

Supplementary notes on Moitessieriidae and Hydrobiidae from the Iberian Peninsula (Gastropoda, Caenogastropoda)

Hans D. BOETERS

Karneidstrasse 8, D 81545 München, Germany

This article supplements the review of Moitessieriidae and Hydrobiidae of the Iberian Peninsula by Boeters (1988). It is based on samples collected by J. Notenboom and I. Meijers in subterranean waters in 1983, 1984 and 1986. This supplement deals with three genera and thirteen species of the Moitessieriidae and three genera and seven species of Hydrobiidae. Two genera, one subgenus, nineteen species and four subspecies are described as new. Finally, a differentiation between the Moitessieriidae and the Hydrobiidae is given.

Key words: Gastropoda, Prosobranchia, Caenogastropoda, Moitessieriidae, *Moitessieria*, *Spiralix* s. str. *Spiralix* (*Guadiella*) subgen. nov., *Palaospeum*, Hydrobiidae, *Alzoniella*, *Guadiella* gen. nov., *Plesiella* gen. nov., Spain, Portugal, taxonomy, biogeography.

CONTENTS

Introduction	1
Systematic Part	2
Moitessieriidae Bourguignat, 1863	2
<i>Moitessieria</i> Bourguignat, 1863	2
<i>Spiralix</i> Boeters, 1972	16
<i>Spiralix</i> (<i>Spiralix</i>) Boeters, 1972	16
<i>Spiralix</i> (<i>Burgosia</i>) subgen. nov.	18
<i>Palaospeum</i> Boeters, 1999	23
Hydrobiidae Troschel, 1857	24
<i>Alzoniella</i> Giusti & Bodon, 1984	24
<i>Guadiella</i> gen. nov.	27
<i>Plesiella</i> gen. nov.	31
Notes on Moitessieriidae	35

INTRODUCTION

The following work is based mainly on material collected by J. Notenboom and Ms. I. Meijers between 1983 and 1986 and aims at supplementing Boeters' 1988 review of Iberian Moitessieriidae and Hydrobiidae. It is a contribution to the knowledge of West European Moitessieriidae (no. 3) and West European Hydrobiidae (no. 9).

The research of Notenboom and Meijers concentrated on the Iberian groundwater Amphipoda (Crustacea). It should be expressly stated however, that they did not overlook accompanying prosobranchs but collected a remarkably high number of samples of subterranean molluscs. Details of the examined stations can be drawn from Notenboom (1986, 1987a, 1987b, 1988) and Notenboom & Meijers (1985 [in Spanish]).

The Systematic Part of this work deals with 22 species-group taxa. With the exception of *Moitessieria servaini* Bourguignat, 1880, and *Belgrandiella andalucensis* Boeters, 1983, none of these taxa had been described yet.

Abbreviations: BOE, collection H.D. Boeters, München; MNHN, Muséum National d'Histoire Naturelle, Paris; RMNH, National Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden; N & M, Notenboom & Meijers (1985).

SYSTEMATIC PART

Moitessieriidae Bourguignat, 1863

In Spain the Moitessieriidae are represented by three genera, i.e. *Moitessieria* Bourguignat, 1863, *Spiralix* Boeters, 1972, and *Palaospeum* Boeters, 1999.

Moitessieria Bourguignat, 1863: 435 [8].

Type species (secondary designation by Kobelt, 1878: 132): *Paludina simoniana* Saint-Simon, 1848.

From Spain nine *Moitessieria* species are known. Except for *M. olli* Altimira, 1960, all are represented in the material collected by Notenboom and Meijers.

Table 1. Shells of the Spanish *Moitessieria* species

n = 10 for shell height and inclination of suture with the following exceptions: *Moitessieria meijersae* spec. nov. (n = 1), *M. guadelopensis* spec. nov. (n = 5), *M. lludrigaensis* spec. nov. (n = 11), *M. seminiana* spec. nov. (n = 7); n = 5 for spiral lines with the following exception: *M. meijersae* spec. nov. (n=1).

	Height Extremes with mean value (in mm)	Spiral lines above aperture	Inclination of suture (in degrees)	Contour of last whorl
<i>M. olli</i> ¹ Altimira, 1960	2.15-2.50-2.85	27-30-33	18	slightly flattened roundish
<i>M. robresia</i> spec. nov.	1.90-2.30-2.75	16-20-22	20	roundish
<i>M. notenboomi</i> spec. nov.	2.40-2.48-2.60	14-18-23	20	roundish
<i>M. meijersae</i> spec. nov.	2.30	17	18	roundish
<i>M. guadelopensis</i> spec. nov.	2.05-2.11-2.35	15-16-17	18	roundish to slightly flattened roundish
<i>M. servaini</i> Bourguignat, 1880	1.60-1.89-2.15	14-17-21	19-21	roundish to slightly flattened roundish
<i>M. foui</i> spec. nov.	1.60-1.68-1.75	35	15-16	roundish
<i>M. lludrigaensis</i> spec. nov.	1.55-1.67-1.80	15-18-22	17	slightly flattened
<i>M. seminiana</i> spec. nov.	1.40-1.58-1.65	13-16-17	15	flattened roundish

¹ RMNH 56470/9 paralectotypes and BOE 64/1 paralectotype)

Shell. – (i) The species of *Moitessieria* have a slender to very slender conical to subcylindrical shell. Bodon & Giusti (1991: 9, fig. 6) try to define this shape in a two-dimensional system with one of the axes representing the ratio of total shell height to last whorl diameter, and the other axis representing the ratio of last whorl height to last whorl diameter. This way of defining the shape might be accurate, but it is not very illustrative. To

supplement this approach and to give a more direct impression of the shapes, the following descriptions comprise the inclination of the suture towards the shell axis. For a fictive shell with a given number of whorls which do not grow in size, the inclination of the suture is directly proportional to an increasing ratio of whorl height to whorl diameter. Shells with comparatively high but narrow whorls are characterised by an increased inclination of the suture towards the shell axis. At the same number of whorls such shells appear comparatively more elongated than others with less high but broader whorls.

(ii) The Iberian species. – Spire with 5 1/4-7 1/4 convex or slightly flattened whorls, increasing gradually in size and separated by a moderately to strongly indented suture. The inclination of the suture towards a vertical line on the axis of the shell is c. 15-21 degrees. Rows of pits form a spiral structure (c. 13-30 rows above the upper edge of the aperture). Sometimes the aperture of the last whorl ascends very slightly on the shell wall. The apertural lip is hardly thickened. The edge of the aperture varies from being more or less broadly fused with the wall of the penultimate whorl to only touching it; consequently, the umbilicus varies from slit-like to conspicuously open. Aperture ovoid and slightly oblique. In lateral view, the apertural edge is curved like a question mark (see for example fig. 11, detail). Height 1.45-2.75 mm, diameter 0.45-0.92 mm.

Sympatric occurrence. – *Moitessieria servaini* has been recorded sympatric with *M. meijersae* spec. nov., *M. seminiana* spec. nov. and *M. notenboomi* spec. nov.

Distribution. – Vascongadas (Alava), Navarra, Aragon (Huesca, Zaragoza, Teruel), Cataluna (Barcelona, Gerona, Lerida, Tarragona) and Valencia (Castellon). A single, juvenile specimen (see sub *Moitessieria* spec. 3) is the first record of the genus for Andalucia (Jaén). For Barcelona and Lerida, see Boeters (1988).

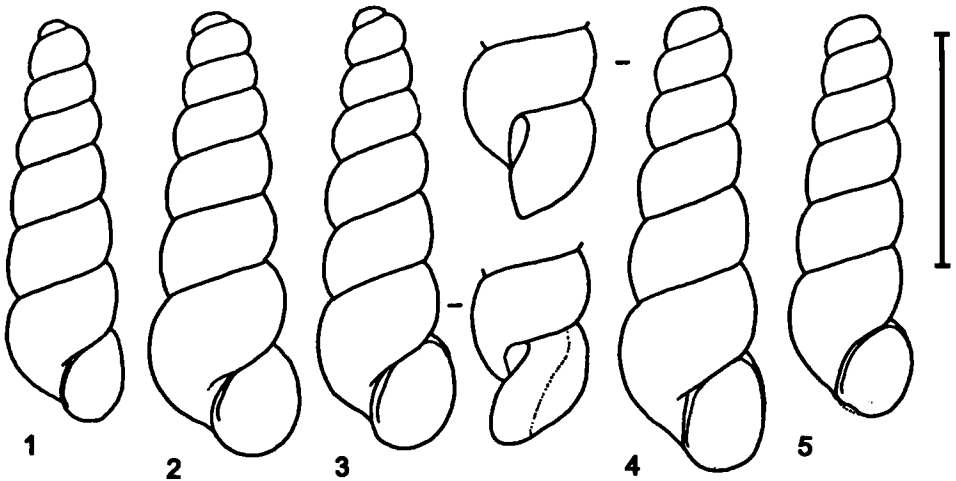
Moitessieria servaini Bourguignat, 1880

(figs 1-5, 89 [shell], 52 [intestine], 62-63 [penis], 101 [distribution])

Paladilhia servaini Bourguignat, 1880: 22. Type locality: "Alluvions de l'Ebre, près de Saragosse en Espagne" [UTM XM71].

Moitessieria cf. *simoniana* (Saint-Simon, 1848); Boeters, 1988: 185, pl. 1 fig. 2. Not Saint-Simon, 1848.

Material. – Castellón: (i) bridge of Villoros, Rio Bergantes (interstitial water), 660 m [UTM YL374062], 06.v.1984 (RMNH/30 shells and 89 animals); (ii) Aguaviva, close to border Teruel-Castellón, E of road Zorita del Maestrazgo-Aguaviva, Rio Bergantes (interstitial water), 540 m [UTM YL 409192], 06.v.1984 (RMNH/2 animals); (iii) 6.2 km off Morella, SE road Morella-Cinctorres, Mas de Sabaté (dug well), 870 m [UTM YK413982], 06.v.1984 (RMNH/4 shells and 5 animals). Huesca: (iv) Angües, bridge of road N 240 Barbastro-Huesca, Rio Alcanadre (interstitial water), 400 m [UTM YM391636], 07.vi.1984 (RMNH/1 shell); (v) 0.5 km N de Villareal de la Canal, Rio de Majones (interstitial water), 550 m [UTM XN 734236], 12.vi.1984 (RMNH/1 shell together with 3 shells of *Moitessieria seminiana* spec. nov. and 3 animals together with 9 animals of *M. seminiana* spec. nov.). Zaragoza: (vi) Puendeluna, bridge, Rio Gallego (interstitial water), 380 m [UTM XM851695], 10.vi.1984 (RMNH/2 shells (1 lost) but no animals). Navarra: (vii) Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (interstitial water), 420 m [UTM XN391274], 14.vi.1984 (RMNH/numerous shells together with 9 shells of *Moitessieria notenboomi* spec. nov. and 12 animals together with 5 animals of *M. notenboomi* spec. nov.). Tarragona: (viii) 16 km NNW of Falset, at Margalef de Montsant, Riu Montsant c. 3 km upstream of Margalef (interstitial water), c. 400 m [UTM CF17], 09.viii.1986 (RMNH 85861/1 and 1 juvenile shell); (ix) 20 km ENE of Les Borges Blanques, Nalec, 50 m S of Riu Corb (well), c. 500 m [UTM CG40], 10.viii.1986 (RMNH 85862 /6 shells); (x) 17 km SE of Vallfogona de Riucorb, at Santa Perpetua de Gaia, Riu Gaia, c. 600 m [UTM CF69], 10.viii.1986 (RMNH 93685/shell; 85863/numerous shells; BOE 1500/5 shells).



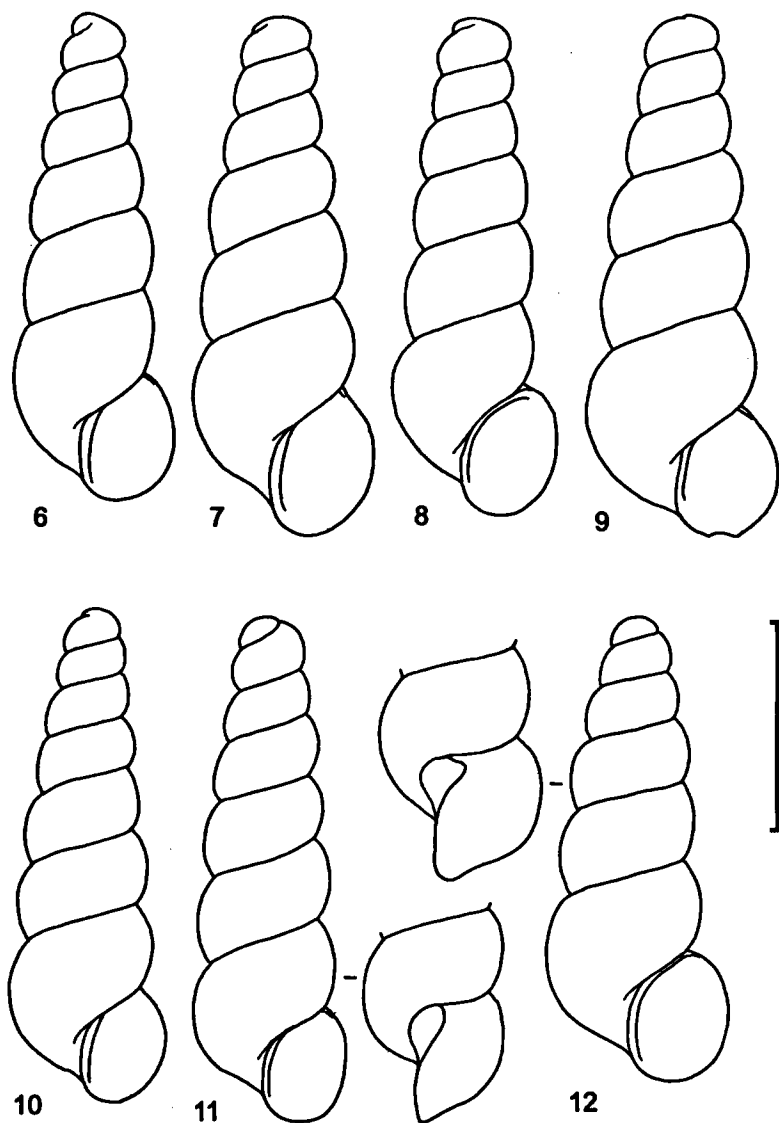
Figs 1-5. *Moitessieria servaini* Bourguignat, 1880. 1, Huesca, 0.5 km N of Villareal de la Canal, Rio de Majones (RMNH) (also fig. 62); 2, Castellón, bridge of Villoses, Rio Bergantes (RMNH); 3, Navarra, Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (RMNH). 4-5, form of Tarragona. 4, Tarragona, 20 km ENE of Les Borges Blanques, Nalec, well 50 m S of Riu Corb (RMNH 85862); 5, Tarragona, 16 km NNW of Falset, at Margalef de Montsant, Riu Montsant c. 3 km upstream of Margalef (RMNH 85861). Scale bar 1 mm.

Shell. – Shell very slender conical, with 7 1/2 whorls. The inclination of the suture towards a vertical on the axis of the shell is c. 19-21°. There are c. 17 [14-21] spiral rows of pits above the upper edge of the aperture [$n = 10$]. The last whorl neither ascends nor descends on the shell wall. The apertural lip is hardly thickened; its edge is fused with the wall of the last whorl over a long distance but leaves a slit-like umbilicus open. Height 1.89 [1.60-2.15] mm, diameter 0.63 [0.45-0.75] mm [$n = 20$].

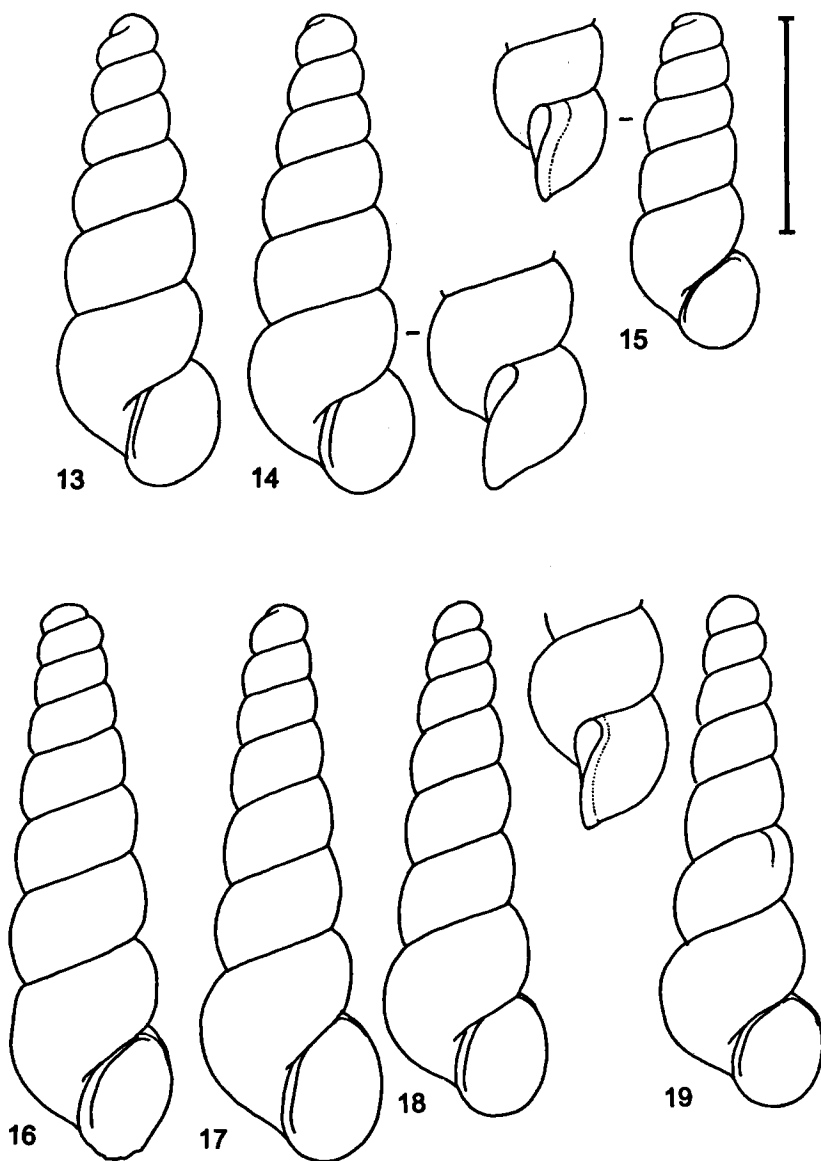
Animal. – Without any pigmentation. Eyes and pallial tentacle missing. Gill leaflets present. Besides a Z-like loop behind the stomach, the intestine does not form any additional loop or a bend. Penis simple, with a length which is c. 6 times that of its base ($n = 2$ of (i) and (v) each). Female sex tract not examined.

