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LITTLE KNOWN AND NEW SOUTH-WEST EUROPEAN SLUGS (PULMONATA: AGRIOLIMACIDAE, ARIONIDAE)

by

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Winter, A.J. de: Little known and new South-west European slugs (Pulmonata: Agriolimacidae, Arionidae).

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Key words: slugs; *Arion*; *Deroceras*; *Kobeltia*; *Mesarion*; systematics; Spain; France; spermatophore.

Four new taxa of slugs of the genera *Arion* and *Deroceras* are described, viz., *Deroceras vascoana* spec. nov., *Arion (Kobeltia) fagophilus* spec. nov. and *Arion (Mesarion) urbiae* spec. nov. from NW Spain, as well as *Deroceras altimirai levisarcobelum* subspec. nov. from the French Pyrenees.

D. altimirai Altena is considered a polytypic species, with three subspecies, *D. a. altimirai* Altena, *D. a. tarracense* Altena and *D. a. levisarcobelum* subspec. nov. The nominate subspecies is reported from France for the first time.

Arion (Kobeltia) anthracius Bourguignat is considered a valid species. Its genital anatomy is described for the first time from specimens collected some 60 km from the type locality. The study of topotypes is still necessary, as the type specimens turned out to be not suitable for dissection.

A second record of *D. chevallieri* Altena is given from SE France, as well as two additional records of *D. ercinae* de Winter from the Spanish province of Santander.

In *A. urbiae* up to three spermatophores were encountered in the bursa of a single individual, a feature so far unknown in arionids.

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RESUMEN

Se describe cuatro taxones nuevos de babosos: *Deroceras vascoana* spec. nov., *Arion (Mesarion) urbiae* spec. nov. y *Arion (Kobeltia) fagophilus* spec. nov. del noroeste de España mas *Deroceras altimirai levisarcobelum* subsp. nov. de los Pirineos franceses. *Deroceras altimirai* Altena es considerado como una especie politípica con tres subspecies: *D. a. altimirai* Altena, *D. a. tarracense* Altena y la subespecie nueva mencionada arriba. Por primera vez se hace mención de la existencia de la subespecie nominal en Francia. *D. anthracius* Bourguignat es con-

siderado como especie válida. Por primera vez su anatomía es descrita, basado en ejemplares que fueron coleccionados a unos 60 kms de la localidad típica. Es conveniente hacer un estudio de topotipos porque los especímenes típicos resultaron inusables para disección. Se registra *Deroceas chevallieri* Altena de un segundo lugar en el sureste de Francia igual que se registra *D. ercinae* de dos lugares adicionales en la provincia española de Santander. En *A. urbiae* se encontró hasta tres espermátóforos en la bursa de un individuo singular, un fenómeno hasta ahora desconocido en los arionidos.

INTRODUCTION

The Iberian Peninsula, including the French Pyrenees, is still poorly known with regard to land slugs. This is partly explained by inadequate collecting, as well as by the very confused systematics of this group, due to the frequent occurrence of poor descriptions in the literature together with the lack of preserved type specimens. The large number of alleged species makes the identification of insufficiently described nominal taxa, without access to topotypes, rather risky.

In the present paper four new taxa are described; additional records are given of three little known species.

The material dealt with here is from northern Spain and southern France. It was in part collected by several friends to whom I am most indebted: C.F.M. den Bieman, Bennekom, Th. Heyerman, Wageningen, J. Notenboom, Haarlem and especially Mlle C. Stévanovitch, Reims, whose collection of Pyrenean slugs, made in 1984, constitutes in fact the basis of the present paper.

I am grateful to Dr. E. Gittenberger for thoroughly reading and commenting on an earlier draft of the manuscript, and to Dr. J.G.M. Raven for preparing the Spanish summary.

Measurements are taken from preserved specimens, unless stated otherwise.

Abbreviations. — MHNG, Muséum d'Histoire Naturelle, Genève; MNCN, Museo nacional de Ciencias Naturales, Madrid; MNHW, Museum of Natural History, Wrocław; RMNH; Rijksmuseum van Natuurlijke Historie, Leiden; SMF, Senckenberg Museum, Frankfurt am Main; WW, colln. de Winter, Wageningen; ZMA, Zoologisch Museum, Amsterdam.

a, atrium; ag, albumen gland; am, atrial muscles; ap, penial appendage; b, bursa copulatrix; bd, duct of bursa copulatrix; e, epiphallus; ep, papilla in front of epiphallus in upper atrium; fo, free oviduct; hd, hermaphrodite duct; i, intestine; l, liver; la, ligula; lo, lower, soft part of the free oviduct; o, ovotestis; p, penis; pr, prostate; rc, rectal caecum; rm, genital retractor muscle; sa, sarcobelum; sod, spermoviduct; uo, upper, muscular part of the free oviduct; vd, vas deferens.

AGRIOLIMACIDAE

In agriolimacids, as well as in other pulmonate slugs, the use of subspecific names is rather uncommon. If such is done, it is usually only to indicate a certain doubt concerning the systematic position of the material. The prerequisites for the establishment of a subspecies as a taxonomically distinct group inhabiting a geographic subdivision of the range of the species (Mayr, 1970), have to my knowledge never been fulfilled in this group. This contrasts to the situation in shelled pulmonates, where subspecific names have been extensively used, and where a number of well documented studies are available.

The literature concerning Agriolimacidae, mainly on *Deroceras*, seems to indicate that the greater part of the species have a rather limited range. Surprisingly few species, mostly synanthropic ones, inhabit larger areas. This feature is also in striking contrast to the situation in many shelled relatives; at least in Europe, besides species endemic for a restricted area, many species apparently show a more extensive distribution, often with a number of geographical races.

Perhaps an important reason for this phenomenon may be found in the limited numbers of characters commonly used in slug taxonomy, which makes it difficult to recognize relationships.

The number of described *Deroceras* species is becoming uncomfortably large. Recently, some attempts have been made to bring order in this chaos by assigning the species to a number of subgenera. As was shown elsewhere (De Winter, 1985), this turned out not to be satisfactory. Bodon et al. (1982) independently reached the same conclusion. Perhaps at closer examination it may turn out to be possible to recognize a number of polytypic species or superspecies, each with a number of subspecies resp. semispecies, thus reducing the number of species, which are expected to fulfill the requirements of the biological species concept.

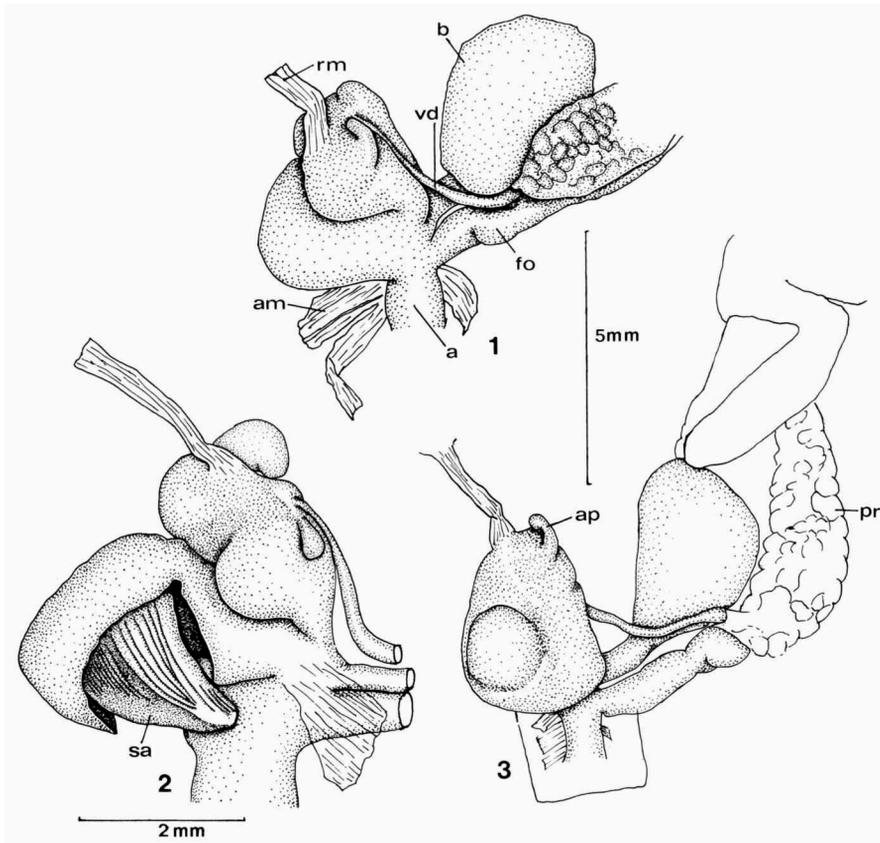
***Deroceras altimirai* Altona, 1969**

Deroceras altimirai Altona, 1969: 104. Type locality: Spain, province of Barcelona, "Garraf" (UTM DF16).

