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Oxychilus (Ortizius) lineolatus n. sp. (Gastropoda Pulmonata: Zonitidae) from Santa Maria Island, Azores

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A new *Oxychilus* species with unique penial structures is described from the island of Santa Maria, Azores; it is classified with the subgenus *Ortizius*.

Key words: Gastropoda, Pulmonata, Zonitidae, *Oxychilus*, taxonomy, Azores.

The variability of the Zonitidae of the Azores Archipelago was already known to the earliest workers on the terrestrial malacofauna of this island group. Morelet (1860), after careful examination of the shell characters of large samples from various localities, noticed the intergradation of shell forms from island to island and frequently preferred to consider these varieties rather than giving them specific rank. Recent studies based on the anatomy (Riedel, 1964; Martins, 1981, 1989; De Winter, 1989) have revealed a corresponding variability of the internal morphology and have allowed a clearer definition of the species.

Oxychilus (*Ortizius*) *lineolatus* n. sp. from the Azorean island of Santa Maria is here described on the basis of shell and anatomical characters. Shells of this new species are included in the type material of *Helix brumalis* Morelet & Drouët, 1857 [= *Oxychilus* (*Radiolus*) *volutella* (Pfeiffer, 1856)]; it was also recorded by Morelet (1860) as a variety of *Oxychilus* (*Ortizius*) *miguelinus* (Pfeiffer, 1856). The new species differs conchologically from the latter by having a less expanded last whorl, an oblique aperture and marked reddish-brown transverse bands, whereas the smaller shell of the former has finer bands, a more retracted last whorl and a rounder, less expanded and less oblique aperture. The penial structures of the new species are unique in having the epiphallus entering near the penial constriction, and a complex set of longitudinal and oblique folds on the inner wall of the distal, dilated portion of the penis, whereas in *O. miguelinus* the epiphallus enters subapically and the folds are homogeneously longitudinal. In *O. volutella* the inner walls have faint, oblique folds, radiating from the epiphallic pore, although the distal portion is pouch-like.

In order to standardize the terminology and contrary to previous works (Martins, 1981, 1989) in which the current consensus in determining the distal and proximal anatomical elements was followed (e.g. Tompa, 1984), we will adopt here the terminology of Forcart (1957) and Riedel (1964, 1980), accepting their authority on the family Zonitidae. For additional data on the Azorean Zonitidae we refer to the latter author.

For collections the following abbreviations are used: BMNH, the Natural History Museum (London); MNHN, Muséum National d'Histoire Naturelle (Paris); NNM, Nationaal Natuurhistorisch Museum (Leiden); Mar, A.M. Frias Martins (Ponta Delgada); Rip, Th.E.J. Ripken (Delft).

Oxychilus (Ortizius) lineolatus n. sp.

Helix brumalis Morelet & Drouët, 1857: 149 [*partim*].
Helix miguelina var. γ Morelet, 1860: 164. Not *Helix miguelina* Pfeiffer, 1856.

Material. — Holotype: Azores, Santa Maria Island, 2 km SSW. of Santo Espírito, moist slope in undisturbed *Laurus* forest at end of the road through Cardal, 200 m alt., UTM: PF7389, 8-V-1988, Th.E.J. Ripken leg. (NNM 56473). Paratypes also from type locality (BMNH/4; MNHN/4; NNM 56474/10; NNM alc. 9295/4; Mar/3; Rip/9).