Variability. – Compared with the three samples from the province of Castellón, the three samples from the neighbouring province of Tarragona represent a shell form with broader apical whorls, and, in lateral view, a palatal edge of the aperture which is curved more regularly sinus-like. The diameter of the 1st, the 2nd and the 3rd whorl of the form from Tarragona is 0.288, 0.328 and 0.394 mm ($n = 5$ of both (ix) and (x)), whereas the samples from Castellón measure 0.273, 0.313 and 0.388 mm, respectively ($n = 5$ of both (i) and (iii)). The diameter of the 1st, the 2nd and the 3rd whorl of the only adult specimen of (viii) is 0.292, 0.337 and 0.412 mm.

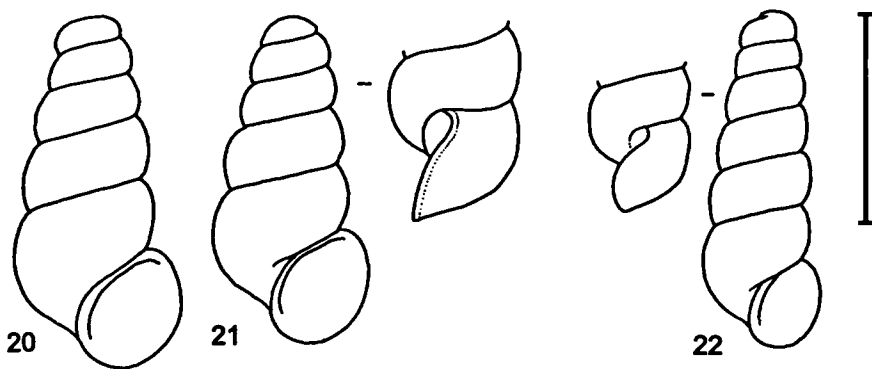
Differentiating features. – (i) With a shell height of c. 2.50 mm, *Moitessieria ollerii* Altimira, 1960, is c. 1/3 larger than *M. servaini*. With 30 [27-33] spiral ridges above the aperture, *M. ollerii* is clearly more densely spirally sculptured than *M. servaini*. For photographs of syntypes of both species, see Boeters (1988: pl. 1 figs 2, 3). (ii) Compared with *M. simoniana*, shells of *M. servaini* are less cylindrical and rather elongated conical. (iii) As regards *M. meijersae* spec. nov., see below.



Figs 6-12. *Moitesseria* spec. 6-11, *M. notenboomi* spec. nov. 6, Huesca, Monzón, bridge at Barbastro, Rio Cinca (RMNH 93690/paratype); 7-8, Navarra, Burgui, 0.2 km N of the border Navarra-Zaragoza, E of the road C137 Burgui-Salvatierra, at W side of Rio Esca (RMNH 93692/paratypes); 9, Navarra, Larraún, 3.5 km E of Betelu, at N side of the road N 240 Pamplona-San Sebastián, Nacimiento del Rio Araxes (RMNH 93698/paratype); 10, Tarragona, Arnés, bridge at Valderrobres, Rio Algas (RMNH 93687/paratype); 11, Navarra, Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (RMNH 93695/paratype). 12, *M. mejersae* spec. nov., Castellón, bridge of Villoros, Rio Bergantes (RMNH 93701/holotype). Scale bar 1 mm.



Figs 13-19. *Moitessieria* spec. 13-14, *M. guadelopensis* spec. nov. 13, Teruel, bridge 3 km S of Alcaniz, Rio Guadelope (RMNH 93705/paratype); 14, Teruel, Calanda, bridge at Torrevelilla, Rio Guadelope (RMNH 93704/holotype). 15, *M. lludrigaensis* spec. nov., Tarragona, c. 2 km SE of Capafonts and 12 km WNW of Alcover, Fuente Lludrida (RMNH 93707/holotype). 16, *M. ollerii* Altimira, 1960, Barcelona, Moyá, cueva del Toll (BOE 64/paratype). 17-19, *M. robresia* spec. nov. 17, Teruel, Cretas, 7.6 km off Valderrobres, S of the road Valderrobres-Arnés (RMNH 93711/paratype); 18-19, Teruel, 0.8 km off Valderrobres, E of the road Valderrobres-Arnés (RMNH 93708/holotype [18] and 93709/paratype [19]). Scale bar 1 mm.



Figs 20-22. *Moitesseria* spec. 20-21, *M. foui* spec. nov., Tarragona, 6 km SW of Falsset, c. 5 km SE of Capcanes, Cova de la Fou (RMNH 93715/paratypes). 22, *M. seminiana* spec. nov., Huesca, 0.5 km N of Villareal de la Canal, Rio de Majones (RMNH 93712/paratype). Scale bar 1 mm.

Habitat. – Subterranean waters of the following temperatures (in °C, measured at the localities indicated between brackets on the days given under Material): 11.7 (iii), 13.6 (i), 15.2 (v), 15.8 (iv), 16.3 (vii), 16.2-16.9 (ii) and 23.6 (vi), thus ranging from 11.7 to 23.6°C. The species was found sympatric with *M. meijersae* spec. nov. at (i), with *M. seminiana* spec. nov. at (vi), and with *M. notenboomii* spec. nov. at (vii).

Distribution. – *M. servaini* is known from Castellón, Huesca, Zaragoza and Navarra.

Remarks. – Boeters (1988) treated this species as *Moitesseria* cf. *simoniana*. Meanwhile a lectotype of *Paludina simoniana* Saint-Simon, 1848, has been designated (Boeters & Falkner, 2001) and the species was sufficiently redescribed (Boeters & Falkner, 2001; Bodon & Giusti, 1991 [partim]). A syntype of *Paludithia servaini* was already known (Boeters, 1988: pl. 1 fig. 2). Based on the material collected by Notenboom and Meijers, it is possible now to differentiate between *M. simoniana* and *M. servaini*.

***Moitesseria notenboomii* spec. nov.**

(figs 6-11, 90 [shell], 53 [gill], 54 [intestine], 65 [penis], 102 [distribution])

Material. – Alava: (i) Aspárrena, Arroya 1.5 km upstream, at Cueva del Molino, Rio Iturrioz (interstitial water), 690 m [UTM WN 563504], 11.iv.1984 (RMNH 93686/3 paratypes, shells). Tarragona: (ii) Arnés, bridge at Valderrobres, Rio Algas (interstitial water), 470 m [UTM BF683325], 05.v.1984 (RMNHL 93687/1 paratype, shell; 93688/1 paratype, animal). Huesca: (iii) Monzón, bridge at Barbastro, Rio Cinca (interstitial water), 250 m [UTM BG 6644], 07.vi.1984 (RMNH 93690/3 paratypes, shells; 93689/12 paratypes, 10 and 2 juvenile animals); (iv) bridge at Ascara, N road C 134 Jaca-Puente la Reina, Rio Aragón (interstitial water), 650 m [UTM XN926146], 11.vi.1984 (RMNH 93691/2 paratypes, shells). Navarra: (v) Burgui, 0.2 km N border Navarra-Zaragoza, E road C 137 Burgui-Salvatierra de Esca, al borde O. del Rio Esca (small resurgence), 610 m [UTM XN627399], 13.vi.1984 (RMNH 93692/numerous paratypes, shells; 93693/21 paratypes, animals); (vi, type locality) Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (interstitial water), 420 m [UTM XN391274], 14.vi.1984 (RMNH 93696/holotype; 93695/6 paratypes, shells (together with numerous shells of *Moitesseria servaini*); 93694/5 paratypes, animals (together with 12 animals of *M. servaini*); BOE 1501/2 paratypes, shells); (vii) Egües, opposite Venta de Eransus, N road Urroz-Villava (dug well), 550 m [UTM

XN216419], 14.vi.1984 (RMNH 93697/2 paratypes, shells); (viii) Larraún, 3.5 km E Betelu, northern side of road N 240 Pamplona-San Sebastián, Nacimiento del Río Araxes (large resurgence), 360 m [UTM WN865646], 18.vi.1984 (RMNH 93698/numerous paratypes, shells; 93699/1 paratype, animal).

Shell. – Shell very long, slightly conical, with 6 1/2 whorls. The inclination of the suture towards a vertical on the axis of the shell is c. 20 degrees. The last whorl ascends very slightly on the shell wall immediately before the aperture. Spiral sculpture with c. 18 [14-23] rows on the last whorl above the upper edge of the aperture ($n = 5$). The edge of the aperture is hardly thickened and is fused with the wall of the last whorl over a long distance. Height 2.48 [2.40-2.60] mm, diameter 0.81 [0.73-0.92] mm ($n = 10$).

Animal. – Without any pigmentation. Eyes and pallial tentacle missing. 11 gill leaflets ($n = 1$). The intestine of a dissected male forms two shallow bends behind the stomach, which are missing in a female from the same locality (vi); regarding possible dimorphism of intestinal structures, see Giusti & Bodon (1991: 15, fig. 9B, 9D). Penis simple and very long, its length c. 15 times that of its base ($n = 1$). Female sex tract not examined.

Differentiating features. – The shell of this species is larger than shells of *M. servaini*, but more fragile than shells of *M. meijersae* spec. nov. The number of only 18 [14-23] spiral lines differentiates this species from *M. oleri* which has about 30 [27-33] spiral lines.

Habitat. – Subterranean waters of the following temperatures (in °C, with the locality nos): 8.8 (i), 10.0 (v), 10.4 (viii), 12.0 (iv), 12.4 (vii), 13.4 (ii), 14.0 (iii) and 16.3 (vi); range 8.8-16.3°C. Sympatric with *M. servaini* at (vi).

Distribution. – *M. notenboomi* spec. nov. is reported from Alava, Tarragona, Huesca and Navarra.

Derivatio nominis. – This species is dedicated to one of its discoverers, Dr. Jos Notenboom.

Moitessieria meijersae spec. nov.
(fig. 12 [shell], 102 [distribution])

Material. – Castellón: bridge at Villosres, Rio Bergantes (interstitial water), 660 m [UTM YL374062], 06.v.1984 (RMNH 93701/holotype, shell; 93700/3 paratypes, shell fragments (together with 30 shells of *Moitessieria servaini*)).

Shell. – Shell very long and slightly conical, with 6.0 whorls. The inclination of the suture towards a vertical on the axis of the shell is c. 18 degrees. Sculpture of 17 spiral lines above the aperture in lateral view ($n = 1$). The columellar border of the aperture touches the shell wall over a long distance but leaves an umbilical slit open. Only the columellar and the basal border of the aperture are clearly broadened. In lateral view the upper palatal edge of the aperture forms a sinulus whereas the lower edge runs about parallel to the shell axis. Height 2.3 mm, diameter 0.86 mm ($n = 1$).

Animal. – Unknown.

Differentiating features. – (i) Shells of this species are larger than those of *M. servaini*, and (ii) compared to shells of *M. notenboomi* spec. nov., they are less cylindrical and the diameter of the whorls increases more rapidly. (iii) The presence of only 17 spiral lines above the aperture differentiates this species from *M. oleri* which has 30 [27-33] spiral lines there.

Habitat. – Only empty shells have been collected in interstitial water in a river-bed, 3 m from the bank, at a temperature of 13.6°C. At the type locality the species occurs sympatric with *M. servaini*.

Distribution. – *Moitessieria meijersae* spec. nov. has been collected only in Castellón.

Derivatio nominis. – This species is dedicated to one of its discoverers, Mrs. Ine Meijers.

Moitessieria guadelopensis spec. nov.
(figs 13-14, 91 [shell], 102 [distribution])

Material. – Teruel: (i, type locality) Calanda, bridge at Torrelvella, Rio Guadelope (interstitial water), 400 m [UTM YL356349], 04.v.1984 (RMNH 93704/holotype, shell; 93703/2 paratypes, 2 and 1 juvenile shell; 93702/3 paratypes, 1 and 2 juvenile animals; BOE 1502/1 paratype, shell); (ii) bridge 3 km S Alcaniz, Rio Guadelope (interstitial water), 450 m [UTM YL3944]; N & M leg., 04.v.1984 (N & M 1985: 31, 53 (84-5/8); RMNH 93705/2 paratypes, 2 shells (together with 1 fragment of *Moitessieria* spec.)).

Shell. – Shell elongate conical, with 7 to 7 1/4 whorls. The inclination of the suture towards a vertical on the axis of the shell is c. 18 degrees. Spiral sculpture with c. 16 [15-17] rows above the aperture ($n = 5$). The aperture neither ascends nor descends on the shell wall. Its parietal border is fused with the shell wall over a long distance, and the columellar and basal borders are slightly broadened but leave an umbilical slit open. In lateral view the upper corner of the aperture shows a weak recess, like a sinulus. Height 2.11 [2.05-2.35] mm, diameter 0.73 [0.65-0.79] mm ($n = 5$).

Animal. – Not examined.

Differentiating features. – (i) The shell has a coarser spiral sculpture and is clearly larger than that of *Moitessieria lludrigaensis* spec. nov., occurring in the same drainage area. (ii) In *M. servaini* the shell is somewhat smaller and more slender and its whorls are separated by a more strongly inclined suture, i.e. the ratio height:diameter of the last whorl is larger in *M. servaini* (c. 0.72 in *M. servaini* and c. 0.64 in *M. guadelopensis* spec. nov. ($n = 5$)). In *M. servaini* the aperture is much smaller. (iii) In *M. notenboomi* spec. nov. the apical part of the shell is broader, and the shape of all whorls, the last one included, is fairly convex and not slightly flattened. (iv) In *M. meijersae* spec. nov. the shell is more conical, and - as in *M. notenboomi* spec. nov. - the whorls are more convex. (v) Shells of *M. robresia* spec. nov., also from Teruel, are more slender and the whorls are separated by a more strongly inclined suture. (vi) *M. seminiana* spec. nov. has a smaller and more cylindrical shell.

Habitat. – Interstitial waters at (i) in a river-bed, alive at a temperature of 9.6°C.

Distribution. – Known only from Teruel.

Derivatio nominis. – The name is derived from the Rio Guadelope.

Moitessieria lludrigaensis spec. nov.
(figs 15, 92 [shell], 102 [distribution])

Material. – Tarragona: c. 2 km SE of Capafonts and 12 km WNW of Alcover, Fuente Llodriga, 700 m [UTM CF37], 08.viii.1986 (RMNH 93707 (formerly 85860)/holotype, shell; 93706/13 paratypes, shells; BOE 1503/2 paratypes, shells).

Shell. – Shell elongate conical; with 6-6 1/4 whorls, all of which are clearly flattened. The inclination of the suture towards a vertical on the axis of the shell is c. 17 degrees. Spiral sculpture formed by c. 18 [15-22] rows of pits above the upper edge of the aperture ($n = 3$). The aperture does neither ascend nor descend on the last whorl. The parietal edge of the aperture is fused with the shell wall but may leave an umbilical slit open. In

lateral view there is an unclear angular sinulus and the lower palatal border is rather flattened. Height 1.67 [1.55-1.80] mm, diameter 0.63 [0.60-0.70] mm (n = 11).

Animal. – Not seen.

Differentiating features. – (i) The shell has a finer spiral sculpture and is clearly smaller than that of *Moitessieria guadelopensis* spec. nov., which occurs in the same drainage area. (ii) The whorls are less convex than in *M. servaini*. (iii) In *M. seminiana* spec. nov. the shell is conical-cylindrical instead of elongated conical.

Habitat. – Interstitial waters. *M. lludrigaensis* spec. nov. was discovered in a spring which drains to the Ebro river.

Distribution. – Known from Tarragona only.

Derivatio nominis. – The name is derived from the Fuente Llodriga.

Moitessieria robresia spec. nov.
(figs 17-19, 93 [shell], 101 [distribution])

Material. – Teruel: (i, type locality) 0.8 km off Valderrobres, E of road carretera Valderrobres-Arnés (dug well), 520 m [UTM BF 610287], 05.v.1984 (RMNH 93708/holotype, shell; 93709/7 paratypes, shells; 93710/c. 10 paratypes, animals; BOE 1504/1 paratype, shell); (ii) Cretas, 7.6 km off Valderrobres, S of road Valderrobres-Arnés (dug well), 530 m [UTM BF 663308], 05.v.1984 (RMNH 93711/2 paratypes, animals).

Shell. – Shell very long and slightly conical; with 7-7 1/4 whorls increasing gradually in size, except for the last whorl which is relatively large. All whorls are moderately convex. The inclination of the suture towards a vertical on the axis of the shell is c. 20 degrees. Spiral sculpture of c. 20 [16-22] rows of pits above the aperture (n = 5). The last whorl ascends very slightly on the shell wall. The parietal border touches the shell wall and leaves a relatively wide umbilical slit open. The upper edge of the aperture shows a slight recess, like a sinulus. Height 2.30 [1.90-2.75] mm, diameter 0.73 [0.65-0.92] mm (n = 10).

Animal. – Not examined.

Differentiating features. – The shell corresponds in height to that of *M. notenboomi* spec. nov. and *M. meijersae* spec. nov., but the whorls are narrower, with the last one slightly inflated.

Habitat. – Living animals have been found in dug wells at temperatures of 12.7°C at (ii) and 14.3°C at (i).

Distribution. – This species has been collected only in Teruel.

Derivatio nominis. – The name is derived from the village of Valderrobre.

Moitessieria seminiana spec. nov.
(figs 22 [shell], 64 [penis], 102 [distribution])

Material. – Huesca: 0.5 km N of Villareal de la Canal, Rio de Majones (interstitial water), 550 m [UTM XN734236], 12.vi.1984 (RMNH 93713/holotype, shell; 93712/1 paratype, shell (together with 1 shell of *Moitessieria servaini*); 93714/8 paratypes, animals (together with 4 animals of *M. servaini*); BOE 1505/1 paratype, shell).

Shell. – Shell elongate, rather conical-cylindrical, with 5.25 whorls. The inclination of the suture towards a vertical on the axis of the shell is 15 degrees (n = 1). The contour of the last two whorls is straight or slightly concave. Spiral sculpture of c. 16 [13-17] rows of pits above the aperture (n = 5). The aperture ascends slightly on the shell wall. The parietal border touches the shell wall and leaves an umbilical slit open. In lateral view the

lower section of the palatal edge of the aperture is strongly convex. Height 1.58 [1.40-1.65] mm, diameter 0.54 [0.51-0.60] mm (n = 7).

Animal. – Animal eyeless and pigmentless, gill present (number of leaflets not counted). Penis simple, its length c. 5 times that of the diameter at its base (n = 1). Female sex tract: not examined.

Differentiating features. – (i) *M. seminiana* spec. nov. can be clearly distinguished from all other Spanish *Moitessieria* species by a straight-lined to even slightly concave contour of the last two whorls. (ii) At a comparable height of the shell, the ratio height : width of the whorls is smaller in *M. seminiana* spec. nov. than in *M. servaini*. This is reflected by an inclination of the suture towards a vertical on the axis of the shell of only 15 instead of 20 degrees. (iii) Coutagne (1881: 18) described a single shell of *M. bourguignati* from deposits of the Garonne at Toulouse with 70-75 spiral ridges/mm and “2.2 mill. de hauteur et 0.6 de diamètre”. The number of spiral ridges coincides quite well with a range of 70 [63-77] spiral ridges/mm which can be concluded from Bodon & Giusti (1991: 12, fig. 8) for shells from the same locality, i.e. collected in floods of the river Garonne at Toulouse. It is assumed that these shells are figured by Bodon & Giusti (1991: 3, fig. 1). Since they are with 1.55-1.73-1.85 mm clearly smaller than 2.2 mm, it is open to question whether these shells belong to *M. bourguignati*. In any case, a number of c. 48 spiral ridges/mm differentiates *M. seminiana* spec. nov. clearly from *M. bourguignati* with 70-75 spiral ridges/mm. (iv) Coutagne (1881: 17) mentioned 55-65 spiral ridges/mm for *M. simoniana*. Thus, it can be concluded that the species from Huesca does not belong to *M. simoniana* sensu Coutagne.