This species was described from the Spanish province of Barcelona. Additional material was collected by the late L. Gasull from the province of Castellón (Gasull, 1981: 72). This material is all present in the RMNH and could be studied there. The specimens from Castellón differ in no respect

from those from Barcelona. The large gap between these areas is filled up by *D. tarracense* Altena, 1969. This species has a very similar penial apex, but differs in having a conspicuous outgrowth of the basal part of the penis, which contains a fold, derived from the sarcobelum (Altena, 1969: figs. 3a-e).

In 1984 specimens of a species resembling *D. altimirai* were collected from a number of localities in the French Pyrenees. Part of this material differs consistently in a number of characters. However, the penial apex shows the very characteristic features of *D. altimirai*, viz., (1) its oblong shape, (2) its division into two parts, one of which with a short, simple appendage, (3) the apical insertion of the penial retractor muscle, and (4) the median place of entry of the vas deferens (cf. Altena, 1969, figs. 2a-f).



Figs. 1-2. *Deroceras altimirai altimirai* Altena; 1, anterior genitalia of a specimen from Amélieles-Bains and Céret; 2, paratype from Garraf (type locality), penis opened, showing sarcobelum. Fig. 3. *D. altimirai levisarcobelum* subsp. nov., anterior genitalia of paratype from Mont Louis.

In view of the fact that these forms inhabit contiguous areas (fig. 36), as well as the fact that specimens somewhat intermediate between two of these have been found (see below), it seems not impossible that we are dealing with subspecies rather than separate species, viz., *D. altimirai altimirai*, *D. a. taracense* and *D. a. levisarcobelum* subsp. nov. As a hypothesis I would propose to consider them as such. In the area where *D. altimirai* is known from, the occurrence of polytypic molluscan species is not without precedent, e.g. the chondrinid species *Abida secale* (Draparnaud) and especially *Chondrina farinesii* (Des Moulins) (see Gittenberger, 1973).

***Deroceras altimirai altimirai* Altena, 1969**

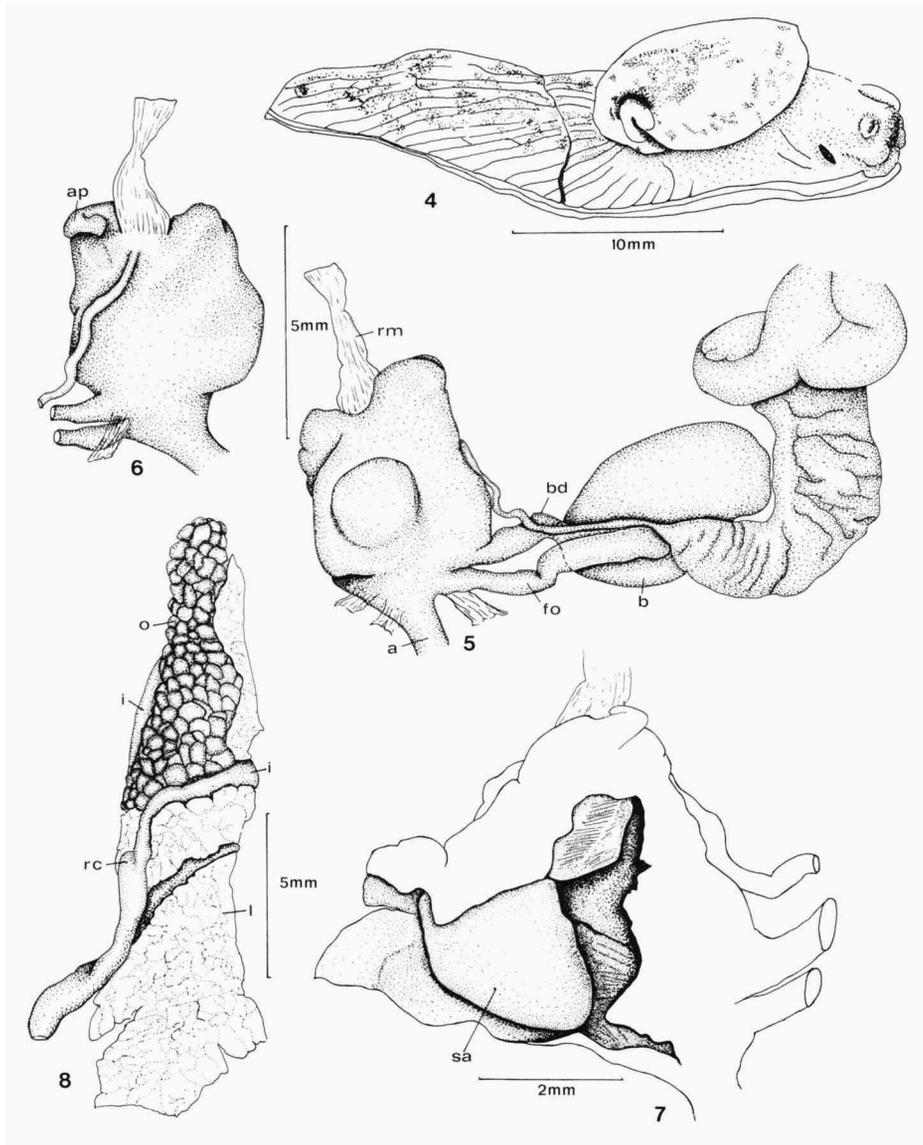
(figs. 1, 2, 36)

Material (fig. 36). — Spain, province of Barcelona (Altena, 1969): Garraf, 24 km SW of Barcelona, type locality, UTM DF16 (RMNH); Santa Fé del Montseny, 38 km SW of Gerona, UTM DG52 (RMNH); Cornella de Llobregat, 4 km SW of Barcelona, UTM DF27 (RMNH); Vallvidrera, 4 km NW of Barcelona, UTM DF38 (RMNH); San Celoni, Pie del Montseny, 40 km NE of Barcelona, UTM DG51 (RMNH); Berga, UTM DG06 (RMNH). Province of Castellón (Gasull, 1981): Ayódar, 28 km W of Castellón de la Plana, UTM YK22 (RMNH); San Juan de Penagolosa, 38 km NW of Castellón de la Plana, UTM YK25 (RMNH).

France, department Pyrénées Orientales: between Amélie-les-Bains and Céret, UTM DH70, 200 m alt., IV-1984 C. Stévanovitch leg. (RMNH/2). Département Hautes-Pyrénées: 6 km ENE of Bagnères-de-Bigorre, UTM BH77, 500-600 m alt., IV-1984, C. Stévanovitch leg. (RMNH/2); Col d'Aspin, 28 km NW of Bagnères-de-Luchon, UTM BH85, 1480 m. alt., IV-1984, C. Stévanovitch leg. (RMNH/1). Département Haute-Garonne: Vallée de la Pique, S of Banères-de-Luchon, UTM CH03, IV-1984, C. Stévanovitch leg. (RMNH/1).

Little needs to be added to the original description, except for a note on the sarcobelum, of which Altena's description and drawing are not very clear. In the holotype, which was figured by Altena, the sarcobelum is somewhat distorted and when viewed from a certain position, it gives the impression of a "papille pointue" (Altena, 1969: 104, fig. 2d). It may be better described as a somewhat conical, often flattened structure, with a sharp apical edge, covered by rather coarse furrows (fig. 2).

Distribution (fig. 36). — This subspecies is known from the Spanish provinces of Barcelona and Castellón, and from one locality in the eastern part of the French department Pyrénées-Orientales. Material from the departments Hautes-Pyrénées and Haute-Garonne is attributed to this subspecies with certain reservations (see below).



Figs. 4-8. *Derocheras altimirai levisarcobelum* subsp. nov., holotype; 4, external appearance; 5, anterior genitalia; 6, penis; 7, penis opened, showing sarcobelum; 8, posterior part of visceral mass.

***Deroceras altimirai levisarcobelum* subsp. nov.**

(figs. 3-8, 36)

Material (fig. 36). — Holotype (RMNH alc. 9157): France, department Ariège, near Aigues-Juntas along the D1, 15 km NW of Foix, UTM CH76, 500 m alt., 3-IV-1984, C. Stévanovitch leg. Paratypes: 1 specimen together with the holotype (RMNH alc. 9158/1). Department Ariège: between Foix and Caraybat along the D9, 5 km SE of Foix, UTM CH86, 600 m alt., IV-1984, C. Stévanovitch leg. (RMNH alc. 9159/1). Department Pyrénées Orientales: Valley of river Têt near Mont-Louis, UTM DH 20, about 1600 m alt., 24-VI-1984, Th. Heyerman leg. (RMNH alc. 9160/2).