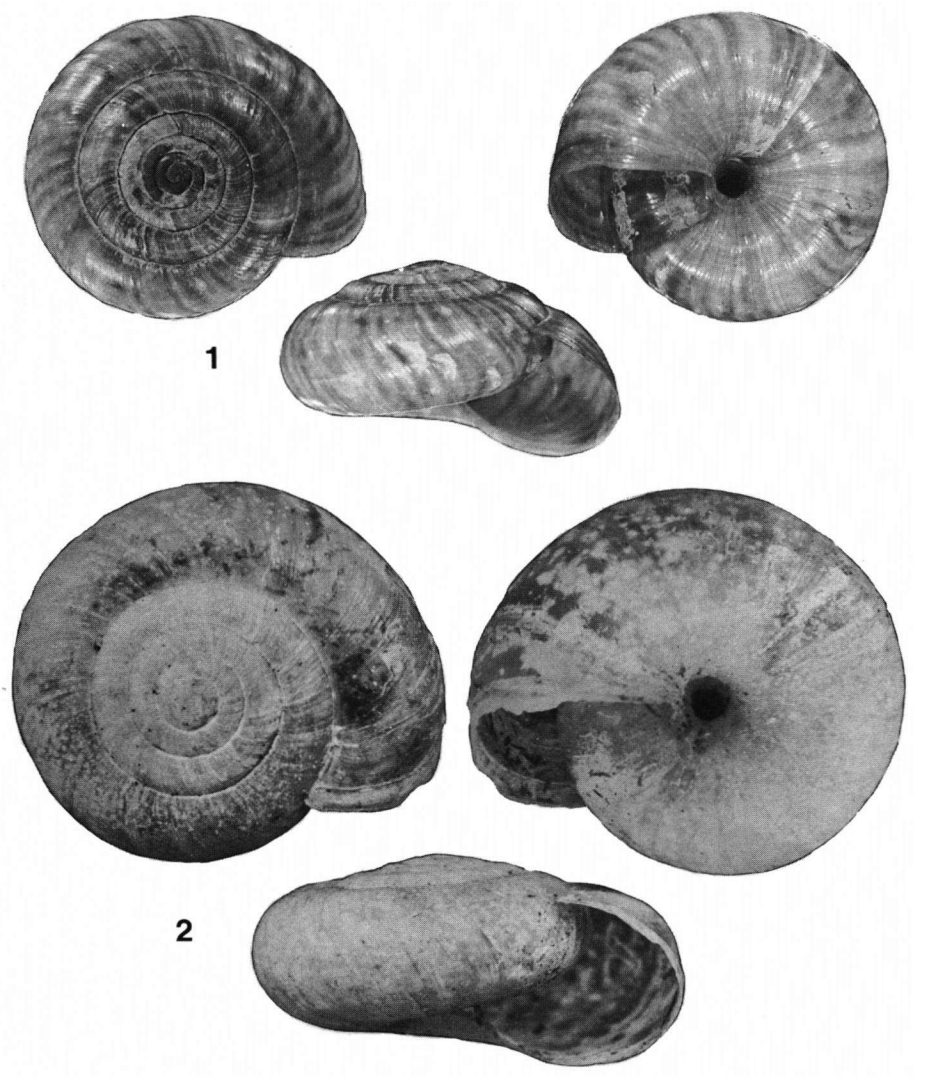
Description. — Shell (fig. 1) relatively solid, with fine spiral striae crossed by deeper, compact growth lines, slightly translucent to opaque, with numerous well marked transverse, narrow reddish-brown bands on a pale yellow background; spire with up to 6.2 convex whorls, somewhat depressed; suture marked; last whorl with oval profile, the largest diameter nearer base. Aperture somewhat retracted, oblique; peristome sharp. Umbilicus deep, about 10% of shell diameter. Dimensions: see table 1.

specimen	diameter	height	whorls
holotype	10.6	6.4	6.2
paratype 1	10.2	5.5	5.9
paratype 2 (dissected)	9.3	4.8	5.6
paratype 3	9.6	5.0	5.8
paratype 4	9.0	5.3	5.7
paratype 5	9.0	5.2	5.6
paratype 6	8.5	4.4	5.6
paratype 7	8.1	4.2	4.8
paratype 8	7.7	4.1	5.1
paratype 9	7.5	3.8	4.8

