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A REVIEW OF MACARONESIAN *TRUNCATELLINA* (GASTROPODA: VERTIGINIDAE) WITH DESCRIPTIONS OF FOUR NEW SPECIES^{1, 2}

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With 10 figures and 2 tables

ABSTRACT. A critical examination of some 2000 shells of *Truncatellina* from Madeira, Porto Santo, the Canary and the Cape Verde Islands proves the present and/or past existence of both edentate and dentate species in Madeira, Porto Santo and the Canaries. Recent and fossil records corroborate the endemic status of 6 species, 4 of which are described for the first time. The record of *Truncatellina* from the Cape Verde Islands is unique and the status of the taxon *molecula* therefore remains uncertain.

RESUMO. REVISÃO DOS *TRUNCATELLINA* MACARONÉSICOS COM DESCRIÇÃO DE 4 NOVAS ESPÉCIES. O estudo crítico de cerca de 2000 conchas de *Truncatellina* da Madeira, Porto Santo, Canárias e Cabo Verde prova a presença e/ou existência, no passado, de espécies dentadas e não dentadas na Madeira, Porto Santo e Canárias. Registos recentes e fósseis corroboram a presença de 6 espécies endémicas, 4 das quais são descritas pela primeira vez. O assinalamento de *Truncatellina* em Cabo Verde é único, permanecendo ainda incerto o status do taxon *molecula*.

¹ Notes on the malacofauna of the Canary Islands, No. 15 [No. 14: Recent and fossil slugs of the genus *Parmacella* in the Canary Islands, with the description of three new species (Pulmonata: *Parmacellidae*). - *Arch. Moll.*, **120**: 73-93 (1990)]

² Beiträge zur Molluskenfauna des Madeira-Archipels, No. 13 [No. 12: Eine pleistozäne marine Molluskenfauna von Porto Santo (Madeira-Archipel). - *Mitt. dtsh. malakozool. Ges.*, **44/45**: 19-30 (1989)]

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INTRODUCTION

Minute snails belonging to the genus *Truncatellina* are common in the Palaearctic region and occur in Ethiopia and southern Africa (PILSBRY, 1920-21); recently a specimen has been recorded also from Ivory Coast (de WINTER, 1990). In the Macaronesian Islands, however, they are rarely encountered, and only 4 edentate taxa have been yet described or quoted, 2 from Madeira, 1 from the Canary Islands and 1 from the Cape Verde Islands; no record exist from the Azores and the Salvages.

The discovery of a new dentate species in the Canary Islands by the first author led us to revise all accessible material in institutional and private collections, and to search for new material in the field. To our surprise we were finally able to study almost 2000 shells from Atlantic Islands. The conclusions derived from this material are presented in this paper.

The collections (with their acronyms in parentheses) where we have examined and/or deposited voucher specimens are: Naturhistorisches Museum, Bern (NMB); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); Naturmuseum Senckenberg, Frankfurt (SMF); Museu Municipal do Funchal, Madeira (MMF); British Museum (Natural History), London (BMNH); Zoologische Staatssammlung München (ZSM); Muséum National d'Histoire Naturelle, Paris (MNHN); Museo de Ciencias Naturales, Santa Cruz de Tenerife (MCNT); collections of J. GERBER, München (CGM); K. GROH, Darmstadt (CGD); J. HEMMEN, Wiesbaden (CHW); R. HUTTERER, Bonn. (CHB); Th. E. J. RIPKEN, Delft (CRD).

All measurements and drawings were made with the aid of a stereo microscope and attached camera lucida.

THE MACARONESIAN SPECIES OF *TRUNCATELLINA**Truncatellina linearis* (LOWE, 1852)

- 1852 Pupa [*Truncatellina*] *linearis* LOWE, *Ann. Mag. nat. Hist.*, (2) 9: 275.
 1854 Pupa [*Truncatellina*] *linearis* LOWE, *Proc. zool. Soc. London*, 22: 207.
 1878 Pupa [*Truncatellina*] *linearis*, WOLLASTON, *Test. Atlant.*: 207.
 1921- 22 *Truncatellina linearis*, PILSBRY, *Man. Conch.*, (2) 26: 62-63, pl.8 figs.1+2.
 1983 *Truncatellina linearis*, WALDÉN, *Ann. Zool. Fennici*, 20: 266, 268.
 1983 *Truncatellina "callicratis"*, WALDÉN, *Ann. Zool. Fennici*, 20: 266, 268.

Type material: The R.T. LOWE collection in the BMNH contains 11 shells and some fragments from Madeira, together with a label in LOWE's handwrit-

ing "*Pupa linearis* L' (Subfoss. Extinct) Mad."; 6 shells were examined. We regard them as syntypes and select the most complete shell as the lectotype for *Pupa linearis* LOWE.