Diagnostic features. — Differs from *D. a. altimirai* by (1) the penis, which lacks a clear distinction between an upper and a lower part, (2) the thicker and more blunt sarcobelum without the usual furrows, (3) a very short or no rectal caecum and (4) the larger ovotestis, which reaches the apex of the visceral mass.

External appearance (fig. 4). — The specimens are all adults and measure between 19 and 34 mm in length. The holotype is 32 mm long, its mantle 11.5 mm. The specimens are brownish-yellow, some nearly orange. The mantle and dorsum are more or less densely covered by diffuse brown spots. In all specimens there is a conspicuous dark "eyebrow"-like spot above the respiratory pore.

Intestine (fig. 8). — A rectal caecum is either very short or completely absent. The mesenteria covering the viscera are unpigmented.

Genital system (figs. 3, 4-6). — The ovotestis is large and extends from the rectum to the rear of the visceral mass, whereas in the nominate subspecies it is always surrounded by liver tissue; the acini are larger and more darkly stained. The albumen gland and the prostate are cream. The spermoviduct is slightly pinkish or greyish. The vas deferens runs along the median line of the penis and enters the penis apically, slightly lower to the insertion of the penial retractor muscle. The penial apex is indistinctly divided into two lobes, one of which carries a short, simple appendage. The division of the penis into an upper and a lower part, like in *D. a. altimirai*, is very indistinct externally. On the lower part of the penis a conspicuous knob is present. The sarcobelum is thicker and has a more blunt apex, compared to that in the nominate subspecies. The usual finger-print-like pattern of furrows on the sarcobelum is lacking or at least very indistinct.

Derivatio nominis. — The name refers to the smooth surface of the sarcobelum.

Remarks. — The specimens from three localities in the French departments Haute-Garonne and Hautes-Pyrénées resemble the nominate subspecies in penial shape, with a clear distinction between apical and basal part and in

their lined sarcobelum. However, in the size and position of the ovotestis as well as in the length of the rectal caecum they resemble the newly described subspecies. These specimens are provisionally attributed to *D. a. altimirai*. Material from the adjoining Spanish area might clarify their systematic position.

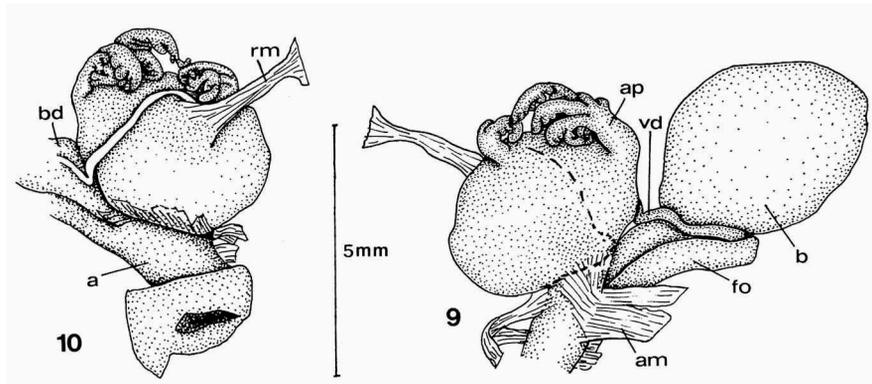
D. altimirai s.l. is at least partly sympatric with *D. agreste* (Linné, 1758), which has a similar penial appendage (Altena, 1970). The study of material from about the same area mentioned by Altena (1970) revealed that *D. agreste* differs in having hardly any external pigmentation, a more elongated penis with a different sarcobelum and a much longer rectal caecum. There also appear to be phenological differences: *D. agreste* is adult in autumn, while all records of *D. altimirai* are from winter and spring.

***Deroceras chevallieri* Altena, 1973**
(figs. 9, 10)

Deroceras chevallieri Altena, 1973: 25. Type locality: France, department Var, "les Salins près de Saint-Tropez" (UTM LN19).

Material. — France, department Vaucluse: N-slope of the Mont Ventoux, UTM FJ89, 700-800 m alt., 9-IV-1984, C.F.M. den Bieman leg. (RMNH/1).

This species has not been reported since its description. The specimen reported upon here resembles *D. chevallieri* in most characters: the possession of two clearly separate penial appendages, the presence of some dark pigmentation on the penial apex, the place of entry of the vas deferens very near the



Figs. 9-10. *Deroceras chevallieri* Altena; specimen from Mont Ventoux, anterior genitalia. In fig. 9 the outline of the sarcobelum is indicated by a dashed line.

penial retractor muscle, etc. (cf. Altena, 1973). It differs (1) in being larger (31 mm), (2) in its more strongly branched, lobate penial appendages, (3) in its very long rectal caecum, which nearly reaches the apex of the visceral mass, and (4) especially in its sarcobelum, which is a large flat fold, with a blunt apex. It is not unlike the specimens described as "*Deroceras* sp. *prope bisacchianum*" by Bodon et al. (1982: 59, figs. 3a-g), but differs mainly in having a second penial appendage and a much longer rectal caecum.

***Deroceras vascoana* spec. nov.**
(figs. 11-16, 36)

Material (fig. 36). — Holotype (RMNH alc. 9161): Spain, provinces of Guipúzcoa/Navarra (border), near Alto de Lizarrusti, 13 km SW of Beasain, collected during rain on large, moss-covered calcareous rocks in a *Fagus* forest, UTM WN75, 650 m alt., 8-IV-1985, J.L.M. Donders & A.J. de Winter leg. Paratypes: 12 specimens together with the holotype (RMNH alc. 9162/4; MNHW/2; MNCN/2; SMF/2; WW/2). Province of Navarra: near Almandoz, 30 km N of Pamplona, along the N1, UTM XN17, IV-1984, C. Stévanovitch leg. (RMNH alc. 9163/1).

Diagnostic features. — A pale unicolourous *Deroceras* species. Penis bulbous, with apically very conspicuous purple-brownish pigmentation, which contrasts with the white, strongly branched, penial appendage. Rectum without a caecum.

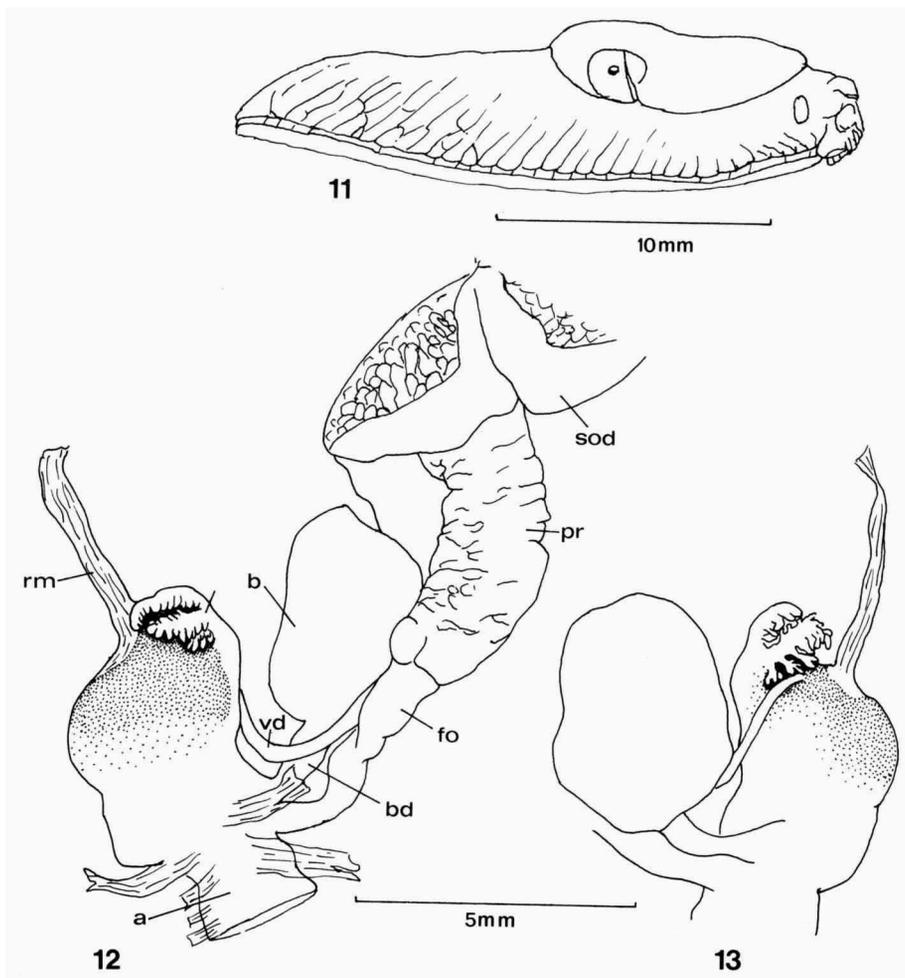
External appearance (fig. 11). — All specimens are unicolourous, very pale brown, without darker spots; the area around the pneumostome is not conspicuously paler, in contrast to many other species. Disturbed specimens abundantly excrete milky white mucus. The skin is not transparent. Very superficial furrows run across the dorsum and the sides. The posterior third part of the dorsum is sharply keeled. The holotype measures 30 mm in length, its mantle 13 mm; the largest paratype (from Almandoz) measures 32 mm, the smallest 22 mm. All specimens have well developed genitalia.