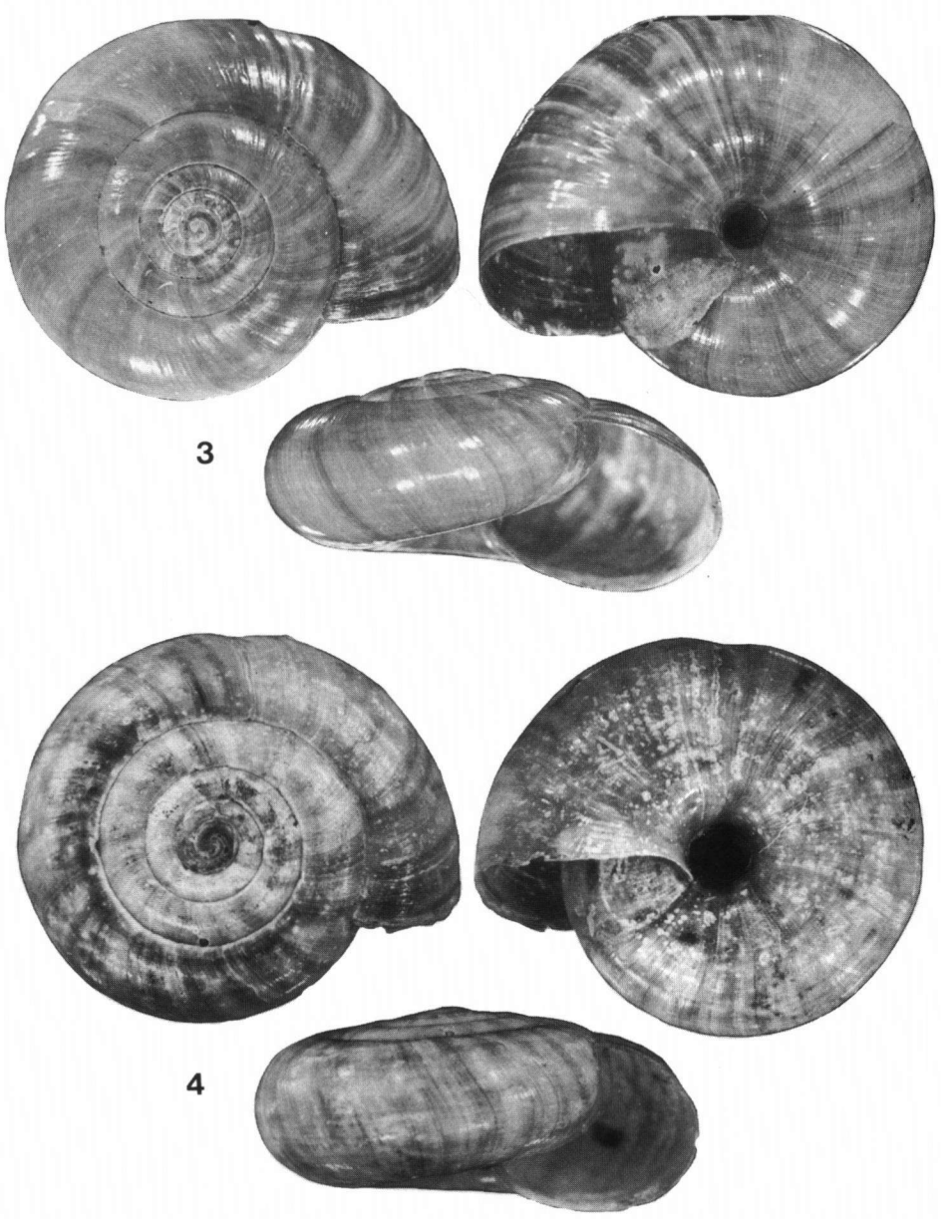
Table 1. Shell measurements in mm of the holotype and several paratypes of *Oxychilus* (*Ortizius*) *lineolatus* n. sp.

Animal light blue, becoming lighter towards whitish foot, with dark greyish blue longitudinal bands on neck, descending from darker blue upper tentacles; mantle border whitish, sprinkled with rust-coloured dots, denser around the pneumostome, extending over adjacent foot and neck.