Habitat. – Living animals sympatric with *Moitessieria servaini* have been found in interstitial water of a river-bed at a temperature of 15.2°C.

Distribution. – Known only from Huesca.

Derivatio nominis. – The name is a combination of the Latin *semi* and the two final syllables of the name of the type species *Moitessieria simoniana*.

Moitessieria foui spec. nov.
(figs 20-21, 94 [shell], 101 [distribution])

Material. – Tarragona: 6 km SW of Falset, c. 5 km SE of Capcanes, Cova de la Fou (small temporary resurgence cave), c. 200 m [UTM CF15], viii.1986 (RMNH 93715/holotype, shell; 93716/numerous paratypes, shells; BOE 1506/3 paratypes, shells).

Shell. – Shell elongate-conical; with 5 ?-6 whorls. Spiral sculpture of c. 35 ridges above the upper edge of the aperture. The inclination of the suture towards a vertical on the axis of the shell is c. 15-16 degrees. The aperture ascends on the last whorl. The apertural border is slightly thickened only near the umbilicus. Its parietal border touches the shell wall but leaves the umbilicus fairly open. In lateral view the palatal border is curved like a question mark. Height 1.68 [1.60-1.75] mm, diameter 0.78 [0.74-0.81] mm (n = 2).

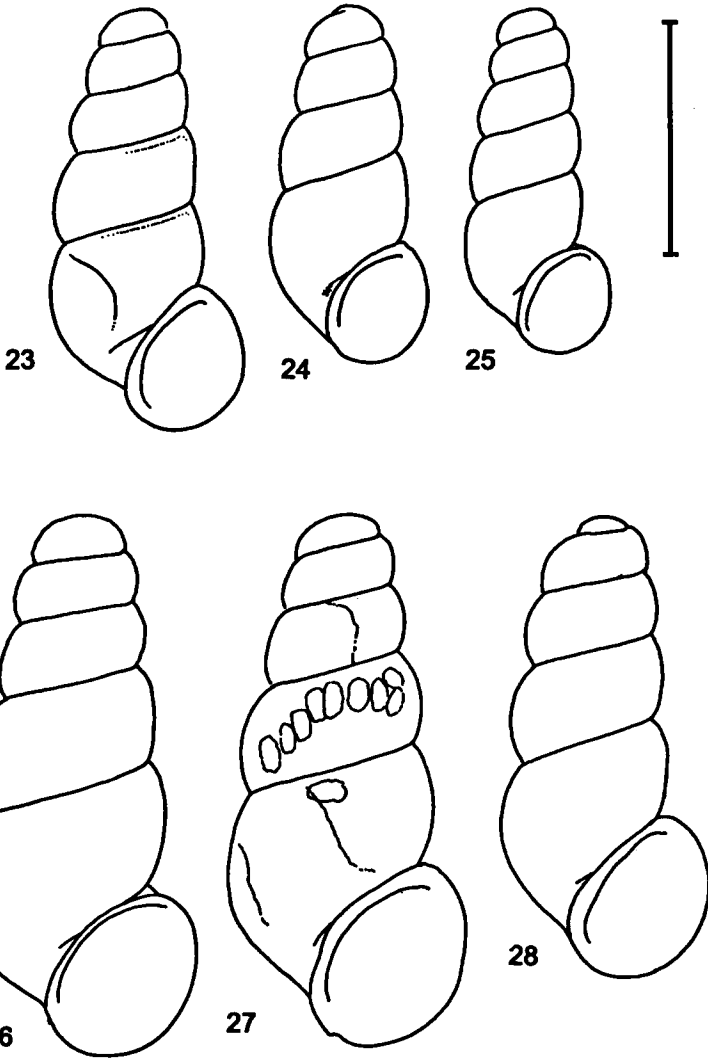
Animal. – Not seen.

Differentiating features. – This species can hardly be confused with any other *Moitessieria* species from Spain. The shell looks more like that of the *Paladilhia* Bourguignat, 1865, species which, however, are not sculptured by spiral ridges as in *Moitessieria*.

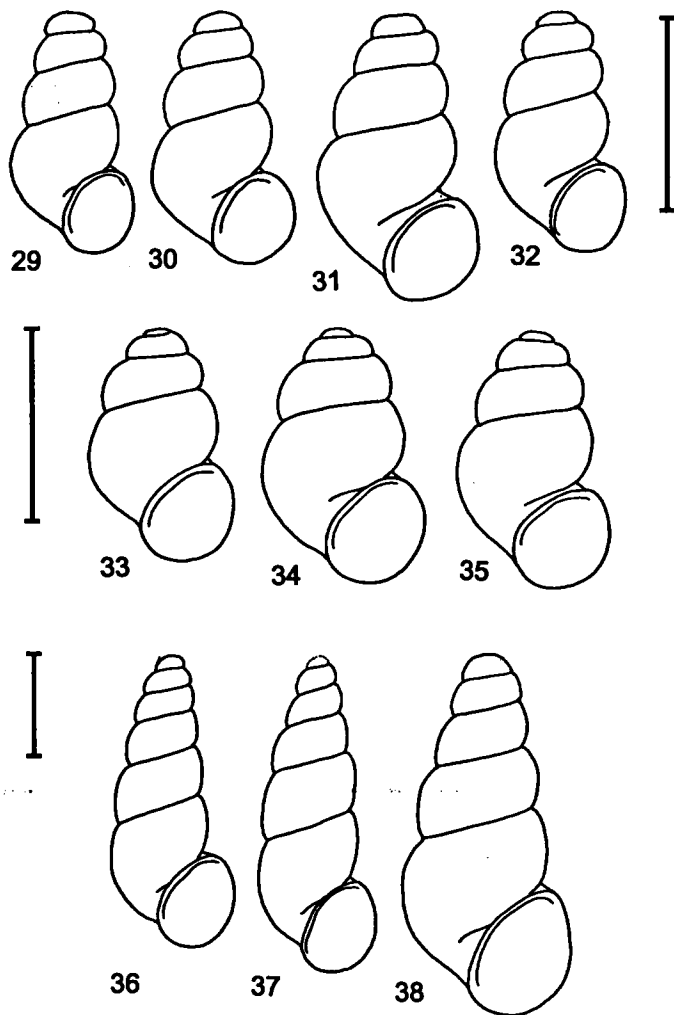
Habitat. – Subterranean waters.

Distribution. – Known from Tarragona only.

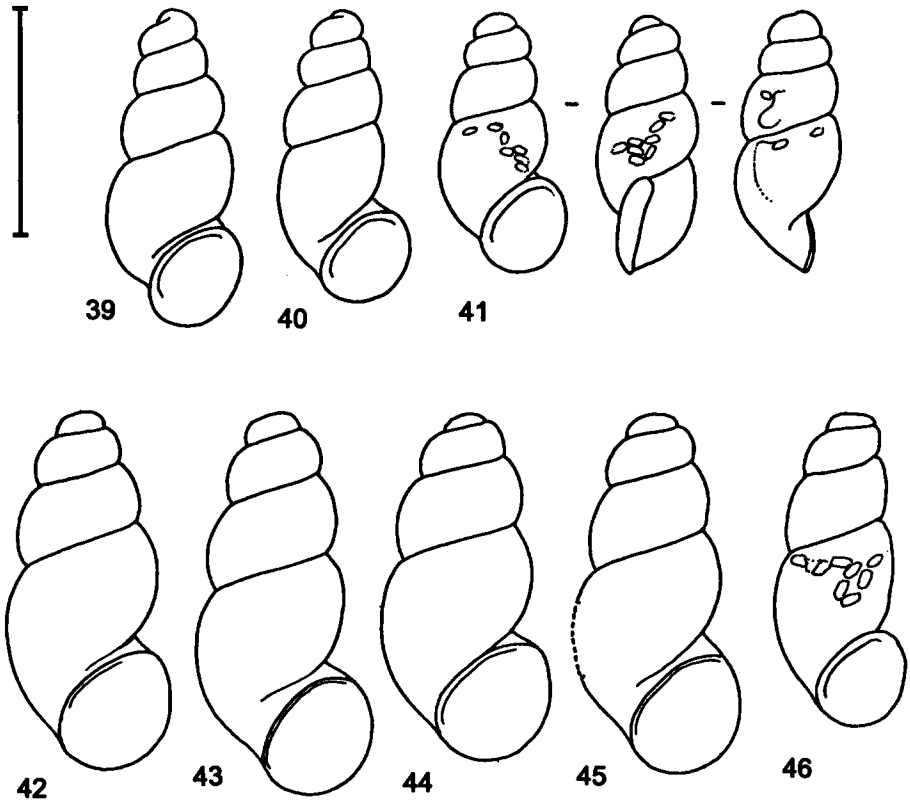
Derivatio nominis. – The name is derived from the Cova de la Fou.



Figs 23-28. *SpiraliX* (*SpiraliX*) spec. 23-24, *S. (S.) valenciana valenciana* subspec. nov. 23, Valencia, Gestalgar, 0.3 km S of the centre of electricity, at upper bridge (RMNH 93719/paratype) (also fig. 81); 24, Valencia, Requena, Banos de Fuente Podrida, Rio Gabriel (RMNH 93720/paratype). 25, *S. (S.) pequenoensis* spec. nov., Castellón, Espadilla, bridge at Onda, Rio Pequeno (RMNH 93717/holotype). 26-28, *S. (S.) valenciana castellanica* subspec. nov. 26, Castellón, Ahín, Cova de les Mans (RMNH 93721/paratype) (also fig. 70); 27, Castellón, Alcudia de Veo, Cueva del Toro (RMNH 93724/paratype) (also fig. 82); 28, Castellón, Morela, Vega del Moll, Masia Torreta Gargallo, at the transformer (RMNH 93725/paratype). Scale bar 1 mm.



Figs 29-38. *Spiralix (Burgosia)* spec. [29-35] and *Palaospeum* spec. [36-38]. 29-32, *S. (B.) burgensis* spec. nov. 29, Santander, Arredondo, Asón, Surgencia Cueva la Cubera (RMNH 93726/paratype) (also fig. 66); 30, Burgos, Merindad de Sotoscueva, spring of Quintanilla de Valdebodres (RMNH 93728/paratype); 31, Burgos, Valle de Mena, Cadagua, Nacimiento del Río Cadagua (RMNH 93729/paratype); 32, Burgos, Merindad de Sotoscueva, Hornillayuso, Cueva la Torcona (RMNH 93732/paratype) (also fig. 83). 33-35, *S. (B.) affinitatis* spec. nov. 33, Burgos, Merindad de Valdevelso, Cereceda, Fuente Sagrero (RMNH 93736/paratypes); 34-35, Burgos, Villarcayo, 1.2 km SE of Escanduso, spring at E bank of Río Nela (RMNH 93737/paratypes). 36, *P. hispanicum odaense* subsp. nov., Castellón, Espadilla, bridge at Onda, Río Pequeño (RMNH 93742/holotype) (also fig. 58). 37, *P. hispanicum hispanicum* subsp. nov., Huesca, Monzón, bridge at Barbastro, Río Cinca (RMNH 93740/paratype). 38, *P. bessoni rebenacquensis* Boeters, 2001, France, Pyrénées-Atlantiques, Rébénacq (BOE 1446/paratype) (also fig. 84). Scale bars 1 mm, combined for figs. 29-35 and for figs. 36-38).

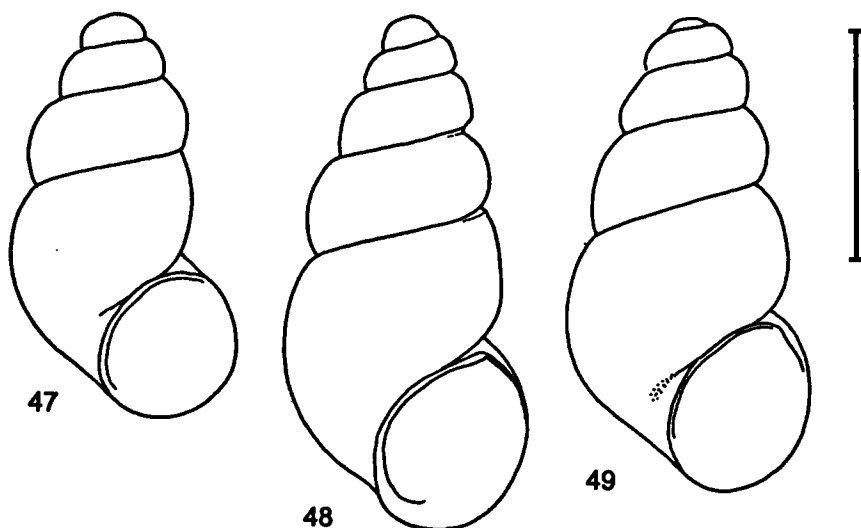


Figs 39-46. *Alzoniella* spec. [39] and *Guadiella* spec. [40-46]. 39, (?) *A. murita* spec. nov., Burgos, Berberane, Murita, Cueva de Murita 1 (RMNH 93743/holotype); idealised drawing since shell covered with crystals. 40-41, (?) *G. arconadae* spec. nov., Burgos, Merinda de Río Ubierna, spring at N side of San Martín de Ubierna (RMNH 93750/paratype and 93748/paratypes). 42-45, *G. andalucensis* (Boeters, 1983). 42, Jaén, Mogón, Río Guadalquivir (RMNH); 43, Jaén, 2 km upstream of Puerta de Segura, Río Guadalimar (RMNH); 44, Sevilla, S side of Alcolea del Río (RMNH); 45, Jaén, between Peal de Becerro and Ubeda, Río Guadalquivir (BOE 547/paratype). 46, *G. ramosae* spec. nov., Jaén, 2 km from Siles, S side of the road J701 Siles-Cotillas (RMNH 93746/paratype) (also fig. 76). Scale bar 1 mm.

Moitessieria spec. 1

Material. – Huesca: bridge at Gésera, Río Guarga (interstitial water), 740 m [UTM YM211968], 08.vi.1984 (RMNH [84-6/7]/ 2 probably juvenile shells together with 1 juvenile shell of *M.* spec.).

Remarks. – The sample comprises 3 shells. One shell might belong to another species than the remaining two. One of the latter has a very thin apertural border, indicating that growth has not yet been completed. The second shell might also be juvenile (height 1.25



Figs 47-49. *Alzoniella* spec. [47] and *Plesiella* spec. [48-49]. 47, *A. onatensis* spec. nov., Guipuzcoa, Onate, 0.25 km S of Berezano, captured spring (RMNH 93744/holotype). 48, *P. guipuzcoa* spec. nov., Guipuzcoa, Amezqueta, at Manatial Zaspi-Iturieta (RMNH 93753/paratype) (also fig. 85); 49, *P. navarrensensis* spec. nov., Navarra, Larraún, Allí, Cueva de Allí (RMNH 93755/paratype). Scale bar 1 mm.

mm and diameter 0.52 mm at 5 1/4 whorls). If both specimens are not fully grown, they could be interpreted as juvenile shells of *M. seminiana* spec. nov. If not, they might belong to a species not yet described.

Moitessieria spec. 2

Material. – Girona: 150 m S of the road to Paralada c. 2 km from Giriguella and 12 km NE of Figueres (well), 50 m [UTM EG08], 14.viii.1986 (RMNH 85866 [86-8/40]/ 6 shells).

Remarks. – It is assumed that these six specimens belong to one or perhaps even two new species. Five shells remind of *M. seminiana* spec. nov., especially because of the somewhat flattened whorls. The general shape of the shells is clearly less slender than in *M. seminiana* spec. nov., however. In all the specimens, the aperture is missing. One shell (height 1.85 mm, diameter 0.65 mm) is more slender than the others.

Moitessieria spec. 3

A sample of *Guadiella ramosae* spec. nov. from Jaén contains a juvenile shell of a *Moitessieria* species that cannot be identified. *Moitessieria* has never before been reported from Jaén.

Spiralix Boeters, 1972

In Spain *Spiralix* is represented by two subgenera, viz. *Spiralix* s. str. and *Spiralix* (*Burgosia*) subgen. nov.

Spiralix (*Spiralix*) Boeters, 1972

Paladilhia (*Spiralix*) Boeters, 1972: 100.

Type species (original designation): *Lartetia rayi* Locard, 1883.

Spiralix had only been reported from France. Now the description of this genus can be supplemented as follows.

Shell. – Shell long, narrow and cylindrical to slightly tapering towards its apex. In the French species the surface of the shell has spiral ridges, whereas in the Spanish ones only occasionally such ridges are visible (cf. *Spiralix* (*S.*) *u. valenciana* subspec. nov.). Operculum corneous.

Animal. – A pallial tentacle is missing. The gill has 6-12 leaflets; 6 leaflets were found for *Spiralix* (*S.*) *u. valenciana* subspec. nov. The intestine has 2 Z-like loops. The penis is provided with a distal lateral protrusion. The oviduct of the female sex tract has a bursa and a single receptaculum.

Differentiating features. – In contrast to the other W European genera of the Moitessieriidae, i.e. *Moitessieria* Bourguignat, 1863, *Paladilhia* Bourguignat, 1865, and *Palaospeum* Boeters, 1999, the intestine has two instead of just a single Z-like loop immediately behind the stomach. The penis is neither simple nor provided with a medial protrusion, but has a distal, lateral appendix.

Distribution. – In France in the drainage area of the Rhône with its tributaries, in Spain in the provinces of Castellón and Valencia.

Spiralix (*Spiralix*) *pequenoensis* spec. nov.
(fig. 25 [shell], 103 [distribution])

Material. – Castellón: Espadilla, bridge at Onda, Rio Pequeno (interstitial water), 260 m [UTM YK 259349], 09.v.1984 (RMNH 93717/holotype, shell).

Shell. – Shell long, narrow, cylindrical and only slightly tapering towards the apex; 4 1/4 whorls are only moderately convex and separated by a slightly indented suture. The last whorl broadens towards the aperture in such a way that the aperture forms a shoulder with the penultimate whorl. The aperture is ovoid and slightly oblique; especially the columellar and the basal border are clearly broadened, leaving an umbilical slit open. Height 1.55 mm, diameter 0.62 mm (n = 1).

Animal. – Unknown.

Differentiating features. – (i) Shell with a height of 1.55 mm smaller than in *S.* (*S.*) *u. valenciana* subspec. nov. (1.60-1.70-2.20 mm) and more cylindrical than conical. (ii) Shells in the neighbouring population of *S.* (*S.*) *u. castellanica* subspec. nov. have a more convex last whorl and with a height of 2.20 [2.0-2.60] mm they are larger.

Habitat. – Interstitial water, sympatric with *Palaospeum hispanicum ondaense* subspec. nov., which has been found alive at a temperature of 15.7°C.

Distribution. – Known only from Castellón.

