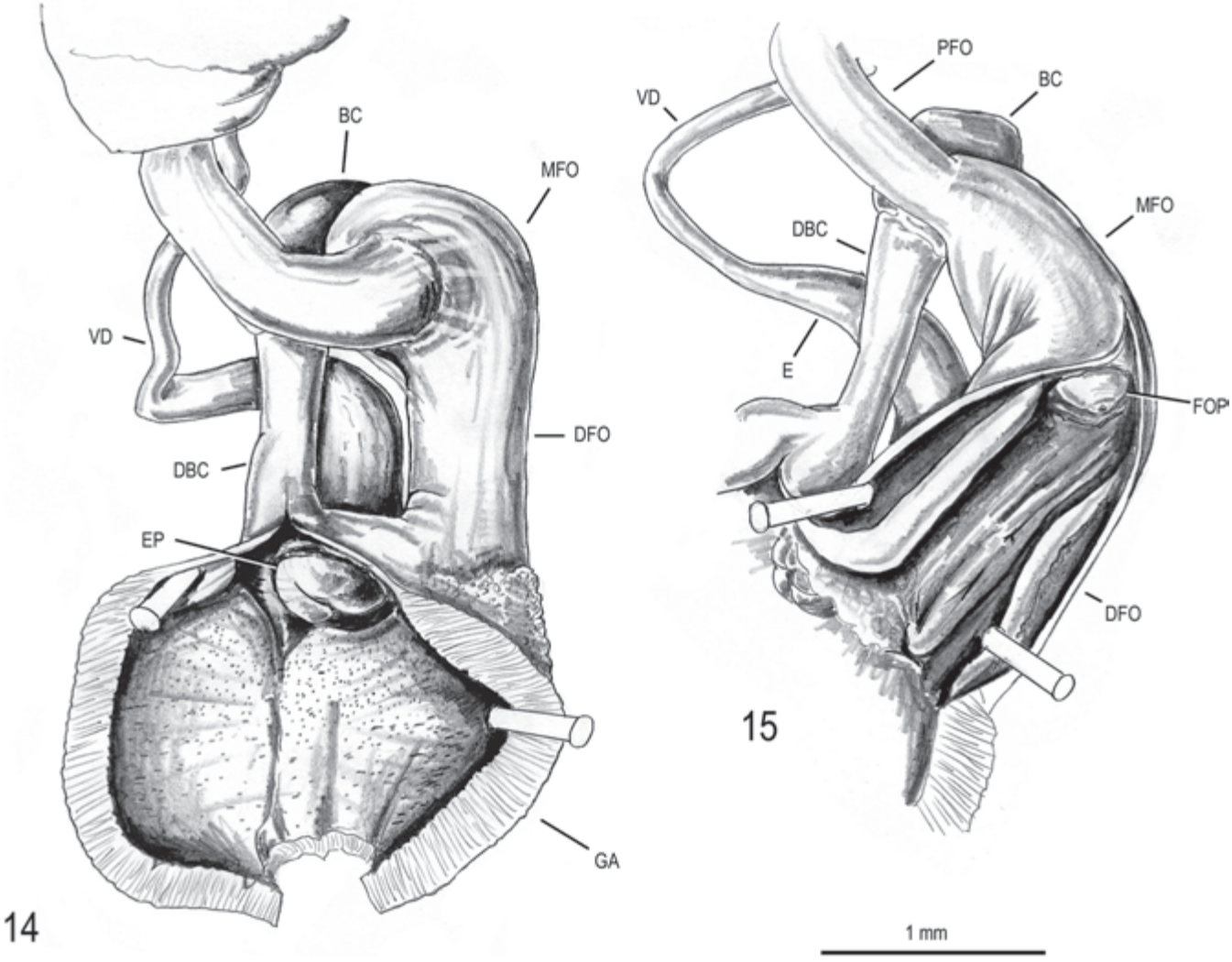
Type material Holotype (SMF 229172) and one paratype (SMF 229173) are in the malacological collection of the Senckenberg-Museum; another paratype is in the private collection of P. Reischütz (A-4981).

Material examined Bucklige Welt, Fichtenwald bei Schlag zwischen Kirchschlag und Karl (Niederösterreich, Austria), P.L. Reischütz leg. 7.1972 (SMF 229173) (1 paratype (juv. spec.)). Asiago, 1000 m a.s.l. (municipality of Asiago, province of Vicenza, Italy), 32TPR9483, A. Battisti leg. 02.09.1988 (1 spec.). Pad to Passo Finestra, Valle delle Grave, Feltre, 750 m a.s.l. (municipality of Cesiomaggiore, province of Belluno, Italy), 32TQS2512, C. Dalfreddo leg. 19.06.1987 (1 spec.). Lover Val Tovanella, 575 m a.s.l. (municipality of Ospitale di Cadore, province of Belluno, Italy), 33TTM9333, C. Dalfreddo leg. 30.09.2005 (1 spec., 1 juv. spec.). Grigno valley, Pieve Tesino, 850 m a.s.l. (municipality of Castello Tesino, province of Trento, Italy), 32TQS0206, M. Bodon leg. 24.09.1994 (1 spec.). Passo di Monte Croce Carnico, 1350 m a.s.l. (municipality of Paluzza, province of Udine, Italy), 33TUM4263, M. Bodon leg. 27.07.1989 (1 spec.). Near the Lago del Predil, 970 m a.s.l. (municipality of Tarvisio, province of Udine, Italy), 33TUM8942, M. Bodon leg. 24.07.1989 (1 juv. spec.). Vedronza valley, downstream of Casera Morandin (municipality of Lusevera, province of Udine, Italy), 33TUM6425, M.M. Giovannelli leg. 22.06.1988 (1 spec.).