Reproductive system (fig. 5). — Ovotestis acinose, consisting of ten or more acini embedded in the last whorls of the hepatopancreas; hermaphroditic duct fine, loosely convoluted; albumen gland subquadrangular, oblong; spermoviduct narrow and relatively smooth in its distal end, proximally pouched and expanded; prostate gland



Figs. 1, 2. *Oxychilus* (*Ortizius*) *lineolatus* n. sp. 1, holotype (NNM 56473), Azores, Santa Maria Island, 2 km SSW. of Santo Espírito, Cardal, Th.E.J. Ripken leg., 8-V-1988 (actual diameter 10.6 mm); 2, paratype, one of three specimens in the type series of *Helix brumalis* Morelet & Drouët (BMNH 93.2.4.1023-5), Azores, Santa Maria Island (actual diameter 9.0 mm).



Figs. 3, 4. Azorean *Oxychilus* species. 3, *O.* (*Ortizius*) *miguelinus* (Pfeiffer), Azores, São Miguel Island, Abelheira, Fajã de Baixo, A.M. Frias Martins leg., 27-II-1988 (actual diameter 15.8 mm) (Mar); 4, *O.* (*Radiolus*) *volutella* (Pfeiffer), syntype of *Helix volutella* Pfeiffer (BMNH 197757), Azores, São Miguel Island (actual diameter 7.0 mm).