Remarks. – (i) Next to *S. burgensis* spec. nov., with a shell height of 1.39 [1.25-1.50] mm the smallest Spanish species of the genus. (ii) The classification with *Spiralix* is based on conchological features only.

Derivatio nominis. – The name is derived from the Rio Pequeno.

Spiralix (Spiralix) valenciana spec. nov.

This species is described here with two subspecies from the political region of Valencia, viz. the nominate subspecies from the province of Valencia and *S. u. castellonica* subsp. nov. from the province of Castellón.

Spiralix (Spiralix) valenciana valenciana subsp. nov.

(figs 23-24, 95 [shell], 55 [intestine], 73-74 [penis], 81 [female sex tract], 103 [distribution])

Material. – Valencia: (i, type locality) Gestalgar, 0.3 km S of the power-station, at the upper bridge (small spring), 315 m [UTM XJ 847855], 06. 03.1984 (RMNH 93718/holotype, animal; 93719/c. 40 paratypes, animals; BOE 1507/1 paratype, shell); (ii) Requena, Banos de Fuente Podrida, Rio Cabriel (interstitial water), 400 m [UTM XJ430559], 17.v.1984 (RMNH 93720/3 paratypes, 2 and 1 juvenile animal).

Shell. – Shell long, slender and slightly conical. The wall of some shells shows an extremely weak spiral sculpture, with c. 40 spirals/mm on the last whorl, which corresponds to c. 13 spirals above the aperture ($n = 1$ of (i)). The 4 1/4 (at a shell height of 1.60 mm) to 5 1/4 whorls (at a shell height of 2.00 mm) are separated by a somewhat indented suture. The whorls are increasingly less convex towards the aperture. The last whorl broadens relatively strong towards the aperture, so that it forms a weak shoulder with the penultimate whorl. Aperture ovoid and clearly oblique. Its border, especially the columellar and the basal part, is broadened, touches the last whorl and leaves the umbilicus only slit-like open. The broadening of the aperture at its top and basis can clearly be seen in lateral view. Height 1.70 [1.60-2.20], diameter 0.84 [0.67-0.90] mm ($n = 10$).

Animal. – Without any pigmentation. Pallial tentacle and eyes not found. Gill with 6 leaflets ($n = 1$ of (i)). Intestine with 2 Z-like loops ($n = 3$; 1 male and 2 females of (i)). Penis with a lateral appendix shaped like a disk ($n = 2$; (i) and (ii)). Female sex tract with 2 sac-like appendices (bursa and receptaculum) at its renal oviduct ($n = 1$ of (i)).

Differentiating features. – (i) With a height of 1.55 mm, the shell of *S. (S.) pequenoensis* spec. nov. is clearly smaller than that of *S. (S.) u. valenciana* subsp. nov.; it is also more cylindrical and less conical. (ii) In the nominate subspecies the shell is smaller, i.e. 1.70 [1.60-2.20] mm high, compared to 2.20 [2.00-2.60] mm in *S. (S.) valenciana castellonica* subsp. nov. The lateral appendix of the penis is disk-like and not like a half-circle, whereas both sac-like pouches of the renal oviduct are relatively small.

Habitat. – Effluents of subterranean waters, and interstitial waters; collected at a temperature of 16.1 at (ii) and 16.3°C at (i).

Distribution. – Found in Valencia only.

Derivatio nominis. – The name refers to the political region of Valencia comprising the provinces of Valencia and Castellón.

Spiralix (Spiralix) valenciana castellonica subsp. nov.

(figs 26-28 [shell], 56 [intestine], 70-72 [penis], 82 [female sex tract], 103 [distribution])

Material. – Castellón: (i) Ahín, Cova de les Mans (cave with stagnant water fed by infiltration or periodic inundations), 570 m [UTM YK272193], 01.iii.1984 (RMNH 93721/3 paratypes, animals); (ii, type locality) Alcudia de Veo, Cueva del Toro (perennial effluent cave), 480 m [UTM YK259215], 01.iii.1984 (RMNH 93723/holotype, animal; 93723/4 paratypes, juvenile animals); (iii) locality and date as for (ii) (RMNH 93724/24 paratypes, 5 and 19 juvenile animals); (iv) Morella, Vega del Moll, Masía Torreta Gargallo, at the transformer (dug well), 910 m [UTM YK462966], 07.v.1984 (RMNH 93725/1 paratype, shell; BOE 1508/1 paratype, shell).

Shell. – Except for the measurements, as the nominate subspecies. A spiral sculpture could not be found. Height 2.20 [2.00-2.60] mm, diameter 0.95 [0.85-1.40] mm (n = 10).

Animal. – Without any pigmentation. Eyes and pallial tentacle missing. The intestine first forms a Z-like loop behind the stomach which is followed by a second Z-like loop towards the anus (n = 3; 1 male of (iii) and 2 animals of undetermined sex of (ii) and (iii), respectively). The penis has a lateral appendix (n = 3; 1 of (i) and 2 of (iii)). Female sex tract: the renal oviductus has two sac-like appendices (bursa and receptaculum) (n = 1 of (iii)).

Differentiating features. – (i) *S. (S.) pequenoensis* spec. nov. can be differentiated by the more cylindrical shells, which are also smaller, i.e. only 1.55 mm in height. (ii) Shells of *S. v. castellonica* subspec. nov. are slightly larger than those of the nominate subspecies, with mean values of 2.20 versus 1.70 mm. Furthermore, the nominate subspecies is characterised by a disk-like appendix of the penis, and in females by two smaller sac-like pouches (bursa and receptaculum) of the renal oviduct.

Habitat. – Carstic and interstitial waters; collected at a temperature of 14.8 at (i) and 15.0°C at (ii) and (iii).

Distribution. – Found only in Castellón.

Remarks. – (i) For (i) only one, badly preserved female could be dissected. This might explain why here only a single appendix of the renal oviductus was found (of the same size as those of a female from the type locality). (ii) At the position of the second Z-like loop, for 1 female only an U-like bend (presumably the proximal leg of the second Z-like loop) and, similarly, for an animal of undetermined sex only a weak Z-like loop could be found (both (iii)). The proximal leg of the second loop may, however, hide the two distal legs.

Derivatio nominis. – The name refers to the province of Castellón.

Spiralix (Burgosia) subgen. nov.

Type species: *Spiralix (Burgosia) burgensis* spec. nov.

Shell. – Shell ovoid-conical, with 3 3/4 to 4 1/4 whorls without spiral ridges. Height 1.25-1.50 mm, diameter 0.65-0.80 mm. Operculum corneous.

Animal. – Pallial cavity without gill leaflets. Intestine with two Z-like loops. Penis simple, crooked and pleated at its concave side. The female sex tract has no gonopericardial duct; bursa and single distal receptaculum (rs1) present.

Differentiating features. – *Burgosia* differs from the nominate subgenus by the ovoid-conical instead of cylindrical-conical shells, and by fairly convex whorls. The pallial cavity has no gill leaflets. The penis has no distal lateral protrusion, but is pleated at its concave side. The female genital opening is positioned close to the posterior wall of the pallial cavity and not at a distance corresponding with half the distance between that wall and the anus.

Sympatric occurrences. – *Spiralix (Burgosia) burgensis* spec. nov. was found sympatric with *S. (B.) affinitatis* spec. nov.

Distribution. – Known from the provinces of Burgos and Santander.

Derivatio nominis. – The name refers to the province of Burgos.

Spiralix (Burgosia) burgensis spec. nov.

(figs 29-32, 96 [shell], 57 [intestine], 66-69 [penis], 83 [female sex tract], 103 [distribution])

Material. – Santander: (i) Arredondo, Asón, Surgencia Cueva la Cubera (interstitial water), 200 m [UTM VN511895], 26.x.1983 (RMNH 93726/14 paratypes, 1 male plus presumably 13 empty shells in alcohol). Burgos: (ii) Merindad de Valdeielso, Cereceda, Fuente Sagrero (temporal effluent cave), 650 m [UTM VN598390], 06.iv.1984 (RMNH 93727/2 paratypes, shells (together with 1 juvenile shell, 1 fragmented shell and 2 adult indet. shells and 2 shells of *S. (Burgosia) affinitatis* spec. nov.; see below); (iii) Merindad de Sotoscueva, spring of Quintanilla de Valdebodres (interstitial water), 700 m [UTM VN456602], 07.iv.1984 (RMNH 93728/c. 20 paratypes, shells); (iv) Valle de Mena, Cadagua, Nacimiento del Rio Cadagua (interstitial water), 400 m [UTM VN714695], 09.iv.1984 (RMNH 93729/2 paratypes, animals; 93730/c. 30 paratypes, shells); (v, type locality) Merindad de Sotoscueva, Hornillayuso, Cueva la Torcona (interstitial water), 700 m [UTM VN504625], 23.iv.1984 (RMNH 93735/holotype, shell; 93733/16 paratypes, shells; 93732/numerous paratypes, animals; BOE 1509/3 paratypes, shells).

Shell. – Shell ovoid-conical, with $3\frac{3}{4}$ to $4\frac{1}{4}$ clearly convex whorls, separated by a pronounced suture. The columella is hollow and can easily be seen through the shell wall if the columella is filled with debris. At least near the shell wall, the border of the aperture is slightly broadened and touches the last whorl over a short distance or forms a small gap with it; umbilicus closed. The ovoid aperture is slightly slanted. Height 1.39 [1.25-1.50] mm, diameter 0.75 [0.65-0.80] mm ($n = 2\ 10$). Operculum corneous.

Animal. – Without any pigmentation. Eyes, pallial tentacle and gill leaflets missing. The intestine first forms a Z-like loop behind the stomach, which is followed by a second Z-like loop towards the anus. The first leg of the first loop lies under the complex of the glands of the pallial oviductus and reaches distally nearly the second Z-like loop, where the intestine forming the first Z-like loop turns back towards the stomach and accompanies the final leg of the first loop. Penis simple, more or less crooked, its concave side with folds following closely after one another ($n = 4$). Female sex tract: distal end of the pallial oviductus far behind the anus; gonopericardial duct missing, bursa and a single distal receptaculum present ($n = 1$).

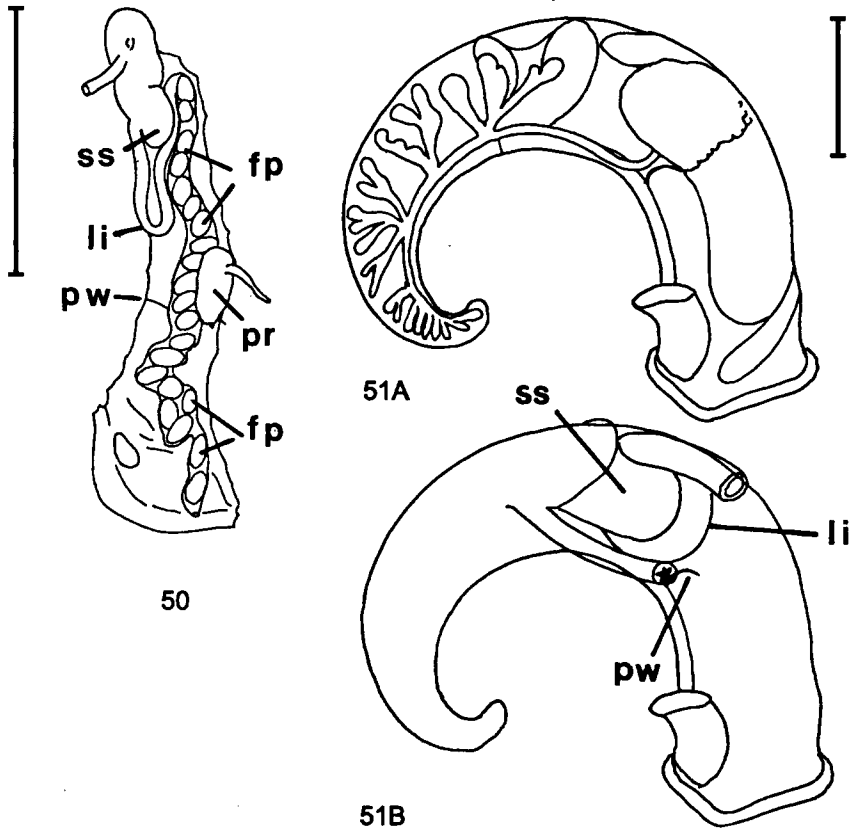
Differentiating features. – Shells of *S. (Burgosia) affinitatis* spec. nov. are less conical and rather ovoid.

Habitat. – Subterranean waters, collected alive at temperatures of 11.9°C at (iv) and at (v); occasionally sympatric with *S. (Burgosia) affinitatis* spec. nov.

Distribution. – Known from the provinces of Santander and Burgos.

Remarks. – (i) This species doubtlessly belongs to the Moitessieriidae. The fact that the first leg of the first intestinal Z-like loop extends far beyond the crystal style sac, nearly towards the second intestinal Z-like loop, indicates that - as usual in Hydrobiidae - a gonopericardial ductus and loops of the renal oviductus are missing.

Derivatio nominis. – The name refers to the province of Burgos.

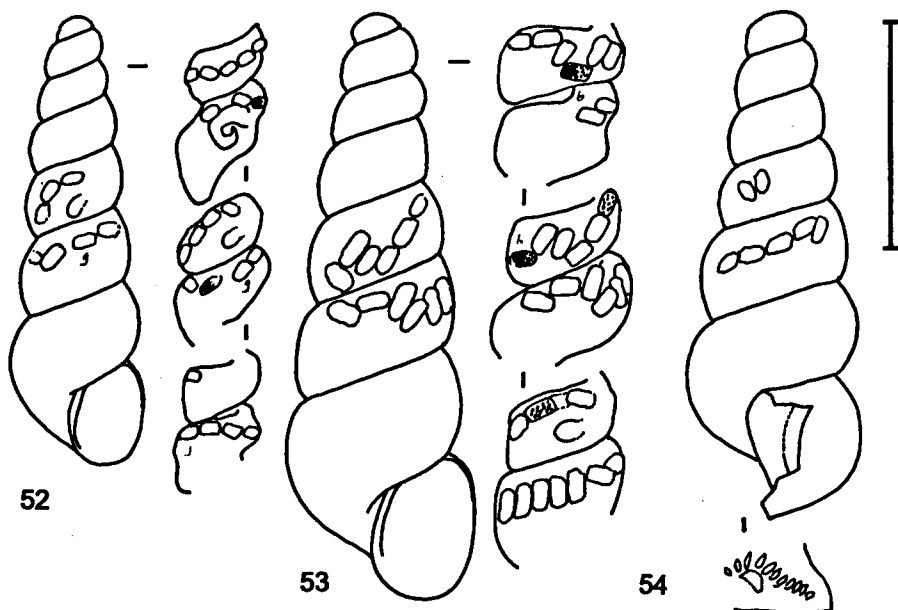


Figs 50-51. Gills and intestine. 50, *Moitessieria* after Giusti & Bodon (1991: 22, fig. 16D, *Moitessieria* cf. *massoti* Bourguignat, 1863). 51A-B, *Hydrobia* spec. after Davis et al.: 51A (1988: 229, fig. 14), 51B (1988: 233, fig. 17A has been superposed on 1988: 229, fig. 14, such that the anterior chambers of the stomach be congruent). Scale bar 1 mm; fp = fecal pellet, li = loop of intestine, pr = prostata, pw = posterior wall of pallial cavity, ss = style sac.

Spiralix (Burgosia) affinitatis spec. nov.
(figs 33-35, 97 [shell], 103 [distribution])

Material. – Burgos: (i) Merindad de Valdevelso, Cereceda, Fuente Sagrero (temporal effluent cave), 650 m [UTM VN598390], 06.iv.1984 (RMNH 93736/2 paratypes, shells (together with 2 shells of *S. (B.) burgensis* spec. nov. plus 1 juvenile, 1 fragment and 2 adult indet. shells; see above); (ii, type locality) Villarcayo, 1.2 km SE of Escanduso, spring at E bank of Rio Nela (interstitial water), 700 m [UTM VN494555], 07.iv.1984 (RMNH 93738/holotype, shell; 93737/numerous paratypes, shells; BOE 1510/3 paratypes, shells).

Shell. – Shell ovoid rather than ovoid-conical, with clearly convex whorls, separated by a pronounced suture. The last whorl neither ascends nor descends on the shell wall. The



Figs 52-54. Gills and intestine. *Moitesseria* spec. 52, *M. servaini* Bourguignat, 1880, Castellón, bridge of Villorres, Rio Bergantes (RMNH) (also fig. 63); 53-54, *M. notenboomi* spec. nov., Navarra, Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (RMNH 93694/paratypes) (also fig. 65). Scale bar 1 mm.

aperture is circular except for its umbilical region where it is slightly compressed, narrowly touching the shell wall or forming a small gap with it, so leaving the umbilicus open. Height 1.35-1.40 mm, diameter 0.75-0.80 mm ($n = 2$).

Animal. - Unknown.

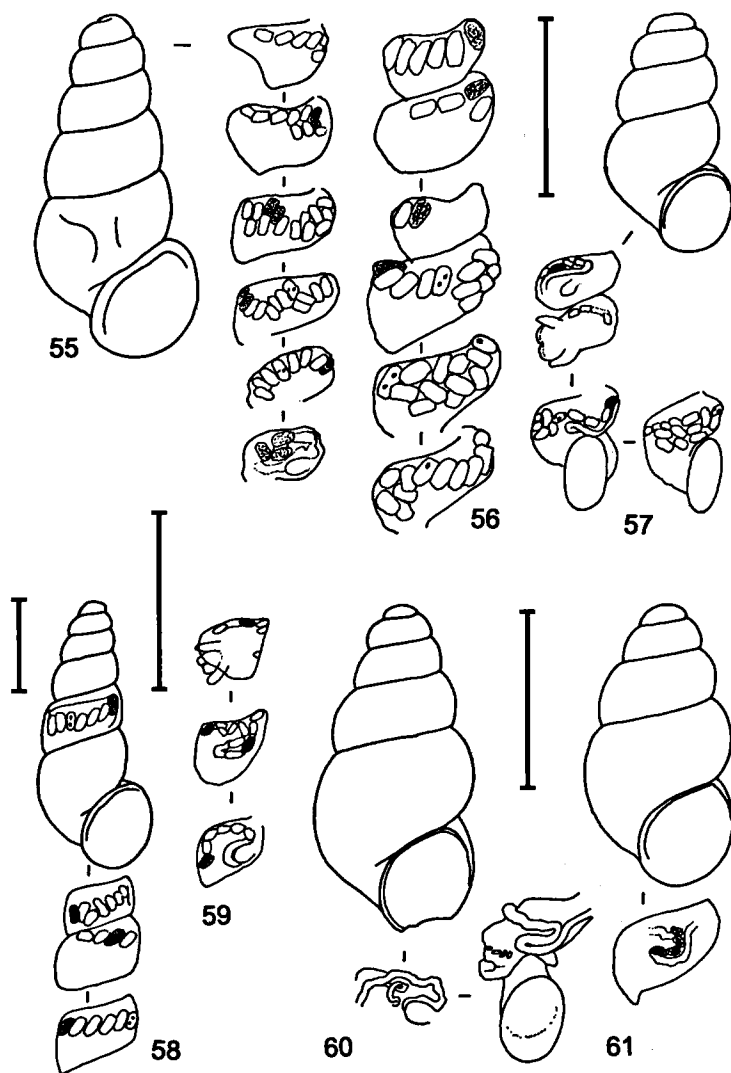
Differentiating features. - Shells of this species are less conical and rather ovoid as compared with *S. (Burgosia) burgensis* spec. nov.