Known distribution and material: Madeira Is., Madeira: "Canical" (LOWE, 1852); same locality, coll. O. REINHARDT (SMF/1 ex.); "Fossil bed", 1883, *leg.* MITTERMAIER, coll. H.G. BRONN (SMF/2 ex. + 1 juv.); Ponta de São Lourenço, valley above Prainha near Piedade, Holocene reddish sands, approx. 20m, 20.X.1989, *leg.* K. GROH (CGD/86 ex.); same locality, from Holocene gray sands, 1975, VII. 1985, *leg.* J. HEMMEN, 14.VII.1985, *leg.* K. GROH & J. HEMMEN, (MMF/10 ex.; MCNT/10 ex.; SMF/20 ex.; CGD/413 ex.; CGM/30 ex.; CHB/30 ex.; CHW/325 ex.); 2 km ENE of Canical, Holocene sand deposits along road at indication Prainha, 19.II.1983, *leg.* Th.E.J. RIPKEN (CRD/17).

Referred recent material: Madeira, E-side of valley of Ribeira do Curral, between Fajã de Dentro and Fajã, 4 km S of Curral das Freiras, dry, W-exposed slope along Levada do Curral, 300 m, 19.IV.1988, A. J. de WINTER *leg.* (RMNH/3 ex.).

Description: Shell short cylindrical with 5 1/2 whorls, usually shorter than 1,6 mm, aperture small and quadrangular, lip only slightly reflected. Shell surface covered with prominent although narrow costulae (Figs. 1, 2), giving it a lamella-like appearance. Colour of the fresh shell medium brown.

Measurements: Tab. 1.

Remarks: *T. linearis* was known up to now only from subfossil shells from the Canical sediments. Three fresh shells collected by A. J. de WINTER in 1988 apparently indicate the existence of a living population in Madeira. The fresh shells differ only slightly from subfossil material in their somewhat denser costulation (Tab. 1). The specimens were found in a rather natural habitat together with a rich gastropod fauna including endemics such as *Actinella nitidiuscula*, *A. lentiginosa*, *Janulus stephanophora*, *Pyrgella leacociana*, *Amphorella* sp., *Toltecia pusilla*, *Craspedopoma mucronatum*, *Boettgeria exigua*, *B. cf. deltasoma*, "*Lemniscia*" *calva* and *Staurodon saxicola* (de WINTER, *in litt.*), providing evidence that the *Truncatellina* found along with them is probably endemic as well. Although we have only a few specimens at hand we regard the living population as a relict of *T. linearis* which, on the other hand, is now extinct on the peninsula of Ponta de São Lourenço.

WALDÉN (1983: 268) mentioned specimens from Madeira and noted that they may represent an edentate form of the European *T. callicratis* (SCACCHI), a view which we do not share. *T. callicratis* is much larger (Tab. 1) and lacks the lamella-like costulation which is so characteristic for *T. linearis*. Another statement of WALDÉN (1983: 268) that *T. linearis* is "probably conspecific with *T. molecula* DOHRN" is also not shared by us in the light of the obviously large conchological differences (Tab. 1, Figs. 1, 2, 5). However, *Truncatellina brandti* ZILCH from Cyrenaica, Libya is very similar to *T. linearis* and may be related. The measurements and figure given by ZILCH (1960: Fig. 2) do not show substantial differences to the Madeiran form.

***Truncatellina atomus* (SHUTTLEWORTH, 1852)**

- 1852 *Pupa atomus* SHUTTLEWORTH, *Mitth. naturforsch. Ges. Bern*, 241/242: 144.
 1872 *Pupilla atomus*, MOUSSON, *Rev. malac. Canaries*: 125.
 1878 *Pupa [Truncatellina] atomus*, WOLLASTON, *Test. Atlant.*: 448-449.
 1921-22 *Truncatella [sic!] atomus*, PILSBRY, *Man. Conch.*, (2) 26: 63
 1975 *Pupa [Truncatellina] atomus*, SHUTTLEWORTH in BACKHUYS, *Tab. inedit.*:
 41, pl.8 fig.4.
 1985a *Truncatellina atomus*, GROH, *Bonn. zool. Beitr.*, 36 (3/4): 396.

Type material: Two syntypes of *Pupa atomus* SHUTTLEWORTH from "Teneriffe", *leg.* BLAUNER (NMB 00679); of these we designate the complete shell as the lectotype and the second broken one as lectoparatype.

Known distribution and referred material: Canary Is., Tenerife: Costa de El Draguillo, Holocene slope deposits, IV.1984, *leg.* R. HUTTERER (GROH, 1985: 400) (SMF/19 juv.; CHB/6 ex.; CGD/2 ex.); La Gomera: Barranco de Machal, Holocene slope-debris, VIII.1982, *leg.* R. HUTTERER (GROH, 1985: 402) (CHB/2 juv.; SMF/13 juv.); Hermigua, right slope Barranco Monte Forte, 3 km S bridge near mouth, 19.XII.1985, *leg.* Th. E. J. RIPKEN (CRD/2); El Hierro: Surroundings of Parador, 15.IV.1989, *leg.* Th. E. J. RIPKEN (CRD/1).