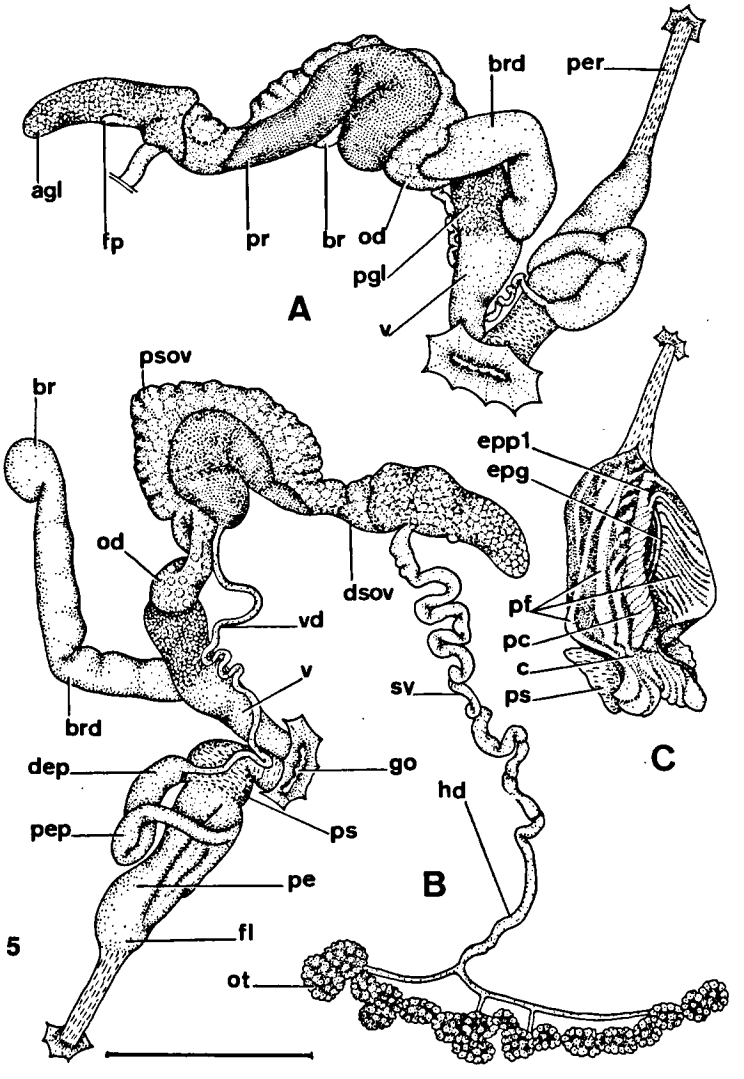


Fig. 5. Reproductive system of *Oxychilus* (*Ortizius*) *lineolatus* n. sp. A, Organs in their natural position; B, Organs dissociated; C, Internal structure of the penis. agl, albumen gland; br, bursa; brd, bursa duct; c, penial constriction; dep, distal epiphallus; dsod, distal spermoviduct; epg, epiphallic groove; eppl, secondary epiphallic pore; fl, flagellum; fp, fertilization pouch; go, genital opening; hd, hermaphroditic duct; od, oviduct; ot, ovotestis; pc, penial column; pe, penis; pep, proximal epiphallus; per, penial retractor; pf, penial folds; pr, prostate gland; ps, penial sheath; psod, proximal spermoviduct; pvg, perivaginal gland; sv, seminal vesicle; v, vagina; vd, vas deferens. Scale: 5 mm.

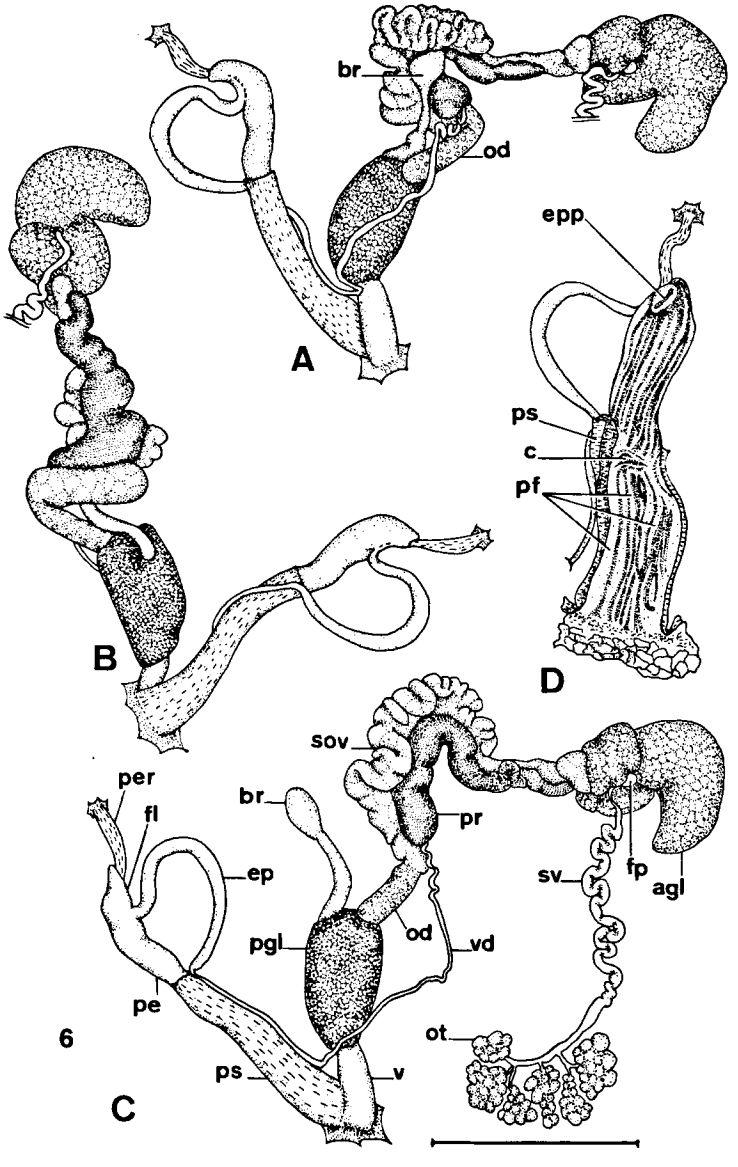


Fig. 6. Reproductive system of *Oxychilus* (*Ortizius*) *miguelinus*. A-B, Organs in their natural position; C, Organs dissociated; D, Internal structure of the penis. agl, albumen gland; br, bursa; c, penial constriction; ep, epiphallus; epp, epiphallic pore; fl, flagellum; fp, fertilization pouch; hd, hermaphroditic duct; od, oviduct; ot, ovotestis; pc, penial column; pe, penis; per, penial retractor; pf, penial folds; pr, prostate gland; ps, penial sheath; pvg, perivaginal gland; sov, spermoviduct; sv, seminal vesicle; v, vagina; vd, vas deferens. Scale: 5 mm.