Habitat. - Subterranean waters; occasionally sympatric with *S. (Burgosia) burgensis* spec. nov.

Distribution. - Known from the province of Burgos only.

Remarks. - The sample from Fuente Sagrero, with 8 specimens, is too small to interpret differences in shell height by the fact that it comprises specimens of two species, i.e. *S. (Burgosia) burgensis* spec. nov. and *S. (B.) affinitatis* spec. nov.

Derivatio nominis. - The name reflects the close conchological similarity with the sympatric *S. (Burgosia) burgensis* spec. nov.



Figs 55-61. Gills and intestine. 55-56, *Spiralix* (*Spiralix*) spec. 55, *S. (S.) valenciana valenciana* subsp. nov., Valencia, Gestalgar, 0.3 km S of the road of the centre of electricity, at the upper bridge (RMNH 93719/paratype) (also fig. 74); 56, *S. (S.) valenciana castellonica* subsp. nov., Castellón, Alcudia de Veo, Cueva del Toro (RMNH 93724/paratype) (also fig. 72). 57, *Spiralix* (*Burgosia*) *burgensis* spec. nov., Burgos, Merindad de Sotoscueva, Hornillayuso, Cueva la Torcona (RMNH 93732/paratype). 58, *Palaospium hispanicum ondaense* subsp. nov., Castellón, Espadilla, bridge at Onda, Rio Pequeno (RMNH 93742/holotype) (also fig. 36). 59, *Guadiella ramosae* spec. nov., Jaén, 2 km from Siles, at S side of the road carretera J701 Siles-Cotillas (RMNH 93746/paratype) (also fig. 77). 60-61, *Plesiella* spec. 60, *P. guipuzcoa* spec. nov., Guipuzcoa, Amezqueta, at Manatial Zaspí-Iturieta (RMNH 93753/paratype); 61, *P. navarrensis* spec. nov., Navarra, Larraún, Allí, Cueva de Allí (RMNH 93755/paratype) (also fig. 78). Scale bars 1 mm (same scale bar for all figs. except for fig. 58).

Palaospeum Boeters, 1999

Palaospeum Boeters, 1999: 193.

Type species (original designation): *Paladilhia bessoni* Bernasconi, 1999.

Palaospeum hispanicum spec. nov.

This is the first record of a Spanish species of *Palaospeum*. It is considered polytypic, with two subspecies.

Palaospeum hispanicum hispanicum subspec. nov.
(figs 37 [shell], 80 [penis], 103 [distribution])

Material. – Huesca: Monzón, bridge at Barbastro, Rio Cinca (interstitial water), 250 m [UTM BG6644], 07.vi.1984 (RMNH 93739/holotype, animal; 93740/5 paratypes, 2 and 3 juvenile animals; BOE 1511/1 paratype, shell).

Shell. – Shell long, narrow, with 6-6 1/2 whorls. The initial four whorls form the pointed conical spire and the final two the rather cylindrical lower c. 2/3 of the shell. The final two whorls are only weakly convex and separated by a rather shallow suture. The aperture is ovoid and only slightly slanted; below the umbilicus, the ovoid contour of the aperture appears weakly angular. Its border is slightly broadened, especially the columellar side, which touches the shell wall over a short distance and leaves the funnel-like umbilicus open. Height 2.9 [2.7-3.3] mm, diameter 1.1 [1.0-1.3] mm (n = 3).

Animal. – Without any pigmentation. Eyes missing. Gill with 16 leaflets (1 male). The intestine forms a Z-like loop behind the stomach; whether this loop is followed by another one or a bend towards the anus, has not been clarified. In conformity with the organisation of other representatives of *Palaospeum* it can be assumed however, that the loop behind the stomach is not followed by a second loop (see also *P. h. ondaense* subspec. nov.). The penis is simple, without any appendix.

Differentiating features. – (i) As regards *P. h. ondaense* subspec. nov., see below. (ii) *P. h. hispanicum* can be differentiated from *P. bessoni* (Bernasconi, 1999) by the penis, which is compact hook-like in its inactive state and pleated on its concave side. In *P. bessoni* a basal, hook-like section of the penis is elongated by a very slim distal section of about the same length.

Habitat. – Interstitial waters; collected at a temperature of 14.0°C.

Distribution. – Found only in Huesca.

Remarks. – The high number of 16 gill leaflets allows a classification of this species with *Palaospeum* (see Boeters, 1999).

Derivatio nominis. – The name reflects that this species is the first known representative of *Palaospeum* from the Iberian Peninsula.

Palaospeum hispanicum ondaense subspec. nov.
(figs 36 [shell], 58 [intestine], 103 [distribution])

Material. – Castellón: Espadilla, bridge at Onda, Rio Pequeno (interstitial water), 260 m [UTM YK259349], 09.v.1984 (RMNH 93742/holotype, animal, and RMNH 93741/1 paratype, 1 juvenile animal).

Shell. – Shell elongate-conical, with 6 whorls. The whorls are separated by a modera-

tely indented suture and show a flattened profile. In frontal view, the left contour of the shell is slightly convex, whereas the right contour is rather straight, with the exception of the palatal border of the aperture, which reaches beyond the straight line. The last section of the last whorl ascends slightly on the shell wall. The aperture is ovoid and slightly slanted. Both its basal and its palatal border are sharply reflected, forming a rim, whereas the umbilical border of the aperture is largely obscuring the umbilicus, leaving it only slit-like open. Height 3.3 mm, diameter 1.5 mm ($n = 1$). Operculum corneous.

Animal. – Without any pigmentation. Eyes missing. Gill not examined (shell not destroyed). Behind the stomach the intestine first forms a Z-like loop, which is followed by a U-like bend towards the anus ($n = 1$).

Differentiating features. – The shell differs from that of the nominate subspecies in that the broadened aperture is shortened ovoid and that its peristome is thickened and reflected, and more clearly obscures the umbilicus.

Habitat. – Interstitial waters; collected at 15.7°C. Found sympatric with *Spiralix pequeñoensis* spec. nov.

Distribution. – Known from the province of Castellón only. The subspecies of *P. hispanicum* spec. nov. have been collected in interstitial waters of separate drainage areas.

Derivatio nominis. – The name refers to Onda.

Hydrobiidae Troschel, 1857

The material collected by Notenboom and Meijers comprises species of three genera, viz. *Alzoniella* Giusti & Bodon, 1984, and two genera, which will be described below, viz. *Guadiella* gen. nov. and *Plesiella* gen. nov.

Alzoniella Giusti & Bodon, 1984

Alzoniella Giusti & Bodon, 1984: 157.

Type species (original designation): *Alzoniella finalina* Giusti & Bodon, 1984.

Alzoniella has not yet been reported from Spain. The material collected by Notenboom and Meijers comprises two new species that are here classified with that genus. This implies that the generic range is enlarged here with the Spanish provinces of Burgos (?) and Guipuzcoa.

(?) *Alzoniella murita* spec. nov.
(fig. 39 [shell], 104 [distribution])

Material. – Burgos: Berberane, Murita, Cueva de Murita 1 (temporal effluent cave), 620 m [UTM VN 951532], 09.iv.1984 (RMNH 93743/holotype, shell).

Shell.— Shell elongate cylindrical-conical, with 4 1/2 moderately convex whorls, separated by a pronounced suture. The aperture is clearly slanted ovoid, its border (especially the columellar section) is rather broadened. The last quarter of the body whorl does not touch the shell wall but forms a gap with it. In frontal view, the palatal border of the aperture is in line with the second to last whorl. Height 1.4 mm, diameter 0.56 mm ($n = 1$).

Animal. – Unknown.

Differentiating features. – The shell of this species is more clearly cylindrical than the

shells of all other species dealt with in this publication, its whorls are more prominently convex and separated by a deeper suture. Shells of (?) *Guadiella arconadae* spec. nov., which is also reported from the province of Burgos, are more conical, with a somewhat triangular aperture.

Habitat. – Interstitial water; collected at a temperature of 10.9°C (not alive).

Distribution. – Known only from the province of Burgos.

Remarks. – The classification of this species with *Alzoniella* is preliminary since no anatomical data are available. Maybe it belongs to *Guadiella* gen. nov. However, the type locality of (?) *A. murita* spec. nov. is far away from the well established range of *Guadiella* gen. nov. and close to that of *Alzoniella* species.

Derivatio nominis. – The name refers to the locality Murita.

Alzoniella onatensis spec. nov.
(fig. 47 [shell], 104 [distribution])

Material. – Guipuzcoa: Onate, 0.25 km S of Berezano, man-made spring, 360 m [UTM WN 4863], 19.vi.1984 (RMNH 93744/holotype, shell).

Shell. – Shell with 4 1/4 whorls, separated by a moderately indented suture; the initial three whorls are convex, whereas the last whorl is slightly flattened. In frontal view, the initial three whorls form a regular cone, in relation to which the last whorl is narrower, though somewhat broader still than the penultimate one. This results in a slightly convex general shape. The last whorl neither ascends nor descends on the shell wall. The aperture is about circular; only its columellar border is slightly broadened, touching the shell wall over a very short distance and leaving an open umbilical slit. Height 1.8 mm, diameter 0.96 mm (n = 1).

Animal. – Unknown.

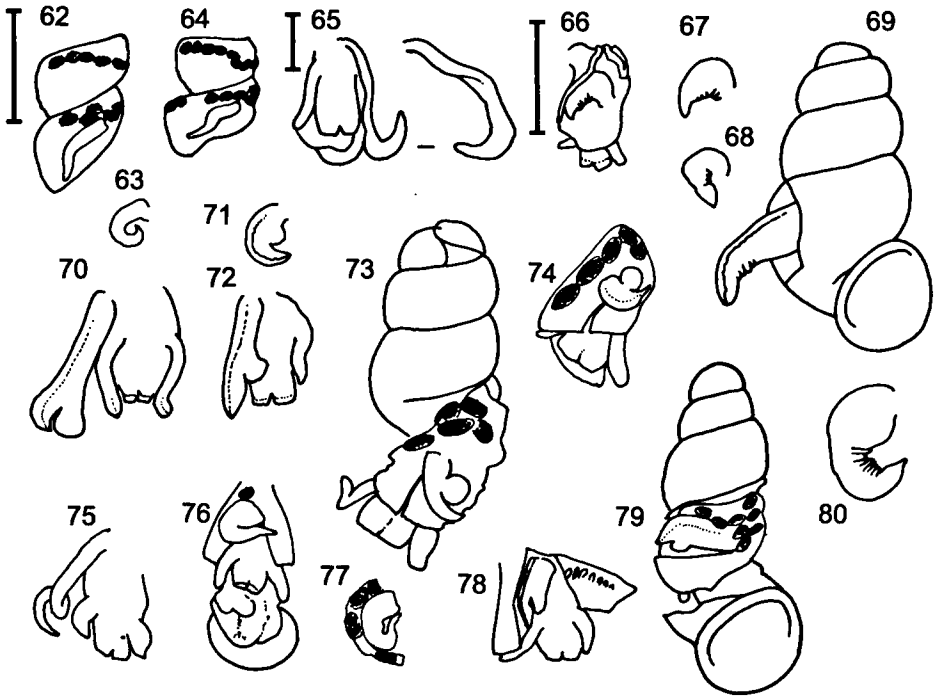
Differentiating features. – (i) With shell heights of 1.4 and 1.24 [1.10-1.40] mm, respectively, (?) *A. murita* spec. nov. and (?) *Guadiella arconadae* spec. nov. are smaller. In lateral view, *A. onatensis* spec. nov. differs from *Plesiella guipuzcoa* spec. nov. and *P. navarrensis* spec. nov. in that the contour of the shell is slightly convex, not conical. It is also smaller and has 4 1/4 instead of 4 1/2 or more whorls. (ii) *A. cantabrica* (Boeters, 1983), described from the provinces of Oviedo, Santander and Burgos, and *A. (Navarriella) elliptica* (Paladilhe, 1874) from Navarra and Basses-Pyrénées differ conchologically by a more ovoid shape (Boeters, 1988: pl. 3 figs 44, 45). With a shell height of 1.5-1.7 mm, *A. haicabia* Boeters, 2000, is smaller; it additionally differs by an inside and outside thickening of the palatal border of the aperture. (iii) Shells of *A. pyrenaica* are similar, but have with a height of 1.8 mm, and 4.0 instead of 4 1/4 whorls. In *A. pyrenaica* the initial three whorls do not form a cone, but contribute to the ovoid general shell shape; the apical part of the shell is more rounded and the first whorl does not protrude like a knob as in *A. onatensis* spec. nov. The fact that the only known population of *A. pyrenaica* is c. 125 km away was taken into account while assuming a differentiation at a higher than subspecific level.

Habitat. – Presumably subterranean waters; collected in a spring fitted up for water supply (temperature not mentioned).

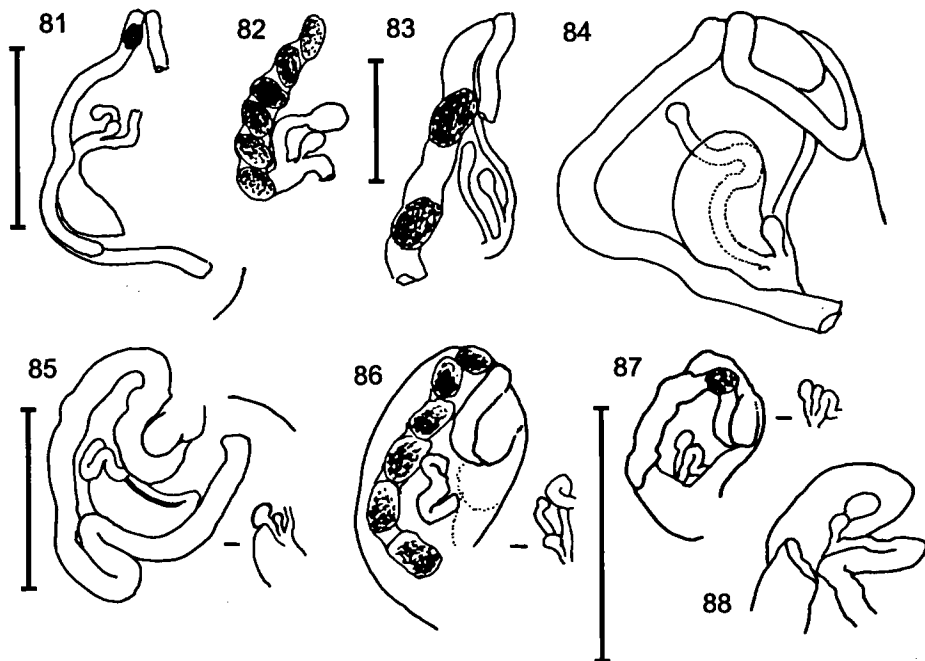
Distribution. – Known from the province of Guipuzcoa only.

Remarks. – This species is conchologically similar to *A. pyrenaica*. This allows an attribution to *Alzoniella* without knowing the anatomical data.

Derivatio nominis. – The name of this species refers to the locality Onate.



Figs 62-80. Male copulatory organs. 62-65, *Moitessieria* spec. 62-63, *M. servaini* Bourguignat, 1880. 62, Huesca, 0.5 km N of Villareal de la Canal, Rio de Majones (RMNH) (also fig. 1); 63, Castellón, bridge of Villares, Rio Bergantes (RMNH) (also fig. 52). 64, *M. seminiana* spec. nov., Huesca, 0.5 km N of Villareal de la Canal, Rio de Majones (RMNH 93714/paratype). 65, *M. notenboomii* spec. nov., Navarra, Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (RMNH 93694/paratype) (also fig. 53). 66-69, *Spiralix* (*Burgosia*) *burgensis* spec. nov. 66, Santander, Arredondo, Asón, Surgencia Cueva la Cubera (RMNH 93726/paratype) (also fig. 29); 67-69, Burgos, Merindad de Sotoscueva, Hornillayuso, Cueva la Torcona (RMNH 93732/paratypes). 70-74, *Spiralix* (*Spiralix*) *valenciana* spec. nov. 70-72, *S. (S.) u castellanica* subspec. nov. 70, Castellón, Ahín, Cova de les Mans (RMNH 93721/paratype) (also fig. 26); 71-72, Castellón, Alcudia de Veo, Cueva del Toro (RMNH 93724/paratypes) (also fig. 56). 73-74, *S. (S.) u valenciana* subspec. nov. 73, Valencia, Requena, Banos de Fuente Podrida, Rio Cabriel (RMNH 93720/paratype); 74, Valencia, Gestalgar, 0.3 km S of the power-station, at the upper bridge ([84-3/25] RMNH 93719/paratype) (also fig. 55). 75-77, *Guadiella* spec. 75, *G. andaluensis* (Boeters, 1983), Jaén, inbetween Peal de Becerro and Ubeda, Rio Guadalquivir (BOE 547/paratype); 76-77, *G. ramosae* spec. nov., Jaén, 2 km from Siles, S side of the road J701 Siles-Cotillas (RMNH 93746/paratypes) (also figs 46 and 59). 78, *Plesiella navarrensis* spec. nov., Navarra, Larraún, Allf, Cueva de Allf ([84-6/33] RMNH 93755/paratype) (also fig. 61). 79, (?) *Guadiella arconadae* spec. nov., Burgos, Merinda de Rio Ubierna, spring at N side of San Martin de Ubierna (RMNH 93748/paratype). 80, *Palaospium hispanicum hispanicum* subspec. nov., Huesca, Monzón, bridge at Barbastro, Rio Cinca (RMNH 93740/paratype). Scale bars 0.5 mm, for figs 62-64, 65 & 66-80.



Figs 81-88. Female sex tracts. 81-82, *Spiralix* (*Spiralix*) *valenciana* spec. nov. 81, *S. (S.) v. valenciana* subspec. nov., Valencia, Gestalgar, 0.3 km S of the centre of electricity, at the upper bridge (RMNH 93719/paratype) (also fig. 23); 82, *S. (S.) v. castellonica* subspec. nov., Castellón, Alcudia de Veo, Cueva del Toro (RMNH 93724/paratype) (also fig. 27). 83, *Spiralix* (*Burgosia*) *burgensis* spec. nov., Burgos, Merindad de Sotoscueva, Hornillayuso, Cueva la Torcona (RMNH 93732/paratype) (also fig. 32). 84, *Palaospium bessoni rebenacquensis* Boeters, 2001, France, Pyrénées-Atlantiques, Rébénacq (BOE 1446/paratype) (also fig. 38). 85-86, *Plesiella* spec. 85, *P. guipuzcoa* spec. nov., Guipuzcoa, Amezqueta, at Manantial Zaspi-Iturieta (RMNH 93753/paratype) (also fig. 48); 86, *P. navarrensis* spec. nov., Navarra, Larraún, Allf, Cueva de Allf (RMNH 93755/paratype). 87-88, *Guadiella* spec. 87, (?) *G. arconadae* spec. nov., Burgos, Merinda de Rio Ubierna, spring at N side of San Martin de Ubierna (RMNH 93748/paratype); 88, *G. ramosae* spec. nov., Jaén, 2 km from Siles, S side of the road J701 Siles-Cotillas (RMNH 93746/paratype). Scale bars 0.5 mm, for figs 81-82, 83-84, 85-86 & 87-88.