Description: Shell longer than in *T. linearis*, with 5-6 convex whorls. Aperture long-oval, outer upper margin of aperture angled (Fig. 3), lip strongly reflected. Shell densely costulated but costulae less prominent than in *T. linearis*. Colour of the lectotype shell glossy light brown.

Remarks: *Truncatellina atomus* was only known by the original description (SHUTTLEWORTH 1852, SHUTTLEWORTH in Backhuys, 1975) before GROH

(1985) reported on the new material collected from Quaternary sediments of Tenerife and La Gomera. These sediments, which eventually date back to the end of the Pleistocene (CRIADO HERNANDEZ & YANES LUGUE, 1982) indicate that the species is not introduced but forms part of the native fauna of the Canary Islands. The species is reported here for the first time from Hierro.

Truncatellina biscoitoi n. sp.

1984a *Truncatellina linearis*, GROH & HEMMEN, *Cour. Forsch.-Inst. Senckenb.*, 71: 9-11 (*partim*).

Type material and known distribution: Madeiran Is., Porto Santo, west coast: Zimbralinho, 20.IV.1986, leg. Th. E. J. RIPKEN (CRD/13 paratypes); Valley of Zimbralinho, Quaternary brownish chalk-sands, approx. 100-120 m, 5.I.1981, leg. J. HEMMEN (CHW/29 paratypes)(GROH & HEMMEN, 1984a: 9-11), NW-Slope of valley south of Zimbralinho, Quaternary yellow to light brownish chalk-sands, approx. 70m, 30.VI.1983, leg. K. & C. GROH (CGD/12 paratypes + 31 fragments), dto., approx. 90m, 19.X.1989, leg. K. GROH (CGD/46 paratypes), 11.VIII.1985, leg. J. GERBER, K. GROH, J. HEMMEN (SMF 308553/holotype, 8 paratypes; MMF/6 paratypes; MCNT/6 paratypes; RMNH/6 paratypes; MNHN/6 paratypes; BMNH/6 paratypes; CGD/91 paratypes + 103 fragments; CGM/168 paratypes; CHB/10 paratypes; CHW/361 paratypes); Ponta de Canaveira, Quaternary yellowish chalk-sands, approx. 20 m, 5.I.1981, leg. J. HEMMEN (GROH & HEMMEN, 1984a: 9-11)(CHW/22 paratypes).

Stratum typicum: Yellow to light-brownish chalk-sands at approximately 70m altitude of presumably Quaternary age (GROH & HEMMEN, 1984a).

Etymology: Named in honour of Dr. MANUEL BISCOITO, director of the Museu Municipal do Funchal, Madeira.

Diagnosis: Size as in *T. atomus* but with less convex whorls and a less dense and prominent costulation. Lip of aperture less reflected and its outer upper margin not angled. Embryonic shell comparatively large (Fig. 4).

Description: Shell small and conic-cylindrical with approx. 5 1/2 convex whorls (Fig. 4). Shell is broadest in the ultimate whorl. Umbilic narrow but open, barely hidden by the somewhat reflected columellar region of the aperture. The comparatively large embryonic shell is densely stippled and has 1 3/4 fast growing whorls. The following whorls are slightly to significantly convex

and sparsely covered by a transversal costulation of narrow but prominent riblets (approx. 46 costulae in the fourth whorl). The last whorl is tapering to the upright ovate to oblique pear-shaped aperture which has a narrow lip and sometimes an indistinct parietal callus. The upper outer margin of the aperture is rounded to slightly angulated.

Measurements: Tab.1.

Distribution: Only known from Quaternary sediments of Porto Santo, Madeiran archipelago, where the species was found together with shells of *T. portosantana* n. sp. in the western part of the island.

Comparisons: Differs from *T. linearis* as mentioned in the diagnosis. Similar-sized *T. atomus* are broadest in the penultimate whorl, have a stronger angulated aperture with a broader lip, lack a parietal callus and are more densely costulated. In the fossil beds of Porto Santo *T. biscoitoi* n. sp. occurs together with the tooth-bearing *T. portosantana* n. sp. which however is clearly distinguished by a more angulated aperture and much denser costulation.

Truncatellina molecula (DOHRN, 1869)

1869 *Pupa molecula* DOHRN, *Malac. Bl.*, 16: 13.

1878 *Pupa [Truncatellina] molecula*, WOLLASTON, *Test. Atlant.*: 512-513.

1921-22 *Truncatellina molecula*, PILSBRY, *Man. Conch.*, (2) 26: 63-64.