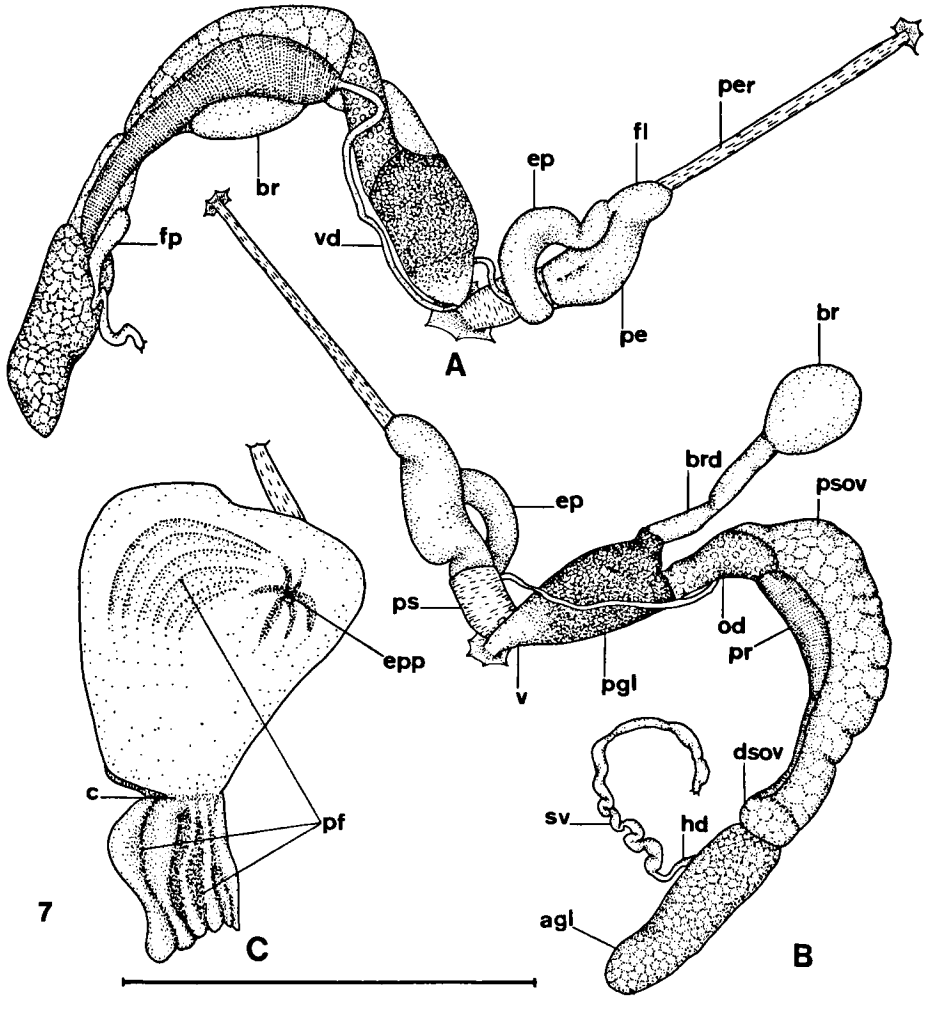


Fig. 7. Reproductive system of *Oxychilus* (*Radiolus*) *volutella*. A, Organs in their natural position; B, Organs dissociated; C, Internal structure of the penis. agl, albumen gland; br, bursa; brd, bursa duct; c, penial constriction; dsov, distal spermoviduct; ep, epiphallus; epp, epiphallic pore; fl, flagellum; fp, fertilization pouch; hd, hermaphroditic duct; od, oviduct; ot, ovotestis; pe, penis; per, penial retractor; pf, penial folds; pr, prostate gland; ps, penial sheath; psov, proximal spermoviduct; pvg, perivaginal gland; sv, seminal vesicle; v, vagina; vd, vas deferens. Scale: 5 mm for A and B, 10 mm for C.