Guadiella gen. nov.

Type species: *Belgrandiella andalucensis* (Boeters, 1983).

Shell and operculum. – Shell narrow, long, cylindrical to slightly conical. The edge of the aperture is sharp, only its columellar border may be slightly broadened. Height 1.40-1.70 mm, diameter 0.55-0.76 mm. Operculum lemon yellow.

Animal. – Without any pigmentation. Eyes missing. Gill with 7-15 leaflets. Upon leaving the stomach, the intestine forms 2 Z-like loops as in *Alzoniella* s. str. Penis simple, without any protrusion or appendix; only in (?) *G. arconadae* spec. nov. there is a small lateral appendix. Female sex tract with bursa and a single receptaculum (distal receptaculum = rs1).

Differentiating features. – In shell shape representatives of *Guadiella* gen. nov. differ from almost all species of *Alzoniella*. Only (?) *A. cornucopia* and *A. fabrianensis* from Italy also have a comparatively long shell. Males of *Guadiella* gen. nov. differ however, by a simple penis, which is not provided with any protrusion or appendix. Females can be differentiated in that the oviductus is equipped with a bursa and a simple receptaculum instead of a bursa and two receptacula. In the coloured operculum *Guadiella* gen. nov. differs from *Bythiospeum* Bourguignat, 1882.

Habitat. – Interstitial water of river-beds.

Distribution. – Drainage area of the Guadalquivir in the provinces of Jaén and Sevilla. *G. andalucensis* has been found in interstitial waters of the Guadalquivir and the Rio Guadalimar, one of its tributaries. *G. ramosae* spec. nov. is only known from interstitial water of the Rio Guadalimar.

Derivatio nominis. – The name is derived from the Guadalquivir.

Guadiella andalucensis (Boeters, 1983)
(figs 42-45 [shell], 75 [penis], 104 [distribution])

Belgrandiella andalucensis Boeters, 1983: 21 (Spain, Jaén, "Sous-écoulement du Guadalquivir [Peal de Becerro [et] Ubeda]", UTM VG89); Boeters, 1988: 225, figs 199-200, 228-231, 290, pl. 3 fig. 42.

Material. – Jaén: (i) Mogón, Rio Guadalquivir (interstitial water), 450 m [UTM VH9714], 24.i.1984 (RMNH/5 shells in alcohol); (ii) 2 km upstream of Puerta de Segura, Rio Guadalimar (interstitial water), 600 m [UTM WH2345], 24.i.1984 (RMNH/1 animal). Sevilla: (iii) S side of Alcolea del Rio (dug well), 10-75 m [UTM TG6466], 24.vii.1984 (RMNH/1 animal).

Shell. – Shell narrow, long and very slightly cylindrical; with 3 1/2 moderately convex whorls ($n = 2$), separated by a moderately deep suture. The columellar border of the aperture touches the last whorl or forms a gap with it; umbilicus closed. Aperture slanted ovoid; its edge is sharp and only the umbilical border may be weakly broadened. Height 1.55 [1.40-1.70] mm, diameter 0.72 [0.66-0.76] ($n = 5$). Operculum with pale orange nucleus.

Animal. – Gill with c. 7 to 15 leaflets. Intestine with 2 Z-like loops behind the stomach. Penis without any protrusion, very slender, its base measuring 1/10 of its length. Female sex tract: renal oviductus with a kidney-shaped bursa and a single receptaculum.

Differentiating features. – (i) *G. andalucensis* differs from *G. ramosae* spec. nov., occurring in the same drainage area, by a shell with more regularly convex whorls, a clearly more slender penis, and a female sex tract with a kidney-shaped bursa. (ii) (?) *G. arconadae* spec. nov. has a more conical shell and the penis has a small lateral appendix.

Habitat. – Interstitial waters. Collected at a temperature of 9.9°C at (ii), 10.2°C at (i) and 19.7°C at (iii).

Distribution. – Drainage area of the Rio Guadalquivir in the provinces of Jaén and Sevilla.

Guadiella ramosae spec. nov.
(figs 46, 98 [shell], 59 [intestine], 76-77 [penis], 88 [female sex tract], 104 [distribution])

Material. – Jaén: 2 km from Siles, at S side of the road J 701 Siles-Cotillas (small spring), 900 m [UTM WH3850], 25.i.1984 (RMNH 93745/holotype, shell; 93746/27 paratypes, animals (together with 1 juvenile shell of *Moitessieria* spec.); BOE 1513/1 paratype, shell).

Shell. – Shell with an elongate conical spire with a broad apex, and a relatively high, flattened, last whorl; with 3 3/4 whorls ($n = 2$), gradually increasing in size and separated by a moderately deep suture. Aperture a broadly rounded triangle, somewhat oblique-elliptical; its columellar border forms a more or less broad gap with the wall of the last whorl. The edge of the aperture is sharp, apart from the columellar border which is slightly broadened. The umbilicus is closed. Height 1.47 [1.35-1.65] mm, diameter 0.60 [0.55-0.65] mm ($n = 10$). Operculum lemon yellow.

Animal. – Without any pigmentation. Eyes missing. Gill with 11 leaflets (1 female). Penis without any appendix, in resting position strongly curved, its base measuring c. 1/3 of its length ($n = 2$). Female sex tract: the renal oviduct has a sac-like bursa and a single, distal receptaculum; the pedunculus of the bursa is longer than that of the receptaculum ($n = 2$).

Differentiating features. – (i) *Guadiella ramosae* spec. nov. differs from *G. andalucensis* (Boeters, 1983) by its clearly less slender penis. (ii) (?) *G. arconadae* spec. nov. differs by its comparatively more conical shape and a penis with a small lateral appendix.

Habitat. – Interstitial waters; collected at a temperature of 12.4°C. Sympatric with *Moitessiera* spec.?

Distribution. – Known only from the province of Jaén.

Remarks. – In the sample with the type material there was also a juvenile shell of a *Moitessiera* species.

Derivatio nominis. – This species is dedicated to Mrs. M. A. Ramos who contributed to the knowledge of subterranean Iberian prosobranchs.

(?) *Guadiella arconadae* spec. nov.

(figs 40-41, 99 [shell], 79 [penis], 87 [female sex tract], 104 [distribution])

Material. – Burgos: (i) Merinda de Rio Ubierna, spring at N side of San Martin de Ubierna (interstitial water), 900 m [UTM VN417067], 30.iii.1984 (RMNH 93747/holotype, shell; 93748/numerous paratypes, animals); (ii) locality as for (i), 28.iv.1984 (RMNH 93750/paratypes, 8 shells; 93749/paratypes, c. 20 animals; BOE 1512/2 paratypes, shells).

Shell. – Shell narrow, elongated conical; with 3 1/2-4 moderately convex whorls ($n = 2$). The aperture does neither descend nor ascend on the shell wall. Aperture oblique-elliptical, its inner lip somewhat less strongly curved than the outer lip; the palatal border slightly broadened and the columellar border more clearly thickened, touching the shell wall over a short distance at most and forming a gap with the shell wall. The umbilicus is closed. Height 1.24 [1.10-1.40] mm, diameter 0.54 [0.43-0.65] ($n = 10$). Operculum vaguely yellowish.

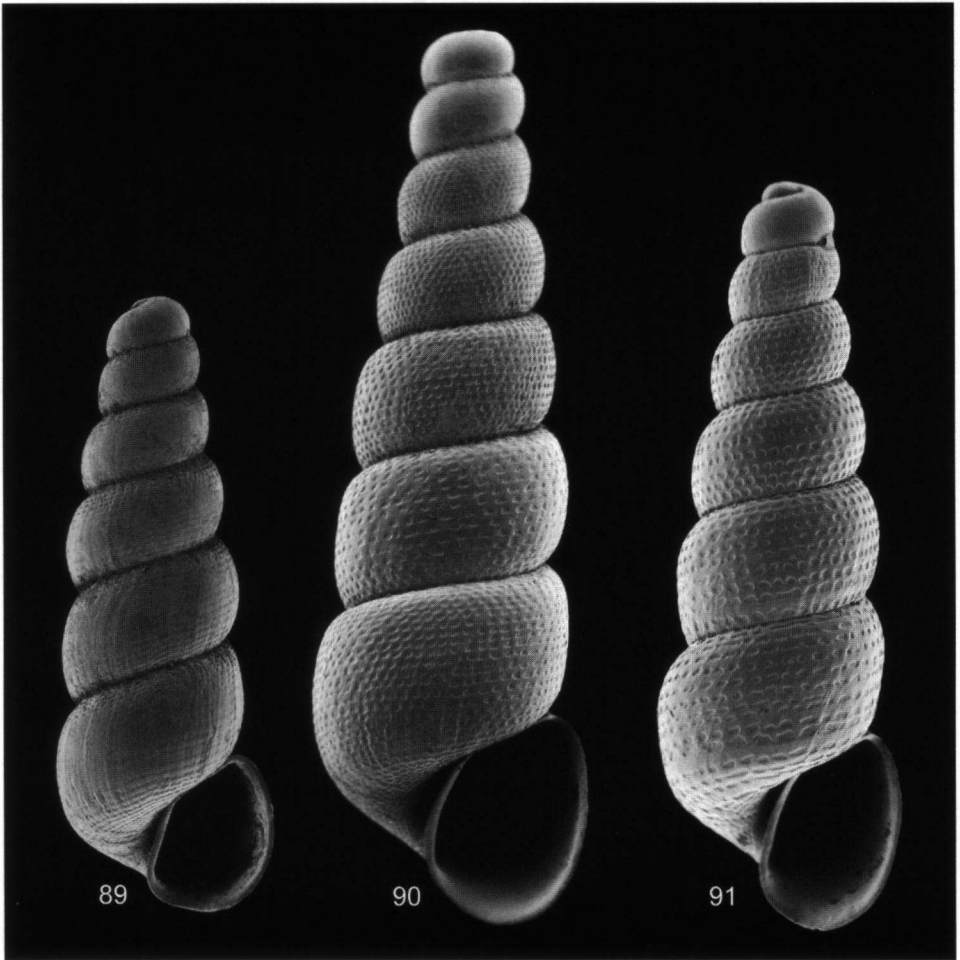
Animal. – Without any pigmentation. Eyes missing. Gill with 4 leaflets (1 female). The intestine forms a Z-like loop behind the stomach, followed by a second Z-like loop. The penis has a small lateral appendix ($n = 1$). Female sex tract: the renal oviduct has a small bursa and parallel to it a single receptaculum (rs1), which is not remarkably smaller than the bursa; an albumen gland could not be identified ($n = 2$).

Differentiating features. – See the remarks below and notes with *Guadiella andalucensis* spec. nov., *G. ramosae* spec. nov. and *Alzoniella onatensis* spec. nov.

Habitat. – Interstitial waters; collected at 12.0 and 12.9°C.

Distribution. – Burgos.

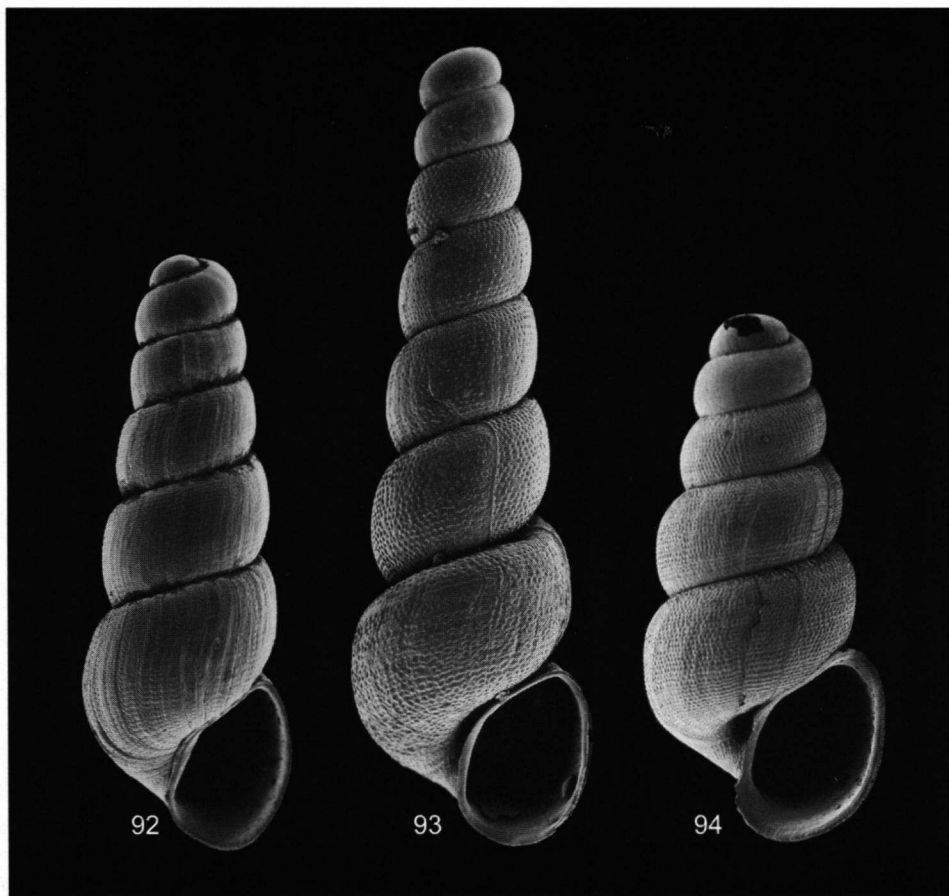
Remarks. – This species is somewhat aberrant in *Guadiella* gen. nov. since the penis has a protrusion, whereas in females the renal oviduct with its bursa and distal receptaculum



Figs 89-91. *Moitessieria* spec. 89, *M. servaini* Bourguignat, 1880, form of Tarragona, 17 km SE of Vallfogona de Riucorb, Santa Perpetua de Gaia, Riu Gaia, c. 600 m, 10.viii.1986 (RMNH 93685/paratype), shell height 1.8 mm; 90, *M. notenboomi* spec. nov., Navarra, Urraul Bajo, Ripodas, bridge at Lumbier, Rio Areta (interstitial water), 420 m, 14.vi.1984 (RMNH 93695/paratype), shell height 2.7 mm; 91, *M. guadelopensis* spec. nov., Teruel, bridge 3 km S Alcaniz, Rio Guadelope (interstitial water), 450 m, 04.v.1984 (RMNH 93705), shell height 2.3 mm. Photographs by J. Goud, Leiden.

runs through the cavum abdominis without touching or being embedded in the albumen gland.

Derivatio nominis. – This species is dedicated to Mrs. B. Arconada who contributed to the knowledge of subterranean Iberian prosobranchs.

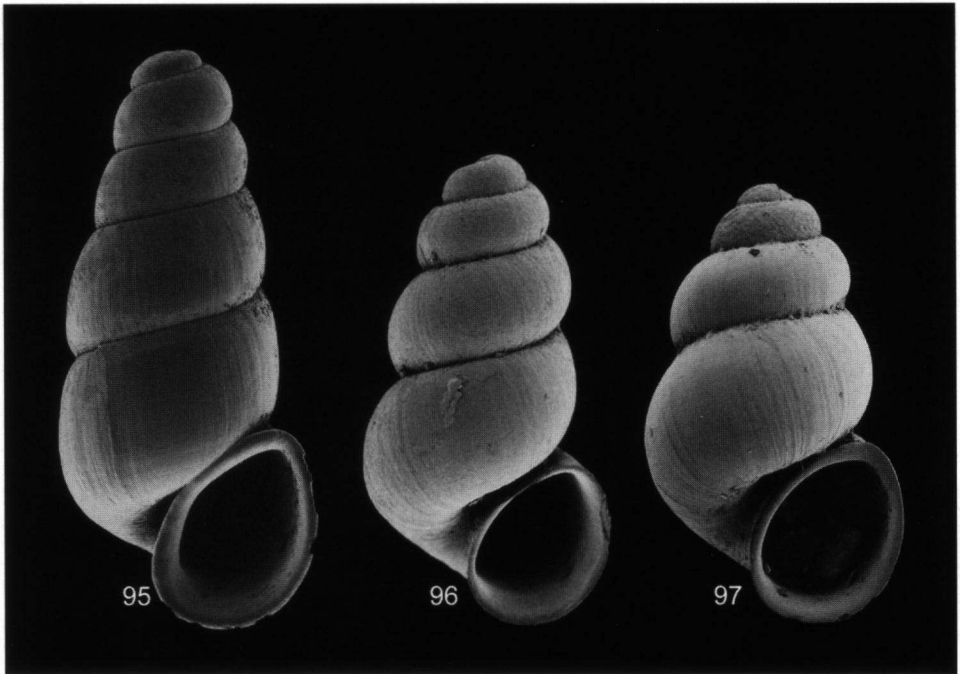


Figs 92-94. *Moitesseria* spec. 92, *M. lludrigaensis* spec. nov., Tarragona, c. 2 km SE of Capafonts and 12 km WNW of Alcover, Fuente Llodriga, 700 m, 08.viii.1986 (RMNH 93707/paratype), shell height 1.8 mm; 93, *M. robresia* spec. nov., Teruel, 0.8 km from Valderrobres, E of road carretera Valderrobres-Arnés (dug well), 520 m, 05.v.1984 (RMNH 93709/paratype), shell height 2.4 mm; 94, *M. foui* spec. nov., Tarragona, 6 km SW of Falset, c. 5 km SE of Capcanes, Cova de la Fou (small temporary resurgence cave), c. 200 m, viii. 1986 (RMNH 93716 paratype), shell height 1.6 mm. Photographs by J. Goud, Leiden.

Plesiella gen. nov.

Type species: *Plesiella guipuzcoa* spec. nov.

Shell. – Shell conical, with $4\frac{1}{2}$ to $5\frac{3}{4}$ whorls. The columella is hollow, but the umbilicus is only slit-like open or even closed. Aperture is ovoid and slightly slanted, and neither thickened nor broadened; it touches the shell wall over a more or less short distance. Height 1.85-2.50 mm, diameter 0.9-1.1 mm. Operculum pale yellow to vaguely red-



Figs 95-97. *Spiralix* spec. 95, *S. (S.) valenciana valenciana* subsp. nov., Valencia, Gestalgar, 0.3 km S of the power-station, at the upper bridge (small spring), 315 m, 06.iii.1984 (RMNH 93719/paratype), shell height 1.7 mm; 96, *S. (Burgosia) burgensis* spec. nov.; Burgos, Merindad de Sotoscueva, Hornillayuso, Cueva la Torcona (interstitial water), 700 m, 23.iv.1984 (RMNH 93733/paratype), shell height 1.4 mm; 97, *S. (B.) affinitatis* spec. nov., Burgos, Villarcayo, 1.2 km SE of Escanduso, spring at E bank of Rio Nela (interstitial water), 700 m, 07.iv.1984 (RMNH 93737/numerous paratype), shell height 1.3 mm. Photographs by J. Goud, Leiden.

brownish.