1983 *Truncatellina molecula*, GROH, *Arch. Moll.*, 113 (1/6): 172, pl.16 fig.11.

Type material: Cape Verde Is., "Santo Antao", *leg.* DOHRN; 2 syntypes in BMNH, of which we select BMNH 1895.2.2.265 (the shell figured by GROH, 1983: pl.16 fig.11) as the lectotype, the remaining specimen therefore becoming a paralectotype.

Description: Shell very large (Tab.1, Fig.6) with 5 1/2 convex whorls, shell finely striated. Aperture large, considerably higher than broad, with significantly reflected lip.

Remarks: This species has not been found again since its discovery by DOHRN in 1867 on the island of Santo Antão. The large dimensions and the shell sculpture of the taxon distinguish it from all other *Truncatellina* known from the Macaronesian region. The species resembles the European *T. cylindrica*, however, all *T. cylindrica* we have examined are smaller than the

type specimens of *T. molecula*, which approach the size of *T. callicratis* (Tab. 1). With no further material at hand it is impossible to decide whether *T. molecula* was based on specimens introduced from Europe or Africa or whether it represents a taxon endemic to the Cape Verde Islands.

Truncatellina purpuraria n. sp.

Type material: Canary Islands, Lanzarote: La Vegueta, sand pit, 2 m below surface level, 15.VII.1987, R. HUTTERER *leg.* (RMNH 56431/holotype, SMF/1 paratype); Orzola, subfossil slope deposits, 20.VII.1987, *leg.* R. HUTTERER (MCNT/1 paratype).

Referred material: Canary Is., Alegranza: La Caldera, 50 m, screened from slope sediments, 6.V.1990, R. HUTTERER *leg.* (CHB/3 ex., 6 fragments, CGD/1 ex.); Fuerteventura: Jandia peninsula, northern coast, above Cofete near base of a steep slope, screened from soil in abandoned cultivated area, approx. 200 m, 20. VII. 1989, R. HUTTERER *leg.* (CHB/2 ex., 1 fragment).

Stratum typicum: Reddish sands of alluvial origin, 2 m below actual surface; in the same stratum a femur of the extinct endemic rodent *Malpaisomys insularis* and a mandible of domestic pig *Sus scrofa* was found (HUTTERER *et al.*, 1988).

Etymology: After the ancient name for the eastern Canary Islands, "Purpuraria".

Diagnosis: A small, stout, densely costulated and 3-toothed *Truncatellina* from the Canary Islands. Distinguished from *T. lardea* JICKELI and *T. klemmi* ZILCH by its much denser costulation and from *T. similis* JICKELI and *T. schilleri* JICKELI by the more anterior location of the palatal tooth. Distinguished from the following two species by the presence of the parietal callus, different striation, and smaller aperture.

Description: Shell short cylindrical, brownish, somewhat glossy with fast growing first whorls, giving a rounded appearance to the top of it, the third whorl being the broadest (Fig. 6). The narrow umbilic is open, almost not hidden by the reflected columellar part of the aperture. There are 5 to 5 1/2 whorls, the embryonic shell is smooth and has 1 3/4 whorls. The following whorls are significantly rounded and densely costulated transversally (approx. 70 costulae in the 4th whorl). The last whorl is tapering to the oblique pear-shaped aperture which is slightly widened up to a narrow lip, more expanded

in the columellar region and exhibiting a significant parietal callus. Within the aperture there are three teeth, one little tooth in the upper interior part of the collumella, a second in the middle of the parietal region, both of them somewhat stretched and forming a short lamella, while the third tooth on the palate is rounded. All three teeth are well visible in a frontal view of the aperture.

Measurements: Tab. 2.

Distribution: The species is known from the eastern Canary Islands Fuerteventura, Lanzarote and Alegranza.

Remarks: The specimens from Alegranza are a bit smaller on average and the ones from Fuerteventura seem to have slightly fewer costulae. However, the principal characters are identical in all three samples. All shells were screened from undated sediments, of which the one from Fuerteventura looked rather recent. It is therefore probable that the species still lives in the eastern Canary Islands.

Comparisons: The new species is clearly separated from the three-toothed species of Central Europe (*T. callicratis*, *T. claustralis* [GREDLER]) by fewer whorls and consequently by significantly smaller shell dimensions (Tab. 1), and by a different denticulation of the aperture. Particularly the palatal tooth is placed in a different position and also is rounded instead of elongated.

There is also little resemblance of the new species to the tooth-bearing North African *Truncatellina* species known to us (*T. klemmi*, "*Vertigo muscorum*" var. *triplicata* BOURGUIGNAT). The shell of *T. klemmi* is significantly wider (width 1.0-1.2mm), sparsely but prominently costulated, and its crest-like teeth are deeper placed in the aperture. The other taxon apparently belongs to the group of *T. callicratis* (cfr. PILSBRY 1921-22: 72) and differs therefore by the same characters mentioned above.

