

## A new slug from the Iberian peninsula: *Arion anguloi* n. sp. (Pulmonata: Arionidae).

By

RAMÓN MARTÍN & BENJAMÍN J. GÓMEZ.

With 4 figures.

### Introduction.

Most of the species of the genus *Arion* were described exclusively on the basis of their external appearance. There are only a small number of works in which the external morphology of the genitalia of the Arionidae more widely distributed in Europe (QUICK 1960, WIKTOR 1973, LIKHAREV & WIKTOR 1980) has been described and figured. During the last years, a variety of authors have been successful in the redescription or better characterization of some species by means of the internal morphology of the genitalia. These works have proven the great validity of these features in this kind of studies.

We have noticed the wide distribution of the genus *Arion* in the Basque Country and surrounding areas, our zone of study (MARTÍN 1985). In our attempt to develop an accurate study of the most common and known species in order to establish their best delimitation, we found a new arionid that possesses constant features clearly different from the rest of the species of the genus. This new species is described herein.

### *Arion anguloi* n. sp.

Figs. 1–4.

**Description:** External features: the body is elongated, cylindrical, and not keeled. It possesses an olivaceous dark green colour in the back, mantle and head; under the microscope such olive green colour is given by numerous grouped grey dots and more scarce yellow dots splashed over them. Yellow dots disappear in the proximity of the peripodial groove; on the other hand the sole, the peripodial groove and the lower part of the sides are splashed with white dots. There are neither bands nor spots in the back and mantle. The tubercles of the back, elongated, narrow and irregular, are rounded and little prominent. The mantle is oval, small, approximately one third of the whole length of the body, and its surface is slightly rough. The tentacles are black. The respiratory orifice is opened in the first half of the mantle, on the right side. The caudal mucous gland is conspicuous, large and triangular. The mucus is transparent and dense, but yellowish mucus is secreted after insistent friction on the back. The length of adult individuals in alcohol varies between 22 and 34 mm. Living adults reach 45–50 mm length when stretched.

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Address of the authors: RAMÓN MARTÍN, BENJAMÍN J. GÓMEZ, Laboratorio de Zoología, Dpto. de Biología, Facultad de Ciencias, Universidad del País Vasco, Apdo. 644, 48080 Bilbao, Spain.