Remarks Arion obesoductus belongs to *Kobeltia* which at present includes nine other species: *A. anthracius* Bourguignat 1866, *A. distinctus*, *A. fagophilus* De Winter 1986, *A. hortensis* Férussac 1819, *A. intermedius*, *A. occultus* Anderson 2004, *A. owenii* Davies 1979, *A. vejdowskyi* Babor & Kostal 1893 and *A. wiktori* Parejo & Martin 1990 (Kerney *et al.*, 1983; Falkner *et al.*, 2001, 2002; Anderson, 2004; Bank, 2004). Quinteiro *et al.* (2005) studied the relationships of the West European arionids, examining five *Kobeltia* species, and found that one *(A. wiktori*) did not group in the *Kobeltia* cluster according to phylogenetic analysis based on the mitochondrial ND1



Figures 10–13 Distal genitalia (Figs 10–11), internal structure of distal genitalia with outlets of epiphallus, duct of bursa copulatrix and free oviduct (Fig. 12) and internal structure of epiphallus (Fig. 13) of specimens of *Arion obesoductus* Reischütz 1973 (= *A. alpinus* auct., non Pollonera 1887), from Val Tovanella (Ospitale di Cadore, Belluno), 33TTM9333, C. Dalfreddo leg. 30.09.2005 (Figs 10–11, 13) and Vedronza valley, downstream of Casera Morandin (Lusevera, Udine), 33TUM6425, M.M. Giovannelli leg. 22.06.1988 (Fig. 12). Acronyms: BC bursa copulatrix, DBC duct of bursa copulatrix, DFO distal free oviduct (eversible portion of free oviduct), E epiphallus, EP epiphallus papilla, FO free oviduct, FOP free oviduct papilla, GA genital atrium, MFO median free oviduct (firm portion of free oviduct), OSD ovispermiduct, PFO proximal free oviduct, VD vas deferens.



Figures 14–15 Epiphallus outlet (Fig. 14), internal structure of free oviduct (Fig. 15) of a specimen of *Arion obesoductus* Reischütz 1973 (= *A. alpinus* auct., non Pollonera 1887), from Val Tovanella (Ospitale di Cadore, Belluno), 33TTM9333, C. Dalfreddo leg. 30.09.2005. Acronyms: BC bursa copulatrix, DBC duct of bursa copulatrix, DFO distal free oviduct (eversible portion of free oviduct), E epiphallus, EP epiphallus papilla, FOP free oviduct papilla, GA genital atrium, MFO median free oviduct (firm portion of free oviduct), PFO proximal free oviduct, VD vas deferens.

gene and nuclear internal transcribed spacer 1 (ITS1).

Dvořák *et al*. (2006, 2007) proved by mitochondrial 16S rDNA sequences that Czech, German and Italian specimens of *A. obesoductus* (as "*A. alpinus*") belong to the same species, close but distinct from *A. distinctus*, *A. hortensis*, *A. owenii*, and *A. intermedius*. Regarding its morphological characterisation, some *Kobeltia* species (*A. anthracius*, *A. vejdowskyi* and *A. wiktori*) are only summarily known (cf. Kerney *et al.*, 1983; De Winter, 1986; Castillejo, 1997, 1998) so that detailed comparison is impossible. *A. obesoductus* is readily distinguished from *A. intermedius*, a species formerly assigned to *Microarion* Hesse 1926, because the latter has distinctive structures in the free oviduct: very short oviduct lacking the firm and eversible portions and papilla (see Davies, 1977; Manganelli & Giusti, 1988; Backeljau & De Bruyn, 1990; Barker, 1999). *A. obesoductus* is also easily distinguished from *A. occultus, A. fagophilus*, *A. distinctus*, *A. hortensis* and *A. owenii* because they have a longer and more slender proximal portion of the free oviduct and a different epiphallus papilla (no papilla in *A. occultus*; thin wall surrounding epiphallus outlet in *A. fagophilus*; conical sessile papilla in *A. distinctus*; oblong sessile papilla in *A. hortensis*;

tongue-like, pedunculated, grooved papilla in *A. owenii*). It is also distinct from most specimens of *A. distinctus* because they have a bipartite oviduct lacking distal eversible portion (for *A. occultus*, see Anderson, 2004; for *A. fagophilus*, see De Winter, 1986; for *A. distinctus*, see Davies, 1977; De Winter, 1984; Backeljau & Van Beeck, 1986; Backeljau & De Bruyn, 1990; Wiktor, 1996; Barker, 1999; Dvořák *et al.*, 2006; for *A. hortensis*, see Davies, 1977; De Winter, 1984; Backeljau & De Bruyn, 1990; Barker, 1999; for *A. owenii*, see Davies, 1977, 1979; Backeljau & Van Beeck, 1986; Backeljau & De Bruyn, 1990).

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