Shell. — The shell of a paratype of 27 mm measures 3.5×2.7 mm. It is relatively solid, partly transparent, with a very thin border.

Intestine (fig. 15). — The rectum has no caecum. The mesenteria, which surround the viscera, are unpigmented.

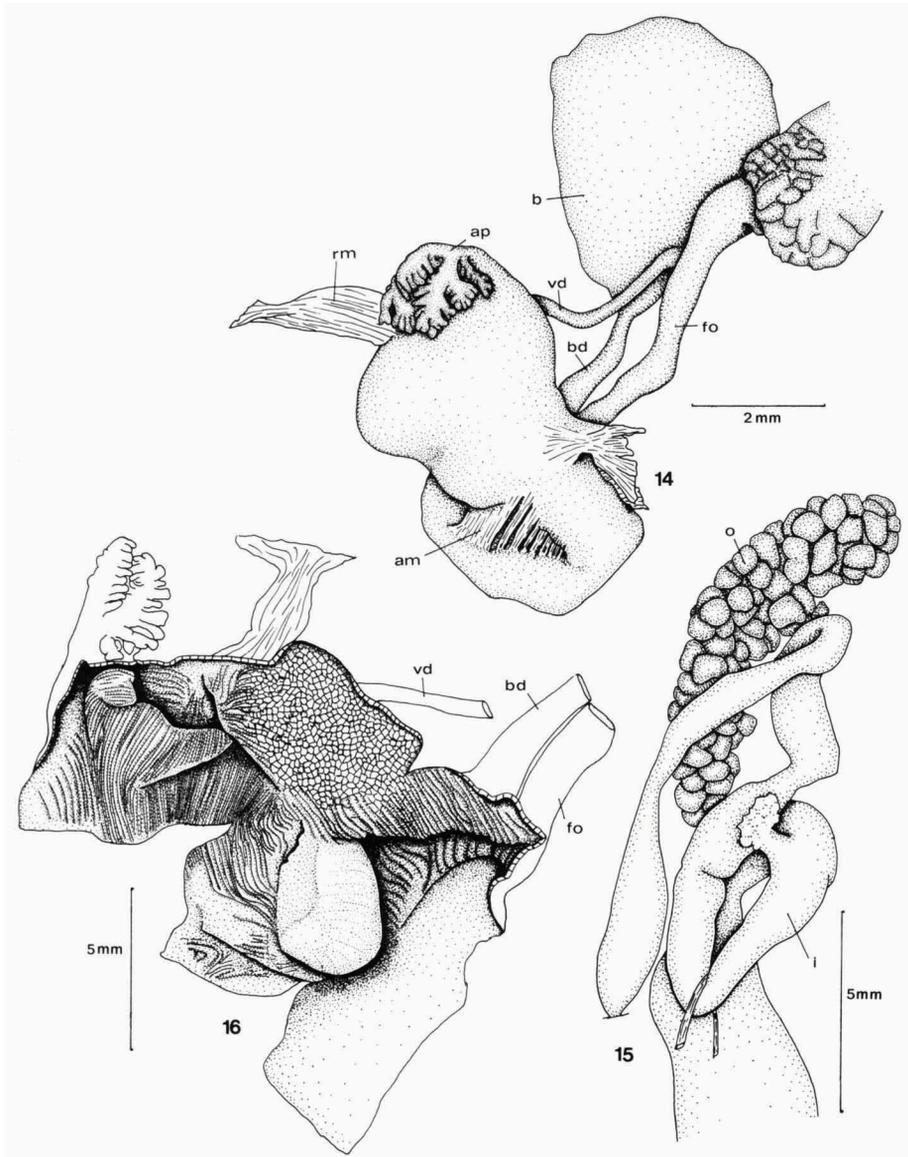
Genital system (figs. 12-14, 16). — The ovotestis consists of large brown acini and is situated at the rear of the visceral mass, partly under the intestine, for the larger part exposed. The spermoviduct is pale pink, the prostate cream. The free oviduct is rather slender, about as wide as the duct of the bursa copulatrix. The bursa itself is a large, bulbous sac, about as large as the penis. The atrium is very broad. The lower part of the penis and the atrium

are firmly attached to the body wall by an unusual large number of muscles. The bulbous penis is relatively small; its apical part is very conspicuously stained by purple-brown pigment. The vas deferens enters the penis on the very apex; its point of entry is usually obscured by the branches of the penial appendage. The penial retractor muscle also inserts on the stained apical part. The penial appendage is strongly branched. The main branch is partly stained; the subsequent ramifications are white and contrast strikingly with the penial apex on which they lay. The main branch is subdivided into three to four se-



Figs. 11-13. *Deroceras vascoana* spec. nov., paratypes from Alto de Lizarrusti; 11, external appearance; 12, 13, anterior genitalia, the dotted area indicates the extent of the pigmentation on the penial apex.

cond order branches, which are each subdivided again, giving the appendage a very lobate appearance. The sarcobelum consists of an obtuse, sometimes flattened top, followed by a broad undulate band, which covers largely the inner wall of the penis.



Figs. 14-16. *Deroceras vascoana* spec. nov.; 14, anterior genitalia of holotype; 15, posterior part of intestine, also showing position of ovotestis; 16, penis of paratype from Alto de Lizarrusti opened, showing internal organization.

Derivatio nominis. — Named after the Pais Vasco, the Basque-speaking Spanish region, where the type specimens were collected.

Remarks. — This species is easily recognizable anatomically by the shape and colouration of its penis and the strongly branched penial appendage. Externally it may be confused with other pale, spotless *Derocheras* species, like *D. agreste* (Linné) and *D. ercinae* de Winter, which differ conspicuously in anatomical features (Luther, 1915; Altena, 1970; De Winter, 1985).

***Derocheras ercinae* de Winter, 1985**
(fig. 36)

Derocheras ercinae De Winter, 1985: 69. Type locality: Spain, province of Oviedo, "around the lago de la Ercina, Picos de Europa" (UTM UN39).

Two additional records can be given (fig. 36): Spain, province of Santander, La Busta, 9 km W of Torrelavega, near entrance of Cueva la Busta (= Cueva del Linar), UTM VP0400, 100 m alt., 16-IV-1984, A.J. de Winter leg. (WW 4181/1); 1 km W of Hazas, 9 km SSE of Arredondo, UTM VN85, 500 m alt., J. Notenboom leg. (WW 3918/3).

ARIONIDAE

The genus *Arion* was divided by Hesse into five subgenera. With the exception of *Microarion*, which most authors presently include in *Kobeltia*, this division seems to be a robust one, but a sound cladistic analysis remains to be done. In the present paper these subgenera are provisionally retained.

In north-western Europe complexes of sibling species are regularly discovered within each subgenus. Morphologically these siblings are often difficult to identify, mainly because of the poverty of suitable characters.

In the Iberian Peninsula the situation is particularly difficult, as the area seems to be exceptionally rich in species. In the present paper some species are described as new, although a number of nominal taxa are still insufficiently known. A more definite solution to the many nomenclatorial problems in Iberian arionids, some of which are likely to have consequences for the nomenclature of more widely distributed western European species as well, must be postponed until sufficient material, especially topotypes of various taxa, become available.

Arion (Kobeltia) fagophilus spec. nov.