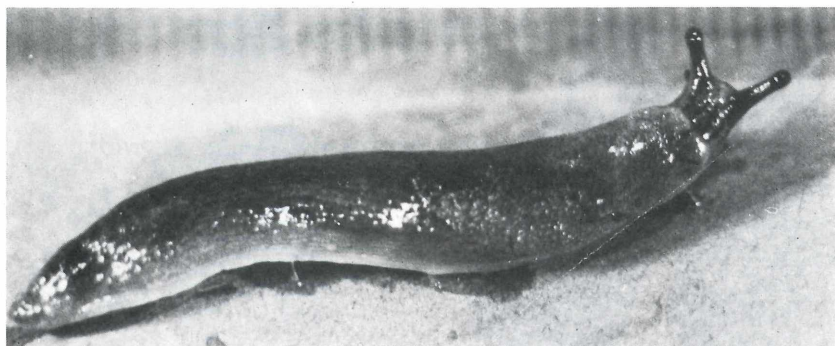
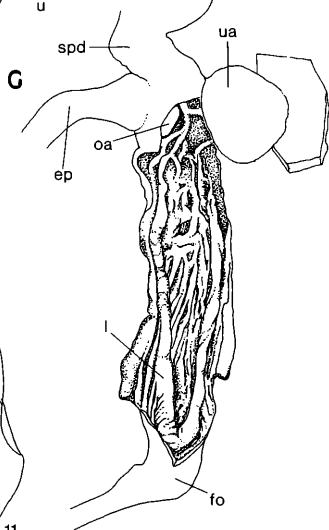
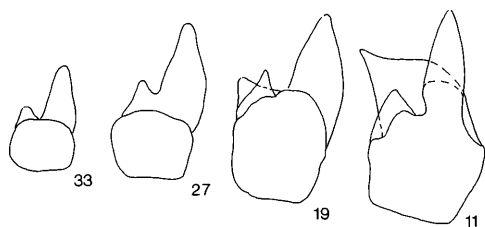
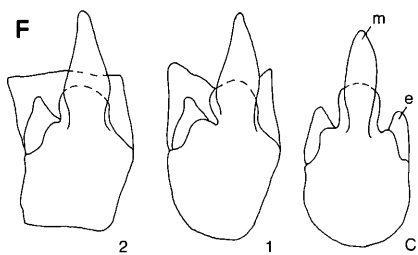
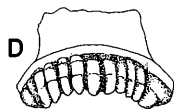
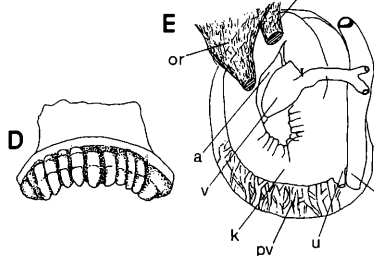
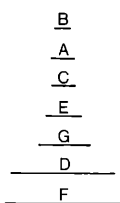
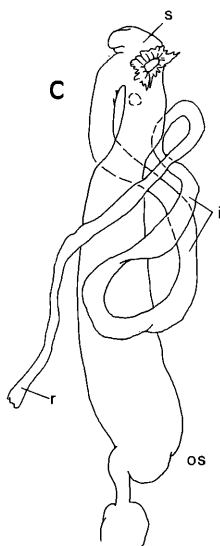
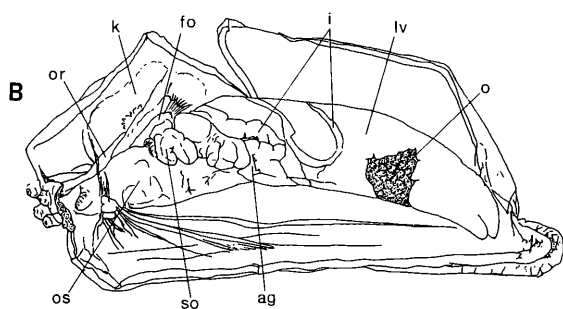
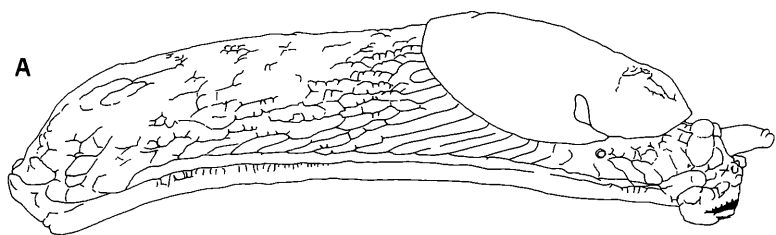


Fig. 1. An adult specimen of *Arion anguloi* n. sp. from Osma (Alava), x 3·5.

Internal features: Reproductive system. The ovotestis is large, black and ventrally located among the lobes of the digestive gland in the posterior third of the visceral complex, partially exposed. The hermaphrodite duct is large, proximally thin and rolled, its thickness increases progressively near its opening to the albumen gland. This latter is white and large in mature individuals. The spermoviduct is long and imbricated, and seldom is partially black coloured. The free-oviduct is long, cylindric, relatively thick and with two elbows; two portions detached by the retractor muscle insertion can be observed. The proximal portion has variable length, long in the juvenil stages and short in the adult ones, but, anyway, shorter than the distal portion. Inside, 7-8 little prominent longitudinal folds occur. The distal portion of the free oviduct is slightly thicker than the proximal one and presents a fine splash of black pigment in the vicinity of the insertion of the proximal retractor muscle. Inside, there is also a "V"-bent fold, say "ligula", with two branches that begin in the zone of insertion of the proximal retractor muscle and run along the inner wall of the oviduct. These branches become less prominent and both end separately at the upper portion of the atrium. The zone of insertion of the proximal retractor muscle of the oviduct presents an increase in the diameter of the inner lumen. The genital retractor muscle arises from the body wall in the posterior part of the kidney periphery, and is divided into three branches: a) one of them, short and wide, is inserted in the proximal elbow of the free-oviduct; b) another one, longer and narrower, is connected with the spermathecal duct; and c) the third one is connected with the annular thickening of the epiphallus. The vas deferens is elongated, and possesses 5 longitudinal folds inside. The epiphallus is long, almost twice as long as the vas deferens, and its diameter increases progressively towards the outlet in the upper atrium. In this outlet an annular thickening occurs, surrounded by fine black dots. Inside, the epiphallus has conic papillae of variable size. Distally, there are two longitudinal rows of large and prominent papillae, and between both these rows a channel is outlined in the wall. The more away from the outlet they