The closest relationship in conchological characters is found with Abyssinian species of *Truncatellina* (*T. lardea*, *schilleri*, *similis*). Of these *T. schilleri* and *T. similis* differ from *T. purpuraria* by the denticulation: their palatal folds (not teeth!) are only visible in an oblique view in the aperture, furthermore, both are narrower umbilicated. *T. lardea* resembles *T. purpuraria* at first sight but is slightly larger (Tab. 1), its palatal tooth is more elongated and - most striking - the costulation is much sparser (PILSBRY 1921-22: pl.9 figs.6-9/1922-26: pl.29 fig.11).

In conclusion, the closest conchological similarities are between *T.*

purpuraria and some Abyssinian species, especially *T. lardea*. This seems curious in view of the large distance between the Canary Islands and Ethiopia, and the lack of linking species in North Africa. However, similar relationships are known from other molluscs of the mid-Atlantic Islands (Helicidae: *Idiomela* of Madeira / *Levantina* (*Asyriella*) of Cyprus and N. Iran [HEMMEN & GROH, 1984: 24]; Clausiliidae: *Boettgeria* of Madeira / *Macroptychia* of Saudi Arabia and South Africa [GROH & HEMMEN, 1984b: 4]; Pupillidae: *Gastrocopta coenopictus senegalensis* of Cape Verde Is. / *G. c. coenopictus* of Arabia and S. Asia [PILSBRY 1921-22: 136]), and also in other faunal and floral groups. These examples must be regarded as relicts of a former Saharo-Sindian distribution.

Truncatellina portosantana n. sp.

1984a *Truncatellina linearis*, GROH & HEMMEN, *Cour. Forsch.-Inst. Senckenb.*, 71: 9-11 (*partim*).

Type material and known distribution: Madeiran Is., Porto Santo, west coast: Ponta da Canaveira, approx. 20m, Quaternary chalk-sands, 5.I.1981, *leg.* J. HEMMEN (GROH & HEMMEN, 1984a: 9-11)(CHW/1 paratype); Zimbralinho, 20.IV.1986, *leg.* Th.E.J. RIPKEN (CRD/2 paratypes); Valley of Zimbralinho, Quaternary brownish chalk--sands, approx. 100-120 m, 5.I.1981, *leg.* J. HEMMEN (GROH & HEMMEN, 1984a: 9-11)(CHB/2 paratypes; CHW/6 paratypes); NW-Slope of valley south of Zimbralinho, Quaternary yellow to light-brownish chalk-sands, approx. 70m, 30.VI.1983, *leg.* K. & C. GROH (CGD/2 paratypes); *dto.*, approx. 90m, 19.X.1989, *leg.* K. GROH (CGD/8 paratypes; MCNT/2 paratypes); 11.VIII.1985, *leg.* J. GERBER, K. GROH, J. HEMMEN (SMF 308555/ holotype, 2 paratypes; MMF/2 paratypes; RMNH/2 paratypes; MNHN/1 paratype; BMNH/2 paratypes; CGD/2 paratypes + 1 fragment; CGM/3 paratypes; CHB/4 paratypes; CHW/35 paratypes); Barbinha, reddish sands, 12.VIII.1985, *leg.* J. GERBER, K. GROH & J. HEMMEN (CGD/4 paratypes; CGM/4 paratypes + 13 fragments; CHB/3 paratypes; CHW/3 paratypes); Ilhéu de Baixo, II.1983, J. HEMMEN *leg.* (CHW/1 heavily corroded shell).

Stratum typicum: As for *Truncatellina biscoitoi* n. sp.

Etymology: Named for the place of its former presence, the island Porto Santo.

Diagnosis: Shell with irregular faint ribs; aperture with 3 indistinct teeth in a very anterior position; columellar tooth almost invisible in front view. Differs from African dentate species by the denticulation, from *T. purpuraria* by a weak (not strong) parietal callus and different denticulation, from *T. prainhana* n. sp. by the very different costulation.

Description: Shell small and cylindrical with fast growing first whorls, giving the top of the shell a conical shape. The narrow umbilic is open. All 5 1/2 whorls are significantly convex, the fourth being broadest (Fig. 8). The 1 3/4 whorls of the embryonic shell are slightly chagrinated when examined under large magnification. The following whorls exhibit a dense costulation of faint riblets (approx. 68 in the fourth whorl) which becomes much sparser in the ultimate whorl. This is tapering to the oblique ovate to oblique pear-shaped aperture which is slightly expanded to a very narrow lip; this is broadest at its columellar edge. The aperture is indistinctly angled at the upper outer margin. A thin parietal layer is present in most specimens. The denticulation is weak and in a very anterior position. The columellar tooth is only visible in a lateral view into the aperture; the narrow parietal tooth is stretched semilunar looking like a short lamella; the most prominent palatal tooth is roundish.