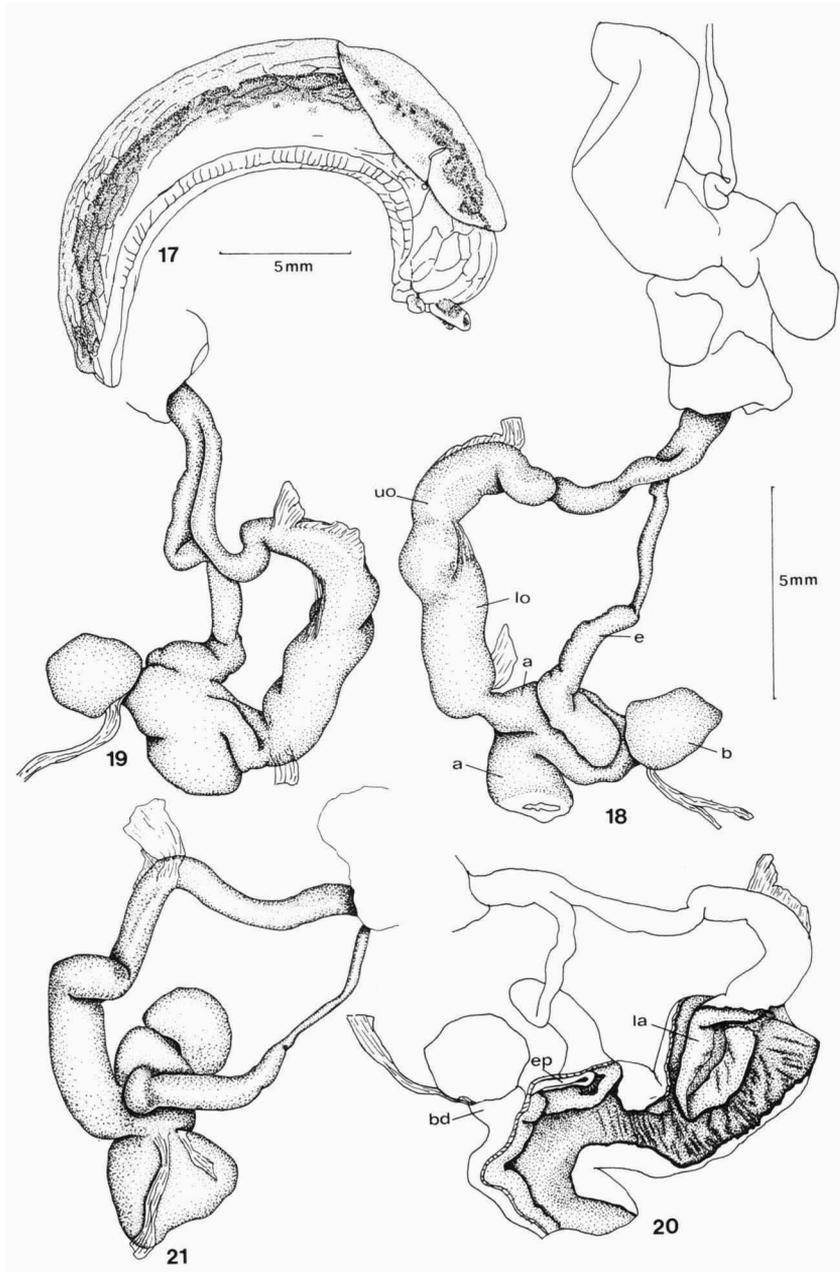
(figs. 17-21, 35)

Material (fig. 35). — Holotype: Spain, province of Navarra, north side of the Sierra de Urbasa, 3 km S of Alsasua; found among leaf litter in a *Fagus* forest on calcareous soil; UTM WN64, 700-800 m alt., 30-III-1985, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9170). Paratypes: 3 specimens together with the holotype (RMNH alc. 9171). Provinces of Navarra/Guipúzcoa (border), *Fagus* forest near Alto de Lizarrusti, 13 km SE of Beasain, UTM WN75, 650 m alt., 8-IV-1985, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9172/2). Province of Guipúzcoa: Sierra de Aitzgorri, 10 km SW of Oñate, *Fagus* forest E of Urbía, UTM WN55, 1200-1300 m alt., 4-IV-1985, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9173/2).

Diagnosis. — A small to medium-sized *Arion* species with a dull grey dorsum and parts of the mantle, white flanks and a bright orange sole and foot-fringe. The free oviduct has a large, soft, part, containing a ligula, followed by a muscular shining part, as in *A. hortensis*. A thin-walled structure surrounds the outlet of the epiphallus, quite unlike the papilla found in other *Kobeltia* species.

External appearance (fig. 17). — The holotype measures 25 × 5.5 mm; its mantle length is 9 mm. Unlike other species of the subgenus *Kobeltia*, the foot-fringe has the same bright yellow-orange colour as the sole. The white colour of the sides is not caused by a concentration of white pigment granules, like in *A. hortensis*, but is the ground colour itself. In living animals white pigment granules are sparsely dispersed over the body. The transition of the grey upper part of the body into the white flanks is marked by rather faint, darker lateral bands. In some specimens these bands are barely distinguishable. Most of the pigment of the right mantle band is above the respiratory pore. The animals are somewhat bell-shaped in cross section, like in *Carinarion* species. In living animals the tentacles show a bright reddish colour, when stretched out in front of a white background.

Genital system (figs. 18-21). — The small ovotestis lies against the gastric caecum and is partly exposed. It consists of few purple-brown acini. The rest of the genital system is cream, without any dark pigmentation, even on the basal part of the epiphallus. The free oviduct consists of a slender upper part, a muscular, shining, central part, which probably serves as a stimulating organ (Davies, 1977), and a broad, thin-walled lower part, with internally a ligula, consisting of two folds. The epiphallus is attached to the bulbous part of the upper atrium, which apically bears the bursa copulatrix. The inner wall of the epiphallus is covered by small papillae. The structure at the outlet of the epiphallus into the upper atrium is very different from the ones in other species of the subgenus *Kobeltia* known so far. It consists of a thin wall surrounding the outlet. The bursal duct is very short and wide, not very well dif-



Figs. 17-21. *Arion fagophilus* spec. nov.; 17, external appearance of a paratype from Alto de Lizarrusti; 18, 19, genitalia of holotype; 20, anterior genitalia of holotype, the atrium and lower oviduct opened; 21, anterior genitalia of paratype from Urbia.

ferentiated from the upper atrium. The bursa is a small, round sac. At the outlet of the bursal duct an irregular thickening is present. Retractor muscles are inserted on the lower and upper parts of the free oviduct as well as on the bursal duct, just underneath the bursa. Some muscles are present at the transition of the lower into the upper atrium. Unfortunately the spermatophores are unknown. Attempts to breed the animals in captivity were not successful.

Derivatio nominis. — The name refers to the fact that all specimens have been found in *Fagus* forests, where they live hidden among leaf litter.

Remarks. — Both externally and internally this species is quite different from all *Kobeltia* species known sofar. It is not impossible that part of the Iberian records of *A. hortensis* refer to *A. fagophilus*. It seems probable that this species has been overlooked, because it is difficult to find.

A preliminary electrophoretic analysis of three paratypes revealed several electromorphs unknown in other *Kobeltia* species (including *A. intermedius*) as well as in *Carinarion* species (Backeljau & de Winter, in prep.).

Arion (Kobeltia) cf. anthracius Bourguignat, 1886
(figs. 22-26, 35)

Arion anthracius Bourguignat, 1886: 178. Type locality: "près de Eaux-Bonnes (Basses-Pyrénées), dans l'étroite vallée qui conduit de l'établissement des Bains à la base du Pic du Gers" (UTM YN16).

Material (fig. 35). — France, Département Hautes-Pyrénées, Col d'Aspin, 28 km NW of Bagnères-de-Luchon, UTM BH85, 1480 m alt., IV-1985, C. Stévanovitch leg. (RMNH/2; WW 3828/1).