Fig. 2. *Arion anguloi* n. sp., paratypes from different localities: A) External appearance. B) Internal organs in situ. C) Alimentary system. D) Jaw. E) Ventral view of the pallial region. F) Radula. G) Inner structure of free oviduct. ►



are, the smaller the papillae are. Surrounding these numerous and pyramidal helicoidally distributed papillae, with rhomboidal basis, occur. These latter papillae become smaller from the longitudinal rows towards the most distant location. Distal papillae, the largest ones, which form a semispherical structure, say epiphallic papilla, are located in the inner part of the annular thickening of the epiphallus. In vivo and also after fixation, the orifice which communicates the epiphallus with the atrium is narrow, centered and cross-shaped. Between the large epiphallic papilla and the opening of the epiphallus into the atrium, an annular thickening of its lumen occurs. The spermatheca, spherical, is connected to the spermoduct by means of a thin muscular fibre. The duct of the spermatheca, which is short, increases in diameter at its mid-zone. Afterwards, it is narrowed and finally its section is thickened, forming an annular end when opening into the atrium. Inside, the spermathecal duct possesses 7–9 soft folds which run along and across the atrium. The lower atrium is small and its wall inside is covered by the folds that also cover the ligula and the spermatheca opening; the upper atrium is flattened, large and its wall is thick and spongy. Therefore the inner division between both parts of the atrium is quite evident. The spermatophore is enlarged, curved, with both ends being sharp and it presents a fine longitudinal serration.