ovate-oblong, tapering distally, covering entire ventral surface of pouched sperm-oviduct; oviduct somewhat longer than vagina, expanding proximally; perivaginal gland non-pigmented, relatively thin, ending near insertion of long spermathecal duct; spermatheca round, slightly wider than spermathecal duct; distal half of vagina as wide as oviduct where it joins the vagina, tapering proximally. Penis as long as vagina and oviduct; proximal third strongly muscularized, covered with thick penial sheath, tapering towards genital opening, separated from distal portion by a constriction not externally visible; distal two thirds expanded, pouch-like, marked with two longitudinal grooves; distal half of epiphallus twice as wide as proximal half, entering penis just above margin of penial sheath and progressing distally inside the penis through an open groove, forming an epiphallic pouch; flagellum short, rounded; penis retractor thick, attaching apically. Internal wall of distal portion of penis with a strong longitudinal column of spirally arranged folds; an epiphallic groove runs distally along and opens behind the distal end of the column through a secondary pore; epiphallic pouch of penis with fine, even, oblique folds; remainder of inner wall of penis with strong longitudinal folds, continuous through the constriction towards the genital opening.

Distribution. — Santa Maria Island, Azores. Known only from the type locality.

Etymology. — The epithet *lineolatus* indicates the striking banded colour pattern of the shell.

Discussion. — Morelet (1860) recorded from Santa Maria *Helix brumalis*, which he synonymized with *H. volutella*, and a smaller variety of *H. miguelina*, which he did not consider sufficiently characteristic to assign specific rank. *H. volutella* was formerly thought to live throughout the Azores. Riedel (1964) restricted the type locality to São Miguel. Analysis of the type material deposited in the BMNH revealed that the specimens of *H. brumalis* from Santa Maria (fig. 2) conform with those of the species herein described. The new species differs conchologically from *Oxychilus* (*Ortizius*) *miguelinus* (fig. 3) by the compact, more discrete banding pattern, the less expanded last whorl and the retracted, oblique aperture. *O.* (*Radiolus*) *volutella* (fig. 4) has a more depressed spire, more retracted last whorl and a less expanded, less oblique and wider aperture than that of the new species.

The reproductive anatomy, especially the internal structure of the penis, clearly separates this new species from any known Azorean *Oxychilus*. In *O. miguelinus* (fig. 6) the evenly wide epiphallus inserts subapically in a penis of more or less equal width over its entire length. The epiphallus of *O. lineolatus* is divided into two parts, the proximal only half as narrow as the distal part, entering the penis near the penial constriction; the penis is sharply divided, the proximal portion being strongly muscularized and homogeneously folded longitudinally, whereas the distal portion is thin-walled, pouch-like, with a complex arrangement of folds resulting from the proximal insertion of the epiphallus. The penial structure of *O. volutella* (fig. 7) apparently shows a similar external arrangement in that there is a strongly muscularized proximal portion and a pouch-like, pear-shaped distal portion. However, the epiphallus is evenly thick and inserts in the penis nearer the distal end; internally the distal portion shows very faint folds radiating from the epiphallic pore, somewhat similar to the epiphallic pouch of the new species, but there is no trace of strong longitudinal folds or of a columnar structure.

The new species is here considered to belong to the subgenus *Ortizius* Forcart, 1957, due to the complete absence of scaliform papillae on the inner wall of the distal portion of the penis. However, the peculiar arrangement of the penial complex makes its relationship with the known endemic species of *Ortizius* not clear, and a statement on the phylogenetic significance of such peculiarities should await further research on the Azorean terrestrial malacofauna.

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