Measurements: Tab. 2.

Distribution: Known only from subfossil shells collected in Porto Santo, Madeira archipelago, where the species was found together with shells of *T. biscoitoi* n. sp. in the western part of the island. In the eastern part and on the Ilheu de Baixo it was the only *Truncatellina* species found.

Comparisons: The apparently closest relationship is given with *T. prainhana* n. sp. from Madeira which shows a very similar denticulation. Nevertheless this species has a less conical top of the shell and exhibits a marked costulation of extremely broad ribs with little space between the ribs. The partly sympatric *T. biscoitoi* n. sp. differs by having 3 teeth, larger dimensions and a sparser costulation. Differences to European and North-African species are the same as discussed for *T. purpuraria* n. sp.

Truncatellina prainhana n. sp.

Type material and known distribution: Madeira: 2 km ENE Caniçal, sand deposit along road at indication Prainha, 19.II.1983, leg. Th. E. J. RIPKEN

(CRD/2 paratypes); Ponta de São Lourenço, valley above Prainha near Piedade, Holocene reddish sands, approx. 20m, 14.VII.1985, *leg.* K. GROH & J. HEMMEN (CGD/5 paratypes); 20.X.1989, *leg.* K. GROH (SMF/2 paratypes; CGD/9 paratypes); same locality, sand pit above Prainha, approx. 40m, Holocene gray sands, 14.VII.1985, *leg.* K. GROH & J. HEMMEN (SMF 308550/ holotype, 3 paratypes; MMF/4 paratypes; MCNT/2 paratypes; RMNH/3 paratypes; MNHN/2 paratypes; BMNH/2 paratypes; CGD/38 paratypes; CGM/4 paratypes; CHB/4 paratypes; CHW/44 paratypes).

Stratum typicum: Grey sands of Holocene age. Radiocarbon datations of charcoal collected nearby gave an age estimation of 2070 ± 180 yrs B.P. (PIEPER, 1985) and of molluscan shells 5130 ± 70 yrs B.P. (KREJCI-GRAF, 1964).

Etymology: Named for the small beach Prainha which is near below the type locality.

Diagnosis: Shell with broad ribs, space between ribs narrow; aperture with 3 indistinct teeth in a very anterior position; columellar tooth almost invisible in front view; parietal tooth a long stretched fold.

Description: Shell small and cylindrical, whorls little convex. Shell is broadest at the height of the third or fourth whorl. The ultimate whorl covers 50% of the total height. Umbilic narrow and open. Adult shell with $5 \frac{1}{2}$, embryonic shell $1 \frac{3}{4}$ whorls. The costulation of the following whorls is formed by broad ribs with narrow interspace of less than one fourth of the rib width (Fig. 9). There are approx. 57 ribs in the penultimate whorl. The surface of the ribs has a faint gloss. Aperture oblique-ovate, its lip narrowly reflected and the upper outer margin indistinctly angled. Denticulation weak and in an anterior position. Parietal tooth a long and thin crest rather than a tooth, as visible in subadult shells (Fig.10).

Measurements: Tab. 2.

Distribution: Only known from subfossil sediments of Madeira, where the species was found together with shells of *Truncatellina linearis*.

Comparisons: Apparently the species is very closely related to *T. portosantana* n. sp. (see above) from which it is mainly distinguished by the

broad costulae but also by a less cylindrical shape and more convex whorls. The new species was found together with *T. linearis* which has no teeth and differs furthermore by a smaller and more quadrangular aperture and thin lamella-like costulae.

CONCLUSIONS

The archipelagos of Madeira and the Canary Islands house both edentate and dentate species of *Truncatellina*. While in the Canaries there are allopatric populations in the western (*atomus*) and eastern (*purpuraria*) islands, the two principal groups occur sympatrically in Madeira (*linearis* and *prainhana*) and Porto Santo (*biscoitoides* and *portosantana*). While the edentate species seem to be closely related to Palaearctic members of the genus (e.g. *brandti* from Libya) the dentate species show affinities to the eastern Ethiopian region (e.g. *lardea* from Abyssinia). Therefore we assume that the immigration of *Truncatellina* into the Atlantic Islands followed two different routes and perhaps occurred also at different times. From both the Canaries and Porto Santo Late Tertiary land shells have been recorded (GITTENBERGER & RIPKEN, 1985, GROH, 1985b), indicating an early colonization of the archipelagos by terrestrial molluscs. In the case of the geologically younger Cape Verde Islands it is questionable whether the only species known (*molecula*) is endemic or whether it was introduced. From the Azores no record of *Truncatellina* is known so far.