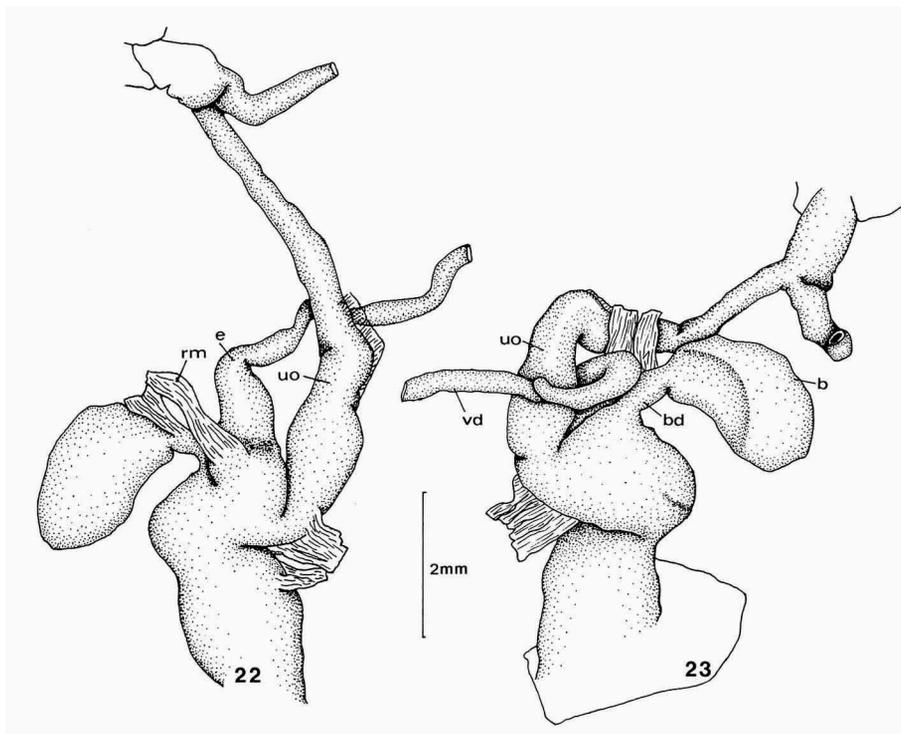
Probably this species has never been recognized since its description, which was based on external features only. Pollonera (1890) as well as Germain (1930) only copied Bourguignat's original description and type locality. Davies (1979) tentatively considered it synonymous to *A. hortensis* Férussac.

The three animals were collected about 60 km from the type locality. They were strongly contracted and difficult to dissect. Two of them contained spermatophores. Their external appearance fits well into Bourguignat's description: a uniform dark colour as well as a lack of lateral bands. They are about 15 mm long. Internally they differ from all species of the *A. hortensis* complex by the possession of a conspicuous retractor muscle inserted on the annular swelling of the epiphallus, which fuses with other retractors inserted on the upper part of the free oviduct and on the bursal duct. The free oviduct consists of a slender upper part, a large, shining, muscular part and a very short thin-walled part attached to the upper atrium; inside no ligula is present. In-

ternally the epiphallus has rows of small papillae. The structure in front of the epiphallus seems to be not unlike the one found in *A. hortensis*, but this character requires reexamination in more, better preserved specimens.

Two slightly damaged spermatophores were found in the bursal ducts of two individuals. They are smaller than the ones from both *A. hortensis* and *A. distinctus* (cf. Davies, 1977; de Winter, 1984). They resemble the former species in the possession of a serrated longitudinal ridge, but, like in *A. owenii* Davies, 1979, they differ in having this ridge spirally arranged along the axis of the spermatophore, with less clearly pronounced teeth. One of the spermatophores possesses a hyaline collar anteriorly, in the other this is lacking.

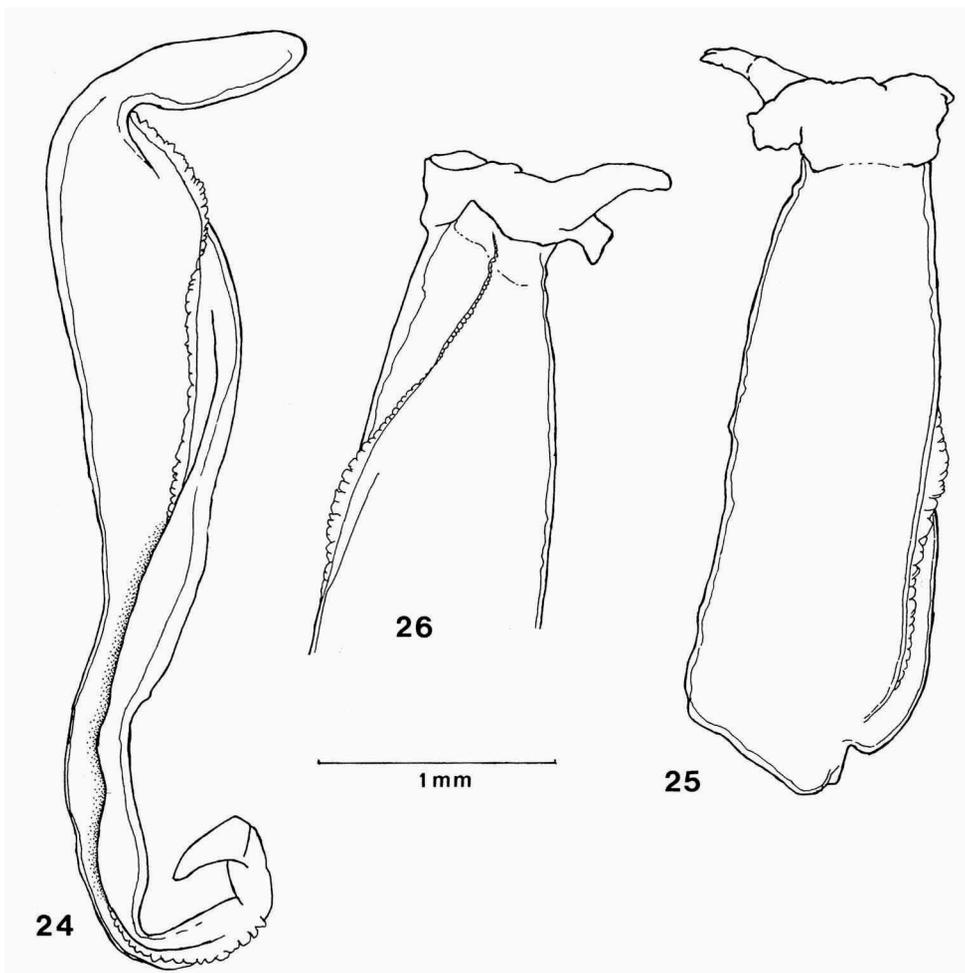
From the above description it may be clear that we are dealing with one more member of the so called "*Arion hortensis* complex", usually placed in the subgenus *Kobeltia* Seibert. The identification with *A. anthracius* must remain somewhat doubtful until material from the type locality is available. Two syntypes of *A. anthracius* are still present in the collection of Bourguignat (MHNG), labeled "*Arion anthracina* Bourg. Vallée du Pic du Gers au dessus d. Eaux-Bonnes". Both are very much shrunk and hardened



Figs. 22-23. *Arion* cf. *anthracius* Bourguignat from Col d'Aspin; 22, 23, anterior genitalia.

and turned out to be not suitable for dissection, even after prolonged soaking in a tri-Sodium phosphate solution.

The existence of a retractor muscle inserted on the epiphallus was reported by Webb (1961: 34) for "*Arion hortensis*". Several attempts to find such a muscle in both *A. hortensis* and *A. distinctus* yielded no success. It seems likely that Webb's specimens actually belonged to *A. intermedius*, which besides such a muscle (cf. Wiktor, 1973, fig. 83) possesses also a large lower atrium as figured by Webb. The presence of a retractor inserted on the epiphallus has been reported in one other arionid, *A. hessei* Simroth from Coimbra, Por-



Figs. 24-26. *Arion* cf. *anthracinus* Bourguignat from Col d'Aspin; 24, spermatophore; 25, 26, spermatophore from another specimen.

tugal (Simroth, 1894: 296). It also occurs in *A. urbiae* spec. nov. (see below). Webb used this feature as an argument that in Arioninae the penis is not altogether lost, but is reduced to "an encompassing ring about the verge" (Webb, 1961: 34). The structure at the outlet of the epiphallus ("the verge") may then be considered the penial papilla.