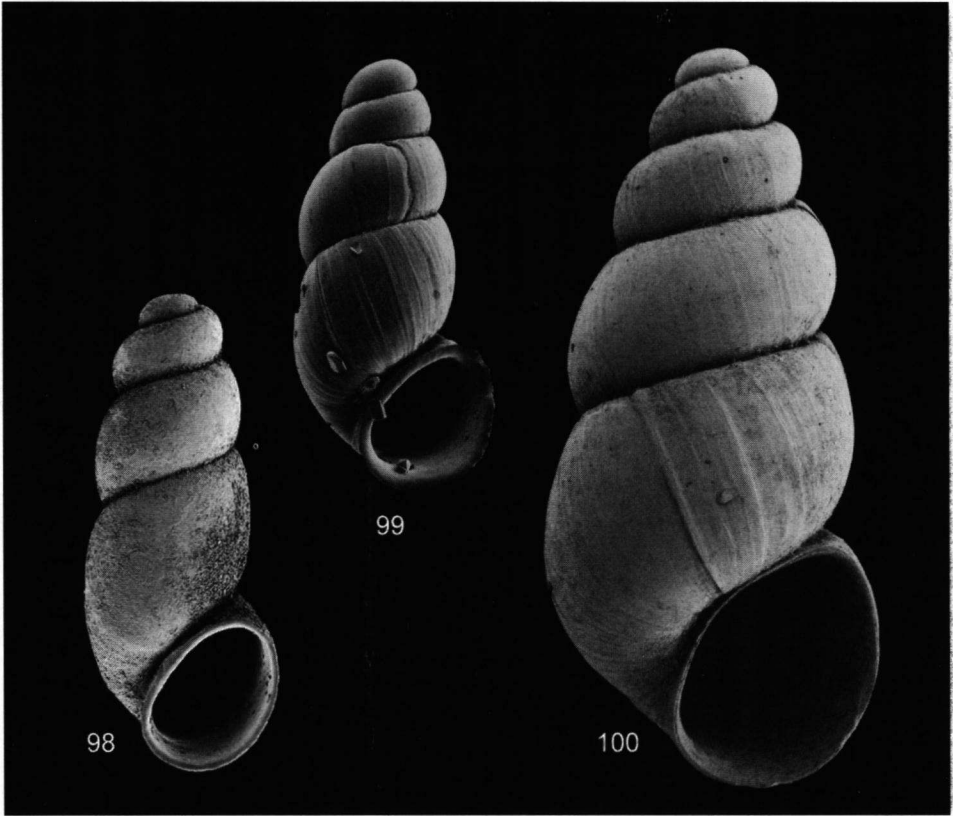
Animal. – The animals are pigmentless and eyeless. A pallial tentacle is missing. The gill is formed by a number of leaflets. The intestine leaves the stomach with a Z-loop, followed by another such loop. The penis of at least one of the species known has a broad lateral appendix. In females the renal oviduct has a bursa and a distal receptaculum (rs1). At least the largest section of the pallial part of the oviduct is formed by an open gutter.

Differentiating features. – Species of *Plesiella* gen. nov. differ from the other Hydrobiidae, except for the Hydrobiinae, by the elongated conical shape of the shell. A characteristic feature of the females is a gutter-like section of the pallial oviduct.

Habitat. – Interstitial waters. Found at temperatures of 10.0-10.2°C.

Distribution. – In northern Spain, in the neighbouring provinces of Guipuzcoa and Navarra.

Notes. – It seems that next to the two *Plesiella* species, only two other European hydrobiid species have been described with a similar pallial oviduct, i.e. *Ginaia munda* (Sturany, 1894) from Lake Ohrid (Radoman, 1983: 145, fig. 96A-B) and (?) *Alzoniella cornuocopia* (De



Figs 98-100. *Guadiella* spec. 98, *G. ramosae* spec. nov., Jaén, 2 km from Siles, S side of the road J 701 Siles-Cotillas (small spring), 900 m, 25.i.1984 (RMNH 93746/paratype), shell height 1.4 mm; 99, *G. arconadae* spec. nov., Burgos, Merinda de Río Ubierna, spring at N side of San Martín de Ubierna (interstitial water), 900 m, 28.iv.1984 (RMNH 93750/paratype), shell height 1.3 mm; 100, *Plesiella guipuzcoa* spec. nov., Guipuzcoa, Amezqueta, at Manantial Zaspí-Iturieta (man-made resurgence), 340 m, 28.xi.1983 (RMNH 93752/paratype), shell height 2.2 mm. Photographs by J. Goud, Leiden.

Stefani, 1880) from the neighbourhood of Siena in Italy (Manganelli et al., 1995: 177, figs 18-20). In this context reference must be made to Johansson (1948: 2-4, figs 2-8), who compared the closed pallial oviduct in an adult female of *Hydrobia* spec. with the homologous structure in a juvenile female and concluded that the closed duct of the adult develops from an open canal, which he considers also phylogenetically meaningful: "Der Uterus, dessen terminales Ende geschlossen ist [in the adult female] ..., öffnet sich hier [in the juvenile snail] mit einer vergleichsweise langen Spalte." He concluded: "Ich bin der Ansicht, dass dies deutlich für die Entstehung des Uterus aus einer offenen Drüsenrinne bei den Hydrobiiden spricht."

Derivatio nominis. – The name is derived from the Greek *plesios* = neighbouring.

Plesiella guipuzcoa spec. nov.

(figs 48, 100 [shell], 60 [intestine], 85 [female sex tract], 104 [distribution])

Material. – Guipuzcoa: Amezqueta, at Manantial Zaspí-Iturieta (man-made resurgence), 340 m [UTM WN746654], 28.xi.1983 (RMNH 93751/holotype, shell; 93752/numerous paratypes, shells; 93753/numerous paratypes, shells in alcohol together with 2 females; BOE 1514/3 paratypes, shells).

Shell. – Shell elongate conical, with 4 $\frac{3}{4}$ -5 whorls with a narrow, rounded edge below the suture ($n = 2$). The columella is hollow (which is sometimes evident by entrapped mud). Aperture ovoid and slightly slanted, its border not thickened, touching the shell wall over a short distance and leaving an umbilical slit open. Height 2.19 [1.90-2.50] mm, diameter 1.04 [1.00-1.10] mm ($n = 10$). Operculum red-brownish.

Animal. – Pallial tentacle and eyes missing. Gill with 15 leaflets ($n = 1$). The intestine forms first a Z-like loop behind the stomach, followed by a second Z-like loop towards the anus. The intestine extends far beyond the mass of the glands covering the pallial oviduct and opens with the anus shortly in front of the mantle edge. Penis not seen. Female sex tract: with a single receptaculum (rs1) and a neighbouring bursa. The pallial oviduct opens with a slit into the mantle cavity ($n = 2$).

Differentiating features. – *Plesiella guipuzcoa* spec. nov. can be distinguished conchologically from *P. navarrensis* spec. nov. by a shell height of 2.19 [1.90-2.50] mm instead of 1.95 [1.85-2.12] mm and by a more shallow suture, bordered below it by a slight edge. In *P. guipuzcoa* spec. nov. the bursa is larger, with a shorter pedunculus.

Habitat. – Interstitial water. Collected at a temperature of 10.0°C.

Distribution. – Known from the province of Guipuzcoa only.

Derivatio nominis. – The name is derived from the Spanish province of Guipuzcoa.

Plesiella navarrensis spec. nov.

(figs 49 [shell], 61 [intestine], 78 [penis], 86 [female sex tract], 104 [distribution])

Material. – Navarra: Larraún, Allí, Cueva de Allí (cave with stagnant water, fed by infiltration or periodic inundations), 630 m [UTM WN903602], 18.vi.1984 (RMNH 93754/holotype, animal; 93755/6 paratypes, 2 and 4 juvenile animals).

Shell. – Shell elongated conical; with 4 $\frac{1}{2}$ -4 $\frac{3}{4}$ convex whorls, separated by a pronounced suture ($n = 3$). Rows of very weak scratches give the impression of a spiral sculpture. The columella is hollow but narrows towards the umbilicus (visible because of mud inside). In two fully grown shells, without a broadened apertural border, the umbilicus is closed by a slight thickening of the umbilical region. The only available specimen with a broadened border of the aperture, the smallest one available, has an open umbilicus. Disregarding the latter specimen, the edge of the aperture is sharp and not thickened, touching the shell wall over a moderately long distance. Aperture ovoid, slightly slanted. Height 1.95 [1.85-2.12] mm, diameter 1.02 [0.92-1.10] mm ($n = 3$). Nucleus of the operculum pale yellow.

Animal. – Unpigmented. Eyes and pallial tentacle missing. Gill with several leaflets. Intestine with 2 Z-like loops. Penis (only one juvenile specimen examined) bifurcate, with a broad lateral appendix. Female sex tract: bursa and a distal receptaculum (rs1) present, a proximal receptaculum (rs2) is missing. The pallial oviduct is gutter-like ($n = 1$).

Differentiating features. – Shells of this species, with a height of 1.95 [1.85-2.12] mm, are larger than those of (?) *Alzoniella murita* spec. nov., with 1.4 mm, *A. onatensis* spec. nov.,

with 1.8 mm, and (?) *Guadiella arconadae* spec. nov., with 1.24 [1.10 to 1.40] mm, and smaller than those of *Pl. guipuzcoa* spec. nov., with 2.19 [1.90-2.50] mm. For differences in the female sex tract, see *Pl. guipuzcoa* spec. nov.

Habitat. – Interstitial water. Collected at 10.2°C.

Distribution. – Known only from the province of Navarra.

Derivatio nominis. – The name of this species refers to the Spanish province of Navarra.

NOTES ON MOITESSIERIIDAE

Gill leaflets. – For genera of the Moitessieriidae, other than *Moitessieria*, gills with gill leaflets have been described. However, in *Moitessieria* gill leaflets had not yet been observed, neither in French nor in Italian populations (as far as anatomically examined). Surprisingly, in all dissected Spanish *Moitessieria* species, viz. *M. servaini*, *M. notenboomi* spec. nov. and *M. seminiana* spec. nov., gill leaflets turned out to be present.

Differentiation. – In Western Europe besides *Moitessieria*, three other genera of the Moitessieriidae are present. They can be differentiated by characters listed in table 2.

Coexistence and speciation. – A sympatric occurrence of different *Moitessieria* species has not yet been reported. Interestingly, the material collected by Notenboom and Meijers comprises samples from three localities where two species appear sympatrically,

Table 2. The genera of Moitessieriidae

	Pallial tentacle	Number of gill leaflets	Z-like loops of intestine	Male copulatory organ	Receptaculum in addition to bursa
<i>Moitessieria</i>	missing	0-11 ¹	1	simple or with medial protrusion	missing ²
<i>Paladilhia</i>	present	10-11	1	simple	present
<i>Palaospeum</i>	present	16-20	1	simple	present
<i>Spiralix</i>	missing	6-12	2	with distal protrusion	present ³

¹) Gill leaflets present in *M. servaini*, *M. notenboomi* spec. nov. and *M. seminiana* spec. nov.

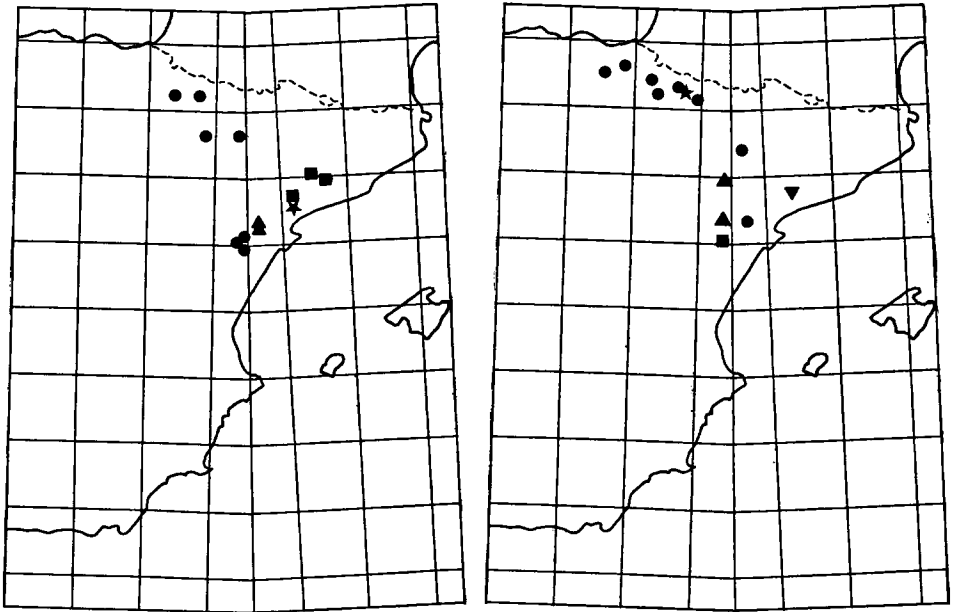
²) After Bodon & Giusti (1991: 25); see also Boeters (1973: 64-65, fig. 4).

³) After Bernasconi (1984: 694) and Boeters (1998: 46, fig. 6); see also Bodon & Giusti (1991: 25). Also in *S. (S.) valenciana* spec. nov.

viz. *M. servaini* with *M. meijersae* spec. nov., *M. servaini* with *M. seminiana* spec. nov., and *M. servaini* with *M. notenboomi* spec. nov.

It might be assumed that interstitial waters do not favour allopatric differentiation as much as carstic waters do. Species like for example *Guadiella andalucensis* (Boeters, 1983) and *Bythiospeum rhenanum* Lais, 1910, sensu auct., inhabit interstitial waters over large distances. *G. andalucensis* is known from the Guadalquivir over a distance of c. 270 km, and *B. rhenanum* has been recorded from interstitial waters of the Rhine over a distance of more than 200 km.

Distribution. – *Moitessieria* has been reported now from Italy, Sardinia included, France and Spain. Its occurrence in Corsica needs to be confirmed, since *M. corsica* Bernasconi,



101

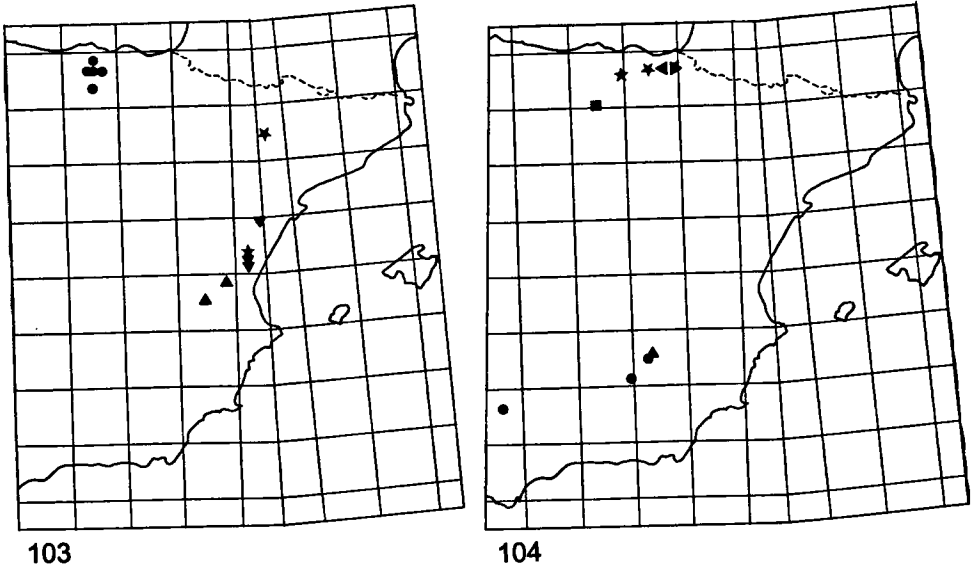
102

Figs 101-102. Records of *Moitessieria* spec. 101, *M. servaini* Bourguignat, 1880 (dots), *M. servaini* Bourguignat, 1880 (form of Tarragona) (squares), *M. foui* spec. nov. (star), *M. robresia* spec. nov. (triangles). 102, *M. notenboomii* spec. nov. (dots), *M. meijersae* spec. nov. (square), *M. seminiana* spec. nov. (star), *M. guadelopensis* spec. nov. (triangles, pointing upwards), *M. lludrigaensis* spec. nov. (triangle, pointing down).

1994, does not seem to belong to this genus as will be discussed elsewhere. Boeters (1988) gave a first review of the distribution in Spain. Based on the investigations by Notenboom and Meijers, this range can now be broadened and defined as follows: Vascongadas (Alava), Navarra, Aragon (Huesca, Zaragoza, Teruel), Cataluna (Barcelona, Gerona, Lerida, Tarragona) and Valencia (Castellon). The occurrence in the province of Jaén is poorly documented by a single juvenile shell.

Moitessieriidae versus Hydrobiidae. – Bodon & Giusti (1991) dealt with the systematic status and position of the Moitessieriidae Bourguignat, 1863, and the genera attributed to this taxon by Boeters (1972, 1973) and Boeters & Meier-Brook (1992). They did not accept the Moitessieriidae as a family next to the Hydrobiidae Troschel, 1857, and attributed *Moitessieria* and *Paladilhia* to the Hydrobiinae (1991: 26, right column). However, some apomorphic character states which representatives of the Hydrobiinae have in common, e.g. *Hydrobia*, *Mercuria* and *Pseudamnicola* species, are not shared by *Moitessieria*, *Paladilhia*, *Spiralix*, *Palaospeum* and *Clameia* species (Boeters & Meier-Brook, 1992), which should not be neglected.

Meanwhile also Wilke et al. (2001) have accepted the Moitessieriidae as a family, based on molecular and anatomical data. They included both *Moitessieria* and *Bythiospeum* as genera. However, on the basis of anatomical characters, *Bythiospeum* can hardly be included in the Moitessieriidae, as shown by Boeters (1973), Boeters & Gittenberger (1990)



Figs 103-104. 103, Records of *Spiralex (S.) valenciana valenciana* subsp. nov. (triangles, pointing upwards), *S. (S.) valenciana castellanica* subsp. nov. (triangles, pointing down), *S. (Burgosia) burgensis* spec. nov. (dots), *S. (B.) affinitatis* spec. nov. (squares), *Palaospeum hispanicum hispanicum* subsp. nov. (star, pointing down), and, sympatric, *S. (S.) pequenoensis* spec. nov. and *P. hispanicum ondaense* subsp. nov. (star, pointing upwards). 104, Records of (?) *Alzoniella murita* spec. nov. (star, pointing upwards), *A. onatensis* spec. nov. (star, pointing down), *Guadiella andalucensis* (Boeters, 1983) (dot), *G. ramosae* spec. nov. (triangle, pointing upwards), (?) *G. arconada* spec. nov. (square), *Plesiella guipuzcoa* spec. nov. (triangle, pointing left), *P. navarrensis* spec. nov. (triangle, pointing right).

and Boeters & Meier-Brook (1992). Therefore, an updated definition of the Moitesseriidae is presented here, based on anatomical characters.