KEY TO THE MACARONESIAN *TRUNCATELLINA* SPECIES

- Edentate 1
 Dentate 4
- 1 Shell large (> 1,8mm), faintly striated *T. molecula*
 Shell smaller, costulated 2
- 2 Shell shorter than 1,6mm, aperture quadrangular, costulae narrow but prominent
 with a lamella-like appearance (Madeira) *T. linearis*
 Shell shorter than 1,80 mm, aperture ovate, costulae less distinct 3
- 3 Whorls significantly convex, lip broadly reflected, upper outer margin of aperture
 angled (Canary Is.) *T. atomus*
- Whorls not significantly convex, lip narrowly reflected, upper outer margin of aperture
 rounded (Porto Santo) *T. biscoitoi*
- 4 Aperture with well developed columellar and parietal callus, all three teeth promi-
 nent (Canary Is.) *T. purpuraria*
- Aperture without prominent callus, teeth indinct, sometimes difficult to see (Madeiran
 archipelago) 5
- 5 Shell with irregular and faint costulae (Porto Santo) *T. portosantana*
 Shell with broad costulae (Madeira) *T. prainhana*

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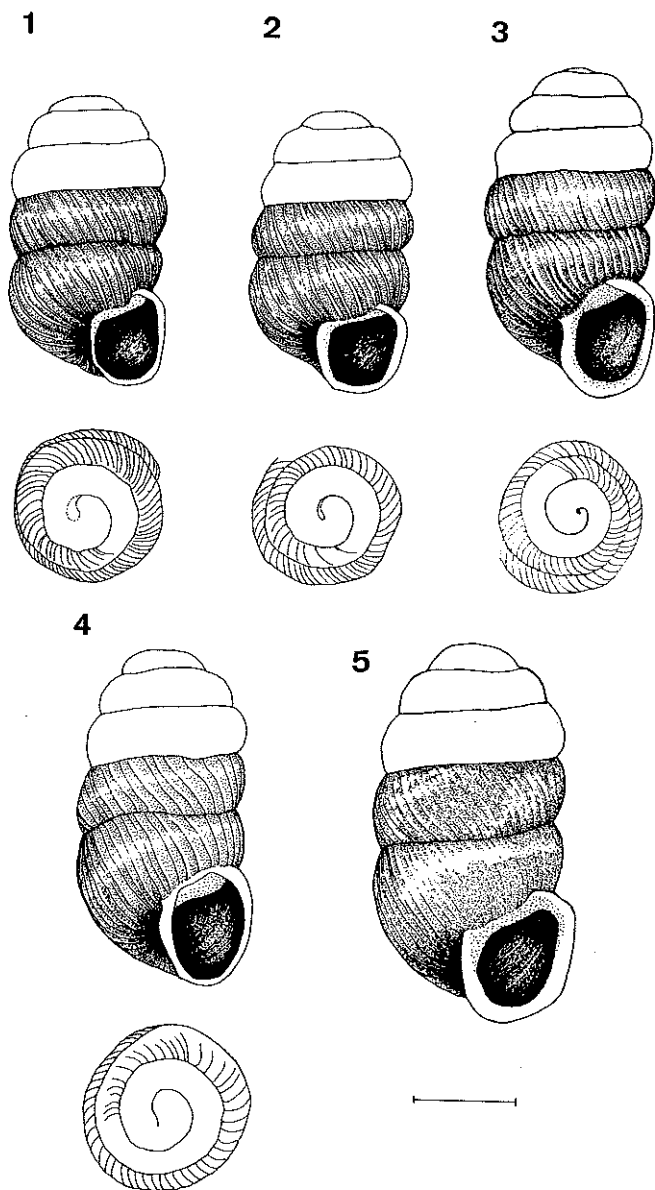
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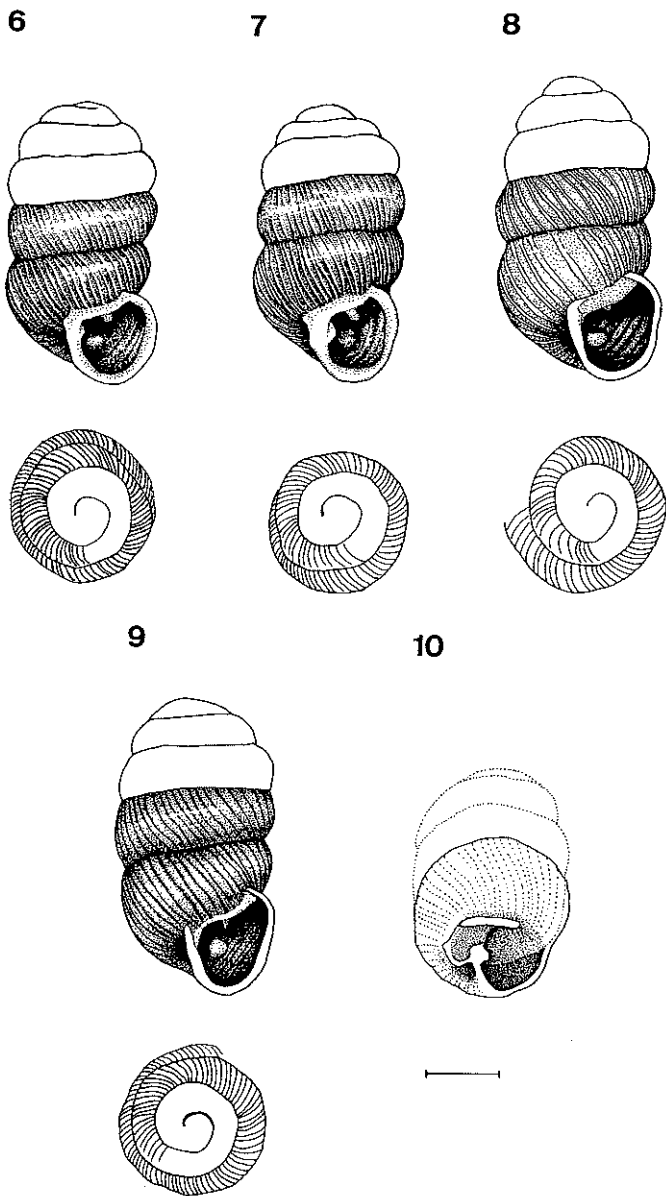
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Figs. 1-5. Shells of edentate species: 1. *Truncatellina linearis*, subfossil population from Ponta de São Lourenço, Madeira (MMF); 2. *T. linearis*, living population from Madeira (RMNH/coll. de WINTER 7564); 3. *T. atomus*, Tenerife (MCNT); 4. *T. biscoitoides*, holotype SMF 308553; 5. *T. molecula*, Cape Verdes, lectotype (BMHN 1895.2.2.265, drawing based on GROH 1983, plate 16 fig. 11). (Scale = 0.5mm).