Arion (Mesarion) urbiae spec. nov.
(figs. 27-35)

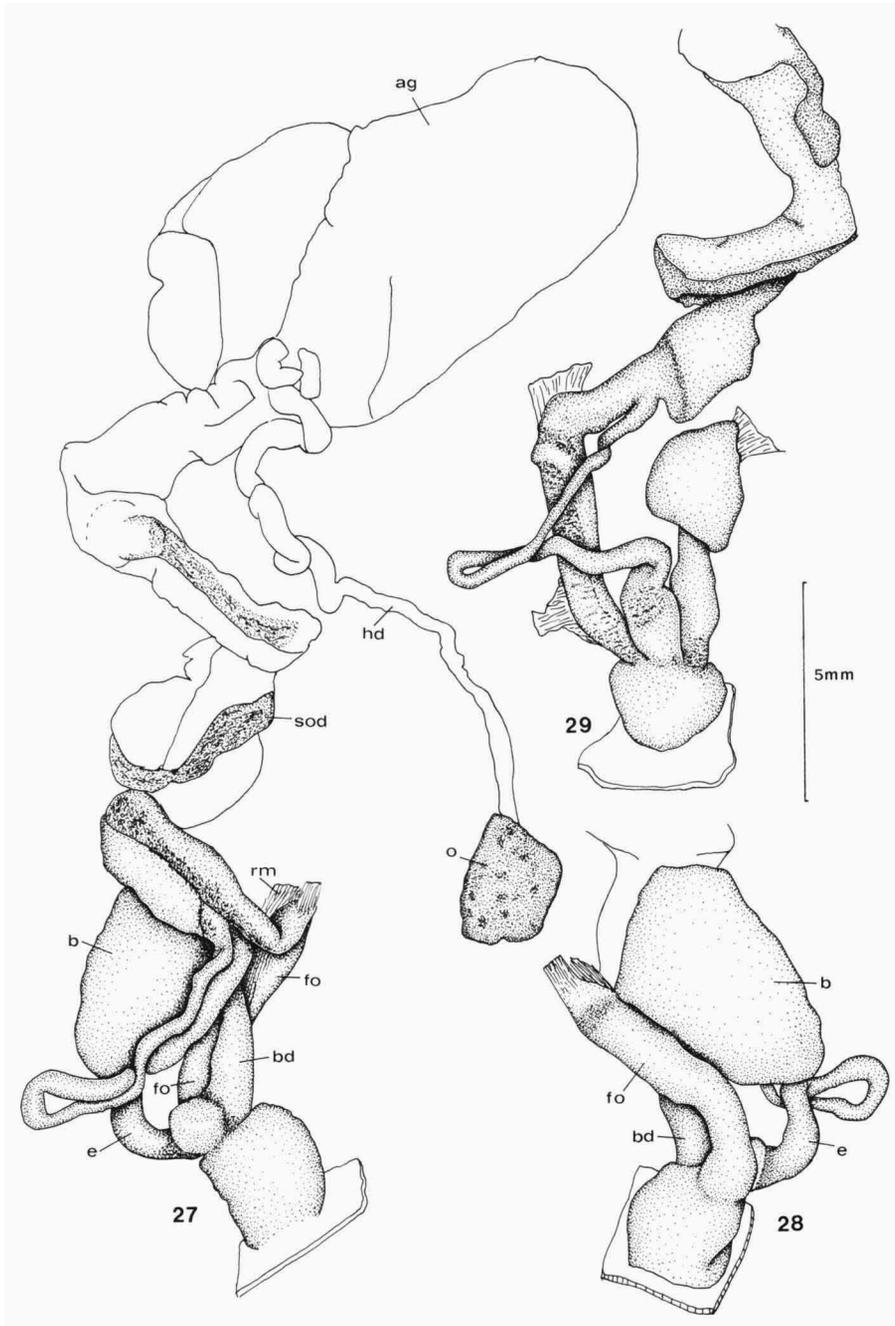
Material (fig. 35). — Holotype: Spain, province of Guipúzcoa, limestone mountains in the vicinity of the Sanctuary of Urbia, Sierra de Aitzgorri, about 10 km SE of Oñate, exposed sites like meadows and rocks, not in woodlands; UTM WN55, 1200-1300 m alt., 3-5-IV-1985, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9164). Paratypes: 53 specimens together with the holotype (RMNH alc. 9165/23; MNHW/5; MNCN/5; SMF/5; ZMA/5; WW 4459/10). Province of Guipúzcoa: 1 km S of Oñate, along the road to Uribarri, UTM WN 46, 250 m alt., 2-IV-1985, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9166/2). Province of Navarra: Alsasua, calcareous rocks near the railway station, UTM WN64, 525 m alt., 30-III-1985, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9167/1). Province of Burgos: La Riba de Valdelucio, 18 km SE of Aguilar de Campoo, near Molino del Diablo, UTM VN1227, 950 m alt., 31-III-1984, J. Notenboom leg. (RMNH alc. 9168/2; ZMA/1); 2 km S of Belorado, UTM VM89, 825 m alt., 21-IV-1982, J.L.M. Donders & A.J. de Winter leg. (RMNH alc. 9169/7; WW 2567/6).

Diagnostic features. — A medium sized greyish to blackish *Arion* species. The anterior genitalia resemble those of *A. subfuscus* (Draparnaud), differing mainly in having a wider bursal duct and usually dark pigment on the epiphallus and oviduct. The free oviduct contains two longitudinal folds. The spermoviduct is more or less greyish. The spermatophore has a spirally arranged, serrated longitudinal ridge and a long filiform tail.

External appearance (fig. 30). — Adult, preserved specimens measure up to about 33 mm in length; living animals are up to about 65 mm long when fully extended. The holotype is 26 mm long and 7 mm wide; its mantle length is 9.5 mm. Most specimens have a dark-grey to nearly black dorsum and mantle. Towards the foot-fringe the colour gradually becomes greyish. A large minority of specimens has two dirty-white bands along dorsum and mantle. Along the mantle edge there are about 17 tubercles between the median line of the body and the genital orifice. In living specimens the colour of the sole is yellowish-white. The mucus is colourless or very pale yellowish. A cross section through the skin shows that the dark pigment is concentrated in a central layer, surrounded by a paler inner and outer layer. In ethanol the colour of the animal often becomes brownish.

Shell. — The shell consists of an agglutination of granules.

Genital system (figs. 27-29, 31-34). — The ovotestis is rather small, largely



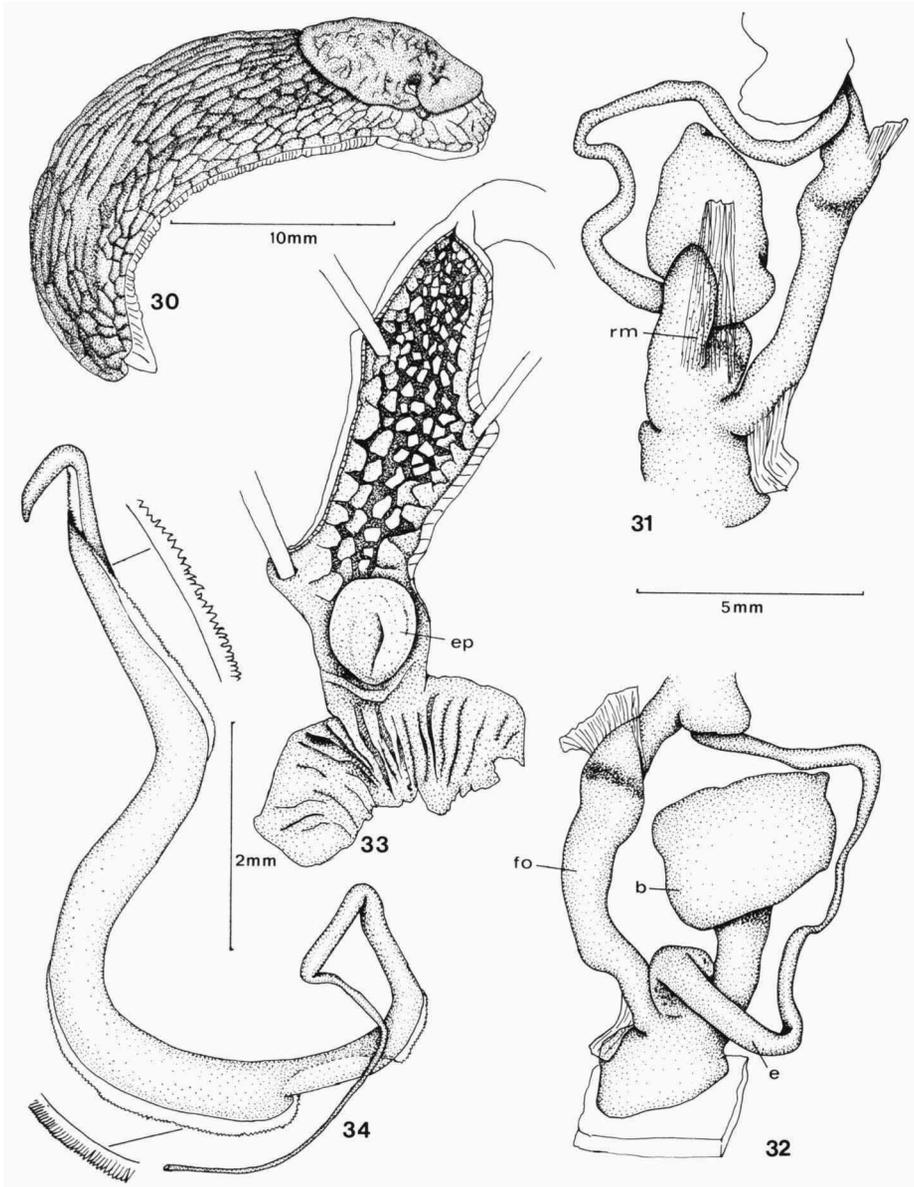
Figs. 27-29. *Arion urbiae* spec. nov., 27, 28, genitalia of holotype; 29, anterior genitalia of paratype from La Riba de Valdelucio.