1. In both males and females, the intestine upon leaving the stomach runs clearly beyond the crystal style sac before turning back to run parallel with the prostata and the albumen gland, respectively, towards the pallial cavity. This has not yet been sufficiently emphasized. For a better understanding, see figs 50-51, illustrating the striking difference in the bauplan of the cavum abdominis between the Moitesseriidae and the Hydrobiidae. In *Hydrobia* the intestine upon leaving the stomach encircles the crystal style sac closely when turning back to the distal wall of the stomach and then changes again its direction by turning towards the pallial cavity up to the mantle skirt. As can be concluded from Davis et al. (1988: 229, fig. 14; 233, fig. 17A), the bend of the intestine around the crystal style sac touches or reaches the posterior wall of the pallial cavity. In *Moitesseria* the intestine upon leaving the stomach and turning back to its distal wall does not reach the posterior wall of the pallial cavity, despite the fact that the turn in front of that wall does not surround the crystal style sac closely but at a distinct distance. The intestine upon leaving the stomach runs directly beyond the distal end of the sac. In the Moitesseriidae the cavum abdominis is clearly relatively larger than in the Hydrobiidae (Bodon & Giusti, 1991: 7, figs 4E, 4L). In the Moitesseriidae the mutual relationship of

this cavity and its organs, the kidney, the nephridial gland and the heart, remains to be examined. Nevertheless, since the renal oviduct need not turn towards the pericard to interconnect both, i.e. the oviduct and the pericard, by a minute short duct, i.e. the gonopericardial duct, this space can be used for the intestine. In the Moitessieriidae the intestine has space enough to turn back towards the stomach after having passed the style sac at a distance. In the Hydrobiidae the intestine surrounds the style sac closely within the gap formed by the sac and the posterior wall of the pallial cavity.

Thus, the intestine turns back at a certain distance of the style sac: in *Moitessieria* (Giusti & Bodon, 1991: 22, fig. 16D [*M. massoti*]), *Paladilhia* (Giusti & Bodon, 1991: 18, fig. 12M [*P. pleurotoma*]), *Spiralix* (Giusti & Bodon, 1991: 15, fig. 9I [*S. rayi*]), *Palaospium* (Boeters, 1999: 196), and *Clameia* (Boeters & Gittenberger, 1990: 127, fig. 8 [*C. brooki*]).

The intestine surrounds the style sac closely: in the Hydrobiinae *Hydrobia* (Radoman, 1977: 206, fig. 1A = 1983: 25, fig. 6A [*Hydrobia spec.*]), *Mercuria* (Giusti & Pezzoli, 1980: 5, fig. 2 [*M. zopissa*]), and *Pseudamnicola* (Radoman, 1972: 198, fig. 4D [*P. conovula*]); in the Horatiinae Taylor, 1966, *Avenionia* (Bodon et al., 2000: 192, fig. 14 [*A. berenguieri*]), *Hauffenia* (Haase, 1992: 121, fig. 7 [*H. wienerwaldensis*]), *Lobaunia* (Haase, 1993: 101, fig. 12 [*L. danubialis*]), *Tarraconia* (Ramos et al., 2000: 83, fig. 5E [*T. gasulli*]), *Boetersiella* (Arconada & Ramos, 2001: 955, 957, fig. 4E, 969 [*B. sturmi*]), *Chondrobasis* (Arconada & Ramos, 2001: 955, 957, fig. 4E, 969 [*C. levantina*]), *Bythiospium* (Seibold, 1904: pl. 6 fig. 3 [*B. quenstedtii*]), *Belgrandia* (Radoman, 1973: 234, fig. 7 [*B. vjetrenicae*]), *Belgrandiella* (Radoman, 1975: 49, fig. 10 [*B. umbilicata*]), *Graziana* (Haase, 1994: 231, fig. 7B [*B. lacheineri*]), and *Alzoniella* Giusti & Bodon, 1984: 161, fig. 2H [*A. finalina*]); in the Amnicolinae Tryon, 1863, as published for *Bythinella* (Radoman, 1976: 137, fig. 3A [*B. schmidtii*]).

2. In females a gonopericardial duct is missing. The fact that such a duct is missing has been described for various genera. According to Fretter & Graham (1962: 359): "The occurrence of a gonopericardial duct cannot be regarded as giving any indication of phylogenetic relationship since it is found in the *Stenoglossa* ... which are specialized in other respects, and it is lost in many of the more primitive mesogastropods: in *Bithynia tentaculata* its presence has been mentioned by some workers (Krull, 1935) and denied by others (Lilly, 1953), suggesting that it is not always developed." An example of the Mesogastropoda (*Taenioglossa*) where this duct is present are the Hydrobiidae, an example of Mesogastropoda where it is not found is *Hyala* Adams & Adams, 1852, classified with the Rissoidae (Johansson, 1950: 3). The view expressed by Fretter & Graham (1962: 359), that the presence or absence of a gonopericardial duct cannot be used in phylogenetic analyses, can only partially be accepted because in *Moitessieria*, *Paladilhia*, *Spiralix*, *Palaospium* and *Clameia*, the cavum abdominis is organised in a consistent manner, differing from that in the Hydrobiidae.

Bodon & Giusti (1991: 26) reported for *Moitessieria* and *Paladilhia*: "Although we searched for the gonopericardial duct in all the females dissected, we were unable to verify its presence. This does not necessarily mean that it does not exist. The specimens are, in fact, too small for a reduced duct to be detectable." An indication for the presence of the duct may be, however, the fusion of the renal oviduct and the wall of the pericardial cavity, i.e. the fact that the oviduct in that region cannot be separated from the wall. In the Moitessieriidae the renal oviduct crosses the cavum abdominis without touching any organ other than the albumen gland. This has been confirmed for all genera in this family, i.e. *Moitessieria*, *Paladilhia*, *Spiralix*, *Palaospium* and *Clameia*. Even if the absence of the gonopericardial duct is not taken into consideration, it cannot be denied that the cavum abdominis, with the free running oviduct, differs from that of the Hydrobiidae. The absence of the gonopericardial duct and the fact that, consequently, the renal oviduct

does not need to pass the pericardium closely, allows a different spatial arrangement of the crystal style sac, the first turn of the intestine upon leaving the stomach, and the renal oviduct.

3. In the Moitessieriidae the renal and pallial oviduct runs close to the spindle and the pallial oviduct does not swing ventrally towards the bottom of the cavum abdominis where the pericard is positioned. For the Hydrobiidae, the spatial relationship of the renal oviduct and its turn towards the pericard has been shown by Krull (1935: 429, fig. 13). A straight course of the renal oviduct along the spindle, characteristic of the Moitessieriidae, is illustrated here for *Palaospeum bessoni* (fig. 84).

4. In females of the Moitessieriidae, the capsule gland does not reach the mantle skirt, and accordingly the gonoporus does not open in proximity of the mantle skirt or the anus, but close to the posterior wall of the pallial cavity. For the Hydrobiidae, similar relationships have been reported for only three species of *Alzoniella* s. str. (Giusti & Bodon, 1984: 161, fig. 2G, and 167, fig. 4L; Manganelli et al., 1995: 177, fig. 18) and for *A. (Navarriella) elliptica* (Boeters 1974: 87, fig. 5).

ACKNOWLEDGEMENTS

I wish to thank Jos Notenboom (Amsterdam), Ine Meijers (Amsterdam), Ton de Winter (Leiden) and Edmund Gittenberger (Leiden) for giving me the chance to study the extraordinary material which has been described in this publication, Claus Meier-Brook for assisting me in drafting the discussion, Ph. Bouchet (Paris) for providing me with a sample of (?) *Graziana provincialis*, and Evelyn A. Moorkens (Dublin), who checked the manuscript.

REFERENCES

- ARCONADA, B., & M.A. RAMOS, 2001. New data on Hydrobiidae systematics: two new genera from the Iberian Peninsula. — *Journal of Natural History* 35: 949-984.
- BERNASCONI, R., 1984a. Hydrobides de France: *Moitessieria*, *Bythiospeum* et *Hauffenia* des départements Gard, Ain, Isère (Gastropodes Prosobranches). — *Revue Suisse de Zoologie* 91: 203-215.
- BERNASCONI, R., 1984b. Découverte du genre *Moitessieria* Bgt (Mollusca Gastropoda Hydrobiidae) dans le Dijonnais (Côte-d'Or). — *Revue Suisse de Zoologie* 91: 687-697.
- BERNASCONI, R., 1994. Le genre *Moitessieria* Bgt, 1863 en France: Revision, inventaire et description de *M. corsica* n. sp. (Mollusca Gastropoda Prosobranchia Hydrobiidae). — *Mémoires de Biospéologie* 21: 7-20.
- BERNASCONI, R., 1999. *Paladilhia bessoni* n. sp. (Gastropoda Prosobranchia Hydrobiidae) des eaux souterraines karstiques de la Haute Soule (Pyrénées Atlantiques, France). — *Revue Suisse de Zoologie* 106: 385-392.
- BODON, M., 1988. Note anatomica su "*Belgrandiella*" *hartwigschueti* Reischütz e revisione della sua posizione sistematica (Gastropoda: Prosobranchia: Hydrobiidae). — *Archiv für Molluskenkunde* 119: 55-63.
- BODON, M., & F. GIUSTI, 1991. The genus *Moitessieria* in the island of Sardinia and in Italy. New data on the systematics of *Moitessieria* and *Paladilhia* (Prosobranchia: Hydrobiidae) (Studies on the Sardinian and Corsican malacofauna, 9). — *Malacologia* 33: 1-30.
- BODON, M., S. CIANFANELLI, G. MANGANELLI, H. GIRADI & F. GIUSTI, 2000. The genus *Avenionia* Nicolas, 1882, redefined (Gastropoda, Caenogastropoda, Hydrobiidae). — *Basteria* 64: 187-198.

- BOETERS, H.D., 1971. *Iglica pezzolii* n. sp. und ein neues Merkmal zur Unterscheidung zwischen *Bythiospeum* und *Paladilthia* (Prosobranchia, Hydrobiidae). — Archiv für Molluskenkunde 101: 169-173.
- BOETERS, H.D., 1972. Westeuropäische Moitessieriidae, 1. *Spiralix* n. subgen. (Prosobranchia). — Archiv für Molluskenkunde 102: 99-106.
- BOETERS, H.D., 1973: Französische Rissoaceen-Aufsammlungen von C. Bou. — Annales de Spéléologie 28: 63-67.
- BOETERS, H.D., 1974. *Horatia* Bourguignat, *Plagigeyeria* Tomlin und *Litthabitella* Boeters (Prosobranchia). Westeuropäische Hydrobiidae, 5. — Archiv für Molluskenkunde 104: 85-92.
- BOETERS, H.D., 1983. Unbekannte westeuropäische Prosobranchia, 5. — Archiv für Molluskenkunde 114: 17-24.
- BOETERS, H.D., 1988. Moitessieriidae und Hydrobiidae in Spanien und Portugal (Gastropoda: Prosobranchia). Westeuropäische Moitessieriidae, 2 und Westeuropäische Hydrobiidae, 7. — Archiv für Molluskenkunde 118 [1987]: 181-261.
- BOETERS, H.D., 1998. Mollusca: Gastropoda: Superfamilie Rissooidea. In: A. BRAUER, J. SCHWOERBEL & P. ZWICK, eds, Süßwasserfauna von Mitteleuropa 5 (1/2): i-ix, 1-76. Stuttgart.
- BOETERS, H.D., 1999. *Palaospeum* n. gen. (Gastropoda Prosobranchia: Moitessieriidae). Unknown West European Prosobranchia, 10. — Basteria 63: 193-197.
- BOETERS, H.D., 2000. The genus *Alzoniella* Giusti & Bodon, 1984, in France. West European Hydrobiidae, 9 (Gastropoda Prosobranchia). — Basteria 64: 151-163.
- BOETERS, H.D., 2001a: A remarkably rich prosobranch fauna endemic to the French Pyrenees. — Basteria 65: 1-15.
- BOETERS, H.D., 2001b: A contribution to the knowledge of *Alzoniella* Giusti & Bodon 1984 in France. Unknown West European Prosobranchia, 13. — Archiv für Molluskenkunde 129: 149-156.
- BOETERS, H.D., & G. FALKNER, 2001. The identity of *Paludina simoniana* Saint-Simon 1848 (Gastropoda: Moitessieriidae). Beiträge zur Nomenklatur der europäischen Binnenmollusken, 13. — Heldia 3: 81-84, pl. 11.
- BOETERS, H.D., & E. GITTENBERGER, 1990. Once more on the Moitessieriidae (Gastropoda Prosobranchia), with the description of *Clameia brooki* gen. et spec. nov. — Basteria 54: 123-129.
- BOETERS, H.D., & C. MEIER-BROOK, 1992. Some phylogenetic relations within the Hydrobiidae. — Proceedings of the Tenth International Malacological Congress (Tübingen 1989): 535-540.
- BOURGUIGNAT, J.R., 1863. Monographie du nouveau genre francais *Moitessieria*. — Revue et Magazine de Zoologie pure et appliquée (2) 15: 432-445, pls. 20-21 [19 pp + pls. 1-2].
- BOURGUIGNAT, J.R., 1880. Description de diverses espèces de *Coelestele* et de *Paladilthia* découvertes en Espagne par le Dr. G. Servain: 1- 22. Angers.
- COUTAGNE, G., 1881. Notes sur la faune malacologique du bassin du Rhône, Fascicule 1: 55 pp. Lyon [1882. Annales de la Société linnéenne de Lyon ns 28 [1881]: 1-55].
- DAVIS, G. M., V. FORBES & G. LOPEZ, 1988. Species status of Northeastern American (Gastropoda: Prosobranchia): Ecology, morphology and molecular genetics.— Proceedings of the Academy of Natural Sciences of Philadelphia 140: 191-246.
- FRETTER, V., & A. GRAHAM, 1962. British prosobranch molluscs. — Ray Society 144: i-xvi, 1-755. London.
- GIUSTI, F., & M. BODON, 1984. Notulae malacologicae, 31. Nuove Hydrobiidae dell'Italia nord-occidentale (Gastropoda: Prosobranchia). — Archiv für Molluskenkunde 114 [1983]: 157-181.
- GIUSTI, F., & E. PEZZOLI, 1980. Gasteropodi, 2 (Gastropoda: Prosobranchia: Hydrobioidea, Pyrgoloidea). In: Guide per il riconoscimento delle specie animali delle acque interne italiane, 8: 1-76. Verona.
- HAASE, M., 1992. A new, stygobiont, valvuliform, hydrobiid gastropod from Austria (Caenogastropoda: Hydrobiidae). — Journal of Molluscan Studies 58: 207-214.
- HAASE, M., 1993. *Hauffenia kerschneri* (Zimmermann 1930): zwei Arten zweier Gattungen (Caenogastropoda: Hydrobiidae). — Archiv für Molluskenkunde 121 [1990]: 91-109.
- HAASE, M., 1994. Differentiation of selected species of *Belgrandiella* and the redefined genus *Graziana*

- (Gastropoda: Hydrobiidae). — Zoological Journal of the Linnean Society 111: 129-246.
- JOHANSSON, J., 1948. Über die Geschlechtsorgane der Hydrobiiden und Rissoiden und den ursprünglichen Hermaphroditismus der Prosobranchier. — Arkiv för Zoologi 40A: 1-13.
- JOHANSSON, J., 1950. Über die weiblichen Geschlechtsorgane von *Hyalia vitrea*, einer von dem Rissoa-Typus stark abweichenden Form der Gruppe Rissoacea. — Arkiv för Zoologi 42A: 1-6.
- KOBELT, W., 1878. Illustriertes Conchylienbuch 1 (3): 65-88, pls. 21-30; (4): 89-104, pls. 31-40; (5): i-xvi, 105-144, pls. 41-50. Nürnberg.
- KRULL, H., 1935. Anatomische Untersuchungen an einheimischen Prosobranchiern und Beiträge zur Phylogenie der Gastropoden. — Zoologische Jahrbücher, Anatomie und Ontogenie 60: 399-464.
- MANGANELLI, G., M. BODON & F. GIUSTI, 1995. The taxonomic status of *Lartetia cornucopia* de Stefani, 1880 (Gastropoda, Prosobranchia, Hydrobiidae). — Journal of Molluscan Studies 61: 173-184.
- NOTENBOOM, J., 1986. The species of the genus *Pseudoniphargus* Chevreux, 1901 (Amphipoda) from northern Spain. — Bijdragen tot de Dierkunde 56: 75-122.
- NOTENBOOM, J., 1987a. Species of the genus *Pseudoniphargus* Chevreux, 1901 (Amphipoda) from the Betic Cordillera of southern Spain. — Bijdragen tot de Dierkunde 57: 87-150.
- NOTENBOOM, J., 1987b. Lusitanian species of the amphipod *Pseudoniphargus* Chevreux, 1901 with a key to all known Iberian species. — Bijdragen tot de Dierkunde 57: 191-206.
- NOTENBOOM, J., 1988. Phylogenetic relationships and biogeography of the groundwater dwelling amphipod genus *Pseudoniphargus* (Crustacea), with emphasis on the Iberian species. — Bijdragen tot de Dierkunde 58: 159-204.
- NOTENBOOM, J., & I. MEIJERS, 1985. Research on the groundwater fauna of Spain: List of stations and first results. — Verslagen en Technische Gegevens, Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Universiteit van Amsterdam 42: 93 pp.
- RADOMAN, P., 1972. Nochmals über die Gattung *Pseudamnicola* und schliesslich die Gattung *Orientalia* n. gen. — Archiv für Molluskenkunde 102: 195-200.
- RADOMAN, P., 1973. Contribution à la connaissance des Gastéropodes des eaux douces de Bosnie et d'Herzégovine. — Bulletin du Muséum d'Histoire naturelle de Marseille 33: 227-237.
- RADOMAN, P., 1975. Speciation in the genus *Belgrandiella* and in its related genera in the Balkans. — Bulletin du Muséum d'Histoire naturelle Belgrade (B) 30: 29-69.
- RADOMAN, P., 1976. Speciation within the family Bythinellidae on the Balkans and in Asia Minor. — Zeitschrift für zoologische Systematik und Evolutionsforschung 14: 130-152.
- RADOMAN, P., 1977. Hydrobiidae auf der Balkanhalbinsel und in Kleinasien. — Archiv für Molluskenkunde 107 [1976]: 203-223.
- RADOMAN, P., 1983. Hydrobioidea a superfamily of the Prosobranchia (Gastropoda), 1. Systematics. — Monographs of the Serbian Academy of Sciences and Arts 547: 256 pp.
- RAMOS, M.A., B. ARCONADA, E. ROLAN & D. MORENO, 2000. A new genus and a new species of hydrobiid snail (Mollusca: Gastropoda: Hydrobiidae) from Eastern Spain. — Malacologia 42: 75-101.
- SEIBOLD, W., 1904. Anatomie von *Vitrella quenstedtii* (Wiedersheim) Clessin. — Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg 60: 198-226.
- WILKE, T., G.M. DAVIS, A. FALNIOWSKI, F. GIUSTI, M. BODON & M. SZAROWSKA, 2001. Molecular systematics of Hydrobiidae (Mollusca: Gastropoda: Rissooidea): testing monophyly and phylogenetic relationships. — Proceedings of the Academy of Natural Sciences of Philadelphia 151: 1-21.