Figs. 6-10. Shells of dentate species; 6. *T. purpuraria*, Lanzarote, holotype (RMNH 56431); 7. *T. purpuraria*, Fuerteventura (CHB); 8. *T. portosantana*, Porto Santo, holotype (SMF 308555); 9. *T. prainhana*, Madeira, holotype (SMF 308550); 10. *T. prainhana*, paratype (MMF), juvenile shell to show the denticulation. (Scale = 0.5 mm.).

| Species | n | Shell height | Shell width | Number of ribs of penultimate whorl |
|--|----|--------------|-------------|-------------------------------------|
| <i>T. linearis</i> type series | 5 | 1.38-1.59 | 0.78-0.90 | 43 |
| <i>T. linearis</i> Madeira (subf.) | 12 | 1.29-1.56 | 0.71-0.84 | 44 |
| <i>T. linearis</i> Madeira (recent) | 3 | 1.36-1.60 | 0.80-0.84 | 60 |
| <i>T. atomus</i> Canary Islands | 8 | 1.32-1.80 | 0.80-0.88 | 52 |
| <i>T. biscoitoi</i> Porto Santo | 10 | 1.48-1.68 | 0.84-0.90 | 46 |
| <i>T. molecula</i> Cape Verde Is. | 2 | 1.98-2.05 | 1.00-1.05 | 57 |
| <i>T. brandii</i> Libya | 26 | 1.40-1.70 | 0.80 | 42 |
| <i>T. cylindrica</i> Germany | 10 | 1.52-1.84 | 0.80-0.93 | 68 |
| <i>T. callicratis</i> Italy | 13 | 1.99-2.50 | 0.94-1.06 | 67 |

Table 1 - Measurements and rib counts of edentate *Truncatellina* species.

| Species | n | Shell height | Shell width | Number of ribs of penultimate whorl | Tooth number |
|---------------------------------------|----|--------------|-------------|-------------------------------------|--------------|
| <i>T. purpuraria</i> Lanzarote | 3 | 1.40-1.44 | 0.76-0.80 | 72 | 3 |
| <i>T. purpuraria</i> Alegranza | 4 | 1.25-1.43 | 0.75-0.77 | 79 | 3 |
| <i>T. purpuraria</i> Fuerteventura | 3 | 1.44 | 0.76-0.80 | 68 | 3 |
| <i>T. portosantana</i> Porto Santo | 10 | 1.29-1.59 | 0.75-0.84 | 68 | 3 |
| <i>T. prainhana</i> Madeira | 10 | 1.40-1.68 | 0.80-0.86 | 57 | 3 |
| <i>T. tardea</i> Abyssinia | 8 | 1.36-1.72 | 0.80-0.87 | 48 | 3 |
| <i>T. claustralis</i> Austria | 4 | 1.60-1.67 | 0.78-0.84 | 76 | 3 |
| <i>T. callicratis</i> France