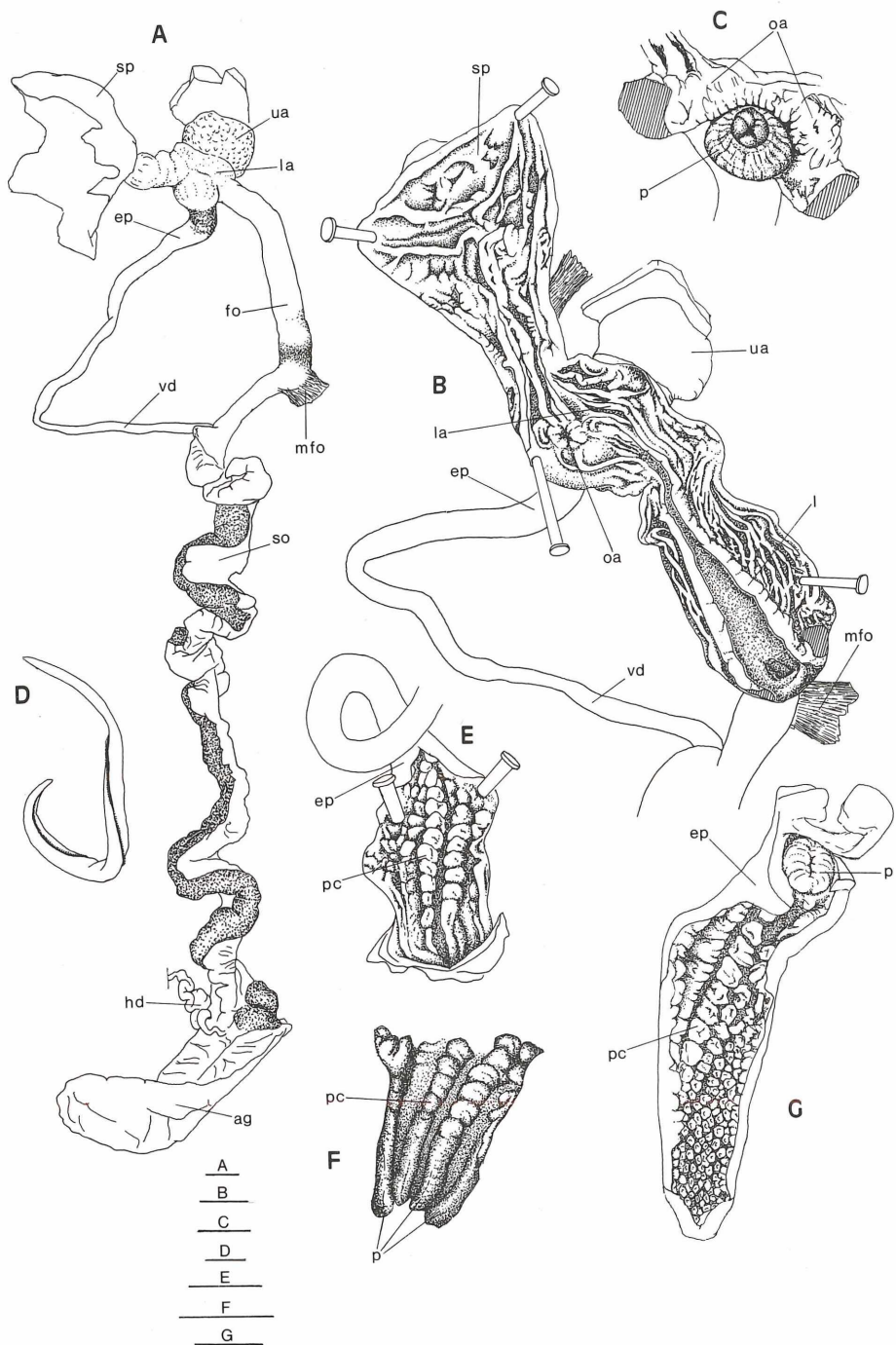
The shell is composed by numerous calcareous, discrete and semitransparent granules.

**Alimentary system:** The jaw is odontognate, crossed by 6–9 ribs. The radula has the following average formula  $(C + 15 + 21) \times 127$ . The central tooth presents a well developed sharpened mesocone and two relatively prominent ectocones. The lateral teeth have a long mesocone and a well developed ectocone. The marginal teeth, which present a wide and long mesocone and a sharpened ectocone, decrease in size along the radula. It is difficult to establish a clear separation between marginal and lateral teeth since a gradient in size exists. The alimentary system appears slightly rolled and changes its direction three times. It presents a thick oesophagus, a differentiated stomach without caecum, and the intestine, also caecumless, divided into three parts, each one twice or three times narrower than the oesophagus.

**Holotype:** Osma, *Quercus rotundifolia* woodland, 650 m (Alava), 30TVN9448, R. MARTIN, B. J. GOMEZ, C. E. PRIETO, K. ALTONAGA and A. I. PUENTE leg. 16.3.86; in coll. R. MARTIN.

**Paratypes:** Salvatierra, 600 m (Alava), 30TWN5046, 1 spm. C. E. PRIETO, K. ALTONAGA and A. ZUBIAGA leg. 9.4.80; Osma, *Q. rotundifolia* woodland, 650 m (Alava), 30TVN9448, 2 spms., E. ANGULO leg. 20.3.82; 1 spm. 8.10.83; 3 spms. 4.11.84; 27 spms. R. MARTIN, B. J. GOMEZ and K. ALTONAGA leg., 17.11.85; 9 spms. R. MARTIN and R. MARTIN leg., 5.12.85; 49 spms., R. MARTIN, B. J. GOMEZ, C. E. PRIETO, K. ALTONAGA and A. I. PUENTE leg., 16.3.86 [paratypes SMF 307182/5]; Berantevilla, xerophilous gazing, 600 m. (Alava), 30TWN1125, 3 spms., R. MARTIN and J. C. MUÑOZ leg., 30.4.82; Gorbea, Mendabibe, 1130 m. (Biscay), 30TWN1667, 3 spms., R. MARTIN and C. E. PRIETO