exposed, surrounded by liver tissue; its acini are hardly discernible through the thick, black, outer connective tissue layer. The hermaphrodite duct is strongly convoluted. The albumen gland as well as the prostate are cream coloured. The spermiduct is more or less grey. The anterior genitalia vary in pigmentation, which is rather constant in each population however. All specimens have at least some pigmentation on the annular swelling of the epiphallus. Specimens from the type locality have a grey band across the broadest part of the free oviduct. Paratypes from Alsasua and Belorado lack this band, while paratypes from Valdelucio have most of their oviducts stained. The free oviduct has interiorly two longitudinal folds as well as some smaller transverse folds connected to them. The free oviduct may be very elongated or somewhat shorter and broader, depending on the fixation of the animal. The bursa copulatrix is usually a rather large sac, covered by conspicuous blood vessels; its duct is of about equal width along its length, less slender than in *A. subfuscus* (Draparnaud). On the inner wall of the epiphallus rows of rather coarse papillae are present. The papilla in front of the epiphallus is hidden by the bulbous part (or what has remained of the penis, see above), and is not visible when the upper atrium is opened, unlike in species of the subgenus *Kobeltia*. This papilla is a round, stiff, slightly conical plate with a slit-like opening. The upper atrium is very small. The genital retractor muscles insert on the upper part of the free oviduct and on the bursal duct, while some fibres are attached to the bulbous part of the epiphallus; a genital retractor is also present on the lower part of the free oviduct.

Several fragments as well as some undamaged spermatophores were found in the bursa copulatrix and bursal duct of specimens from the type locality as well as from Belorado. They have a very slender apex. A conspicuous row of denticles is spirally arranged along the axis of the spermatophore. The filiform hind-part is rather long and carries no denticles. Anteriorly the denticles are well distinguishable individually, but on the posterior part they lay closely against one another.

Derivatio nominis. — The species is named after its type locality, the Sanctuary of Urbia in the Sierra de Aitzgorri.

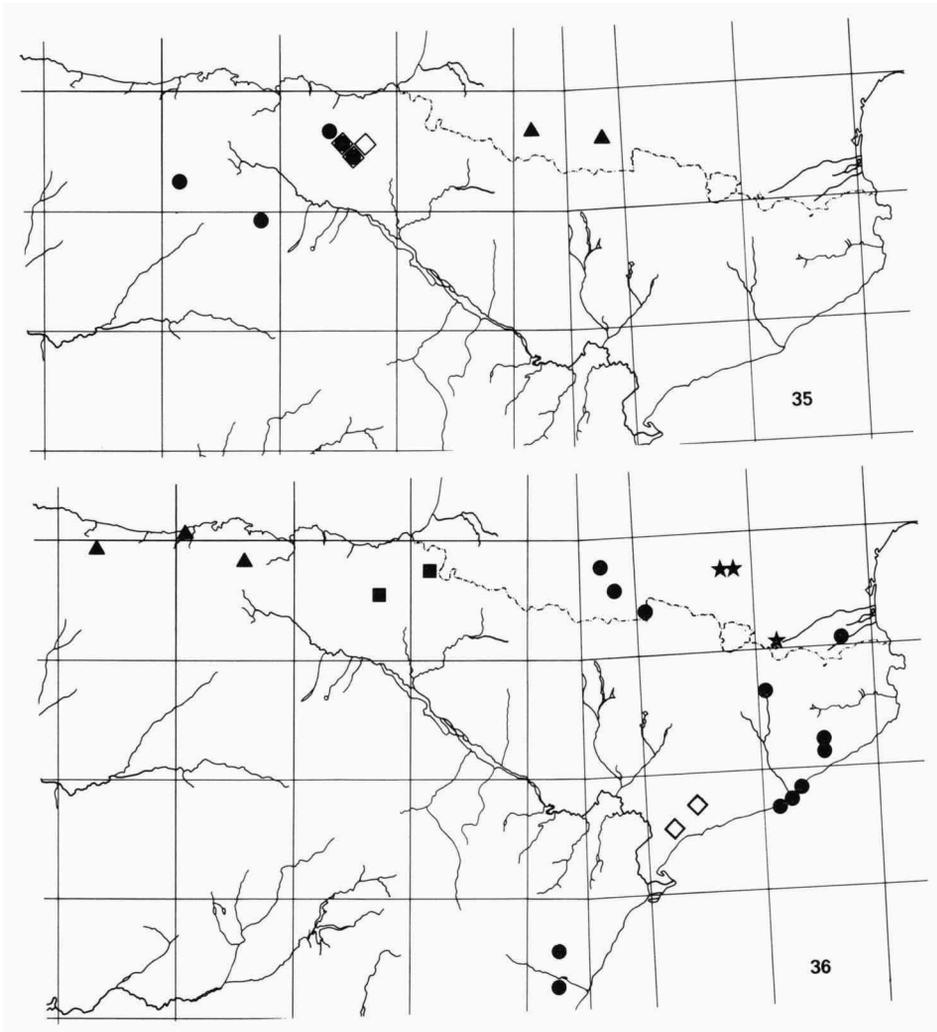
Remarks. — *A. urbiae* is provisionally assigned to the subgenus *Mesarion* Hesse, because of its size, the organization of the anterior genitalia, and the shape of the spermatophore, especially the filiform hind-part, which also occurs in *A. subfuscus* (Quick, 1960: 134, personal observations). It is difficult to delimit *A. urbiae* from dark forms of *S. subfuscus* (e.g. var. *nigricans* Pollonera, 1887), because this species appears to be a complex of at least two species (unpublished results). The systematic problems concerning "*A. subfuscus*" lie outside the scope of the present paper. Nevertheless, *A. subfuscus*



Figs. 30-34. *Arion urbiae* spec. nov., paratypes from Urbia; 30, external appearance; 31, 32, anterior genitalia; 33, epiphallus, opened; 34, spermatophore.

s.l. always has a much more slender bursal duct, while the row of denticles on the spermatophore is not spirally arranged.

It is not unlikely that *A. urbiae* is identical to the species described by Morelet (1845: 32) as "*A. fuscatus* Férussac, 1819" from Tras-os-Montes, NE Portugal, which was originally described from the surroundings of Paris.



Figs. 35-36. Distribution maps of *Arion* and *Deroceras* species, with 100 km² UTM-grid. 35, *A. urbiae* spec. nov. (circles), *A. jagophilus* spec. nov. (diamonds), *A. anthracius* Bourguignat (triangles); 36, *D. altimirai altimirai* Altena (circles), *D. a. levisarcobelum* subsp. nov. (stars), *D. a. tarracense* Altena (diamonds), *D. vascona* spec. nov. (squares), *D. ercinae* De Winter (triangles).

According to Simroth (1886: 21), *A. hispanicus* Simroth, 1886 from the Serra Estrella, Portugal, has, as in *A. urbiae*, a genital retractor muscle inserted on the base of the epiphallus, but differs in being smaller (15 mm), in having dark lateral bands, and in the lack of pigmentation on the spermoviduct (Simroth, 1894: 296, T. II, figs. 4-5).

Another similar species, *A. timidus* Morelet, 1845 from Abrantes, central Portugal, differs according to Simroth's (1891) description of topotypes by its very short epiphallus and vas deferens as well as by its long and slender bursal duct (Simroth, 1891: 349, T. XIV, fig. 3). Simroth's statement, that specimens from Guarda, within the terra typica of *Baudonia montana* Mabilie, 1868, have the same anatomy as *A. timidus*, makes it likely that *A. urbiae* is not identical to this species either.

In the bursa copulatrix of the holotype three rather undamaged spermatophores were found. As the spermatophores in the genus *Arion* are very short-lived, they must have been transferred either during one copulation or during three subsequent copulations within a short period of time. In a paratype from Belorado fragments of at least two spermatophores were encountered. This makes it probable that the phenomenon is not an exception. To my knowledge, the occurrence of more than one spermatophore in a single animal has not been noted before in Arionidae. In a few stylommatophorans it is known to occur, e.g. in some Helicarionidae, where 10-20 spermatophores have been found in the bursa of a single individual (Tompa, 1984: 95). The slug *Trigonochlamys imitatrix* appears to transfer more than one spermatophore at each mating (Likharev & Wiktor, 1980, fide Tompa, 1984: 74, 95). Recently I found three spermatophores in the bursa and bursal duct of a specimen of the slug genus *Parmacella* (unpublished).

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