Fig. 3. *Arion anguloi* n. sp.: A) Reproductive system. B) Inner structure of free oviduct, lower atrium and spermatheca. C) Detail of the epiphallus opening and the epiphallic papilla. D) Spermatophore. E) Detail of the papillar epiphallic complex. F) Detail of the disposition of the infolding forming the epiphallic papilla. G) Inner view of the epiphallus in lengthwise section. — a auricle, ag albumen gland, ao aortic stem, e ectocone, ep epiphallus, fo free oviduct, hd hermafroditic duct, i intestine, k kidney, l ligula, la lower atrium, lv liver, m mesocone, mfo retractor muscle of the free oviduct, o ovotestis, oa opening at the atrium or ocular retractor, os oesophagus, p epiphallic papilla, pc papillar complex, pv pulmonary veins, r rectum, s stomach, so spermoduct, sp spermatheca, spd spermathecal duct, u ureter, ua upper atrium, v ventricle, vd vas deferens. ►



leg., 7.4.85; Quintanilla-Sopeña, 800 m. (Burgos), 30YVN6469, 2 spms., R. MARTIN, B. J. GOMEZ and K. ALTONAGA leg., 17.11.85; Villaventín, 700 m. (Burgos), 30TVN7163, 4 spms., R. MARTIN, B. J. GOMEZ and K. ALTONAGA leg., 17.11.85; Colina, 650 m. (Burgos), 30TVN6465, 1 spm., R. MARTIN, B. J. GOMEZ and K. ALTONAGA leg., 17.11.85. — In coll. R. MARTIN.

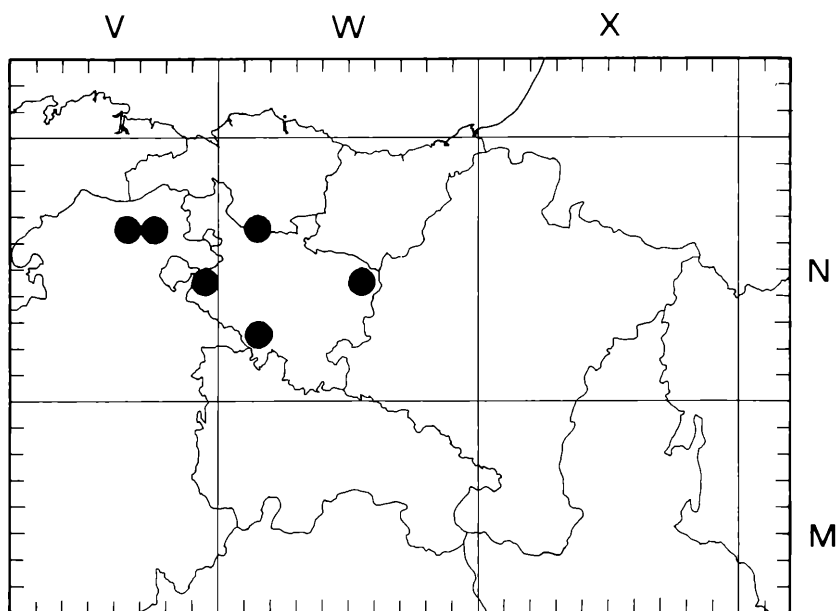


Fig. 4. Distribution of *Arion anguloi* n. sp. in N Iberian Peninsula and UTM notation of 10x10 km squares.

Distribution: *Arion anguloi* has been recorded above 600 m in several localities of the province of Alava, in N-Burgos and S-Biscay. It has not been found along the Cantabrian Slope in our zone of study, though we have intensively looked for it there. The distribution area of this species seems to be limited at the North by the divisory line between the Cantabrian and Mediterranean Slopes. We do not know the meridional limit of its distribution area, however, we can not exclude that this species could live in the south of the Ebro river. SIMROTH (1886) reports two specimens of an arionid from the province of Salamanca (Escorial, UTM 30T TL50, or Baños de Ledesma, UTM 30T TL 55). He only indicates their olivaceous green colour, their small size (2 cm), and the fact that their reproductive system seems to be between the one of "*subfuscus*" and the one of "*bourguignati*". Considering their small size, and the differences between the habitat where they were found, as well as the long distance between these records and ours, we think there is little probability of those being *A. anguloi*.

Habitat: This species has always been found under stones or trunks, in *Quercus ilex* or *Quercus rotundifolia* woodlands, mainly in the mesophilous gazings occurring in their clearances. This habitat is characterized by hard climatological conditions along the year, with strong snowing in winter and intense insolation in summer.

Derivatio nominis: We dedicate this species to Dr. E. ANGULO, malacologist and histologist.

## Discussion.

The diagnostic features distinguishing *Arion anguloi* n. sp. from the other *Arion* species are:

- the olivaceous green colour which appears in the upper of the body.
- the lack of defined bands on the back and mantle.
- the existence of a prominent V-shaped fold, in the inner distal portion of the free oviduct, that becomes branched in fine infoldings along the inner wall of the upper atrium and the spermathecal duct.
- the epiphallus being longer than the vas deferens.
- the occurrence of a pigmented annular thickening in the opening of the epiphallus.
- the papillar complex of the inner epiphallus, constituted by two rows of the thick papillae surrounded by others of gradually smaller size towards the beginning of the epiphallus.
- the papilla that separates the epiphallus from the upper atrium, formed by 4–5 folds limiting a narrow cross-shaped lumen.
- the elongated spermatophore, with sharp-shaped ends and a fine longitudinal serration that runs along it from end to end.

*A. anguloi* presents constant differences against the most similar species, *A. hortensis* FÉRUSAC, *A. distinctus* MABILLE (cf. DAVIES 1977, 1979; DE WILDE 1983, DE WINTER 1984 BAKELJAU 1985), *A. subfuscus* (cf. QUICK 1960 or WIKTOR 1973) and *A. urbiae* DE WINTER (1986).

These four species show an external appearance quite different to the one of *A. anguloi*. Moreover, *A. distinctus* differs from the latter because: a) it possesses a shorter relative length of the epiphallus and the free oviduct; b) it has a different lumen structure of the epiphallus opening; c) it lacks the folds in the inner face of the walls of the free oviduct, upper atrium, and spermathecal duct; and d) its spermatophore has no longitudinal serration. *A. hortensis* differs from *A. anguloi* in: a) the epiphallus being shorter than the vas deferens; b) the flattened shape of the epiphallallic papilla; c) the joint of the two folds of the ligula when reaching the atrium; as well as d) the spermatophore which is blunt in one of its ends. *A. subfuscus* differs from the species we describe herein in: a) the larger size; b) the thicker upper atrium, free oviduct and ligula folds; c) the epiphallus being shorter than the vas deferens, and d) the less prominent annular thickening of the epiphallus opening. Finally, *A. anguloi* differs from *A. urbiae* in: a) the olivaceous colour of its body; b) its yellowish mucus; c) its larger, lineated and more prominent epiphallallic papillae; d) the longer and more prominent ligula, and e) its habitat.

The separation between the subgenera of *Arion* FÉRUSAC is not satisfactory and requires revision. Several authors have remarked this question (QUICK 1960, BOATO and cols. 1984). The description of such subgenera was carried out on the basis of the external appearance and scarce features of the reproductive system anatomy. This has provided a certain degree of confusion. In lack of a taxonomical revision of the genus *Arion* FÉRUSAC, and without determining which features are meaningful in the establishment of subgenerical differences, we have decided not to include *A. anguloi* in any of the described subgenera.

**Summary:** Herein it is described *Arion anguloi* n. sp., close to *A. subfuscus*, *A. hortensis* and *A. distinctus* but maintaining constant differences. This new species has been found in several localities of the N Iberian Peninsula, at the south of the frontier between the Cantabrian and Mediterranean

slopes. As a consequence of the genus *Arion*, the authors do not include *A. anguloi* in any subgenus, meanwhile a review of the taxonomic value of every anatomical feature is not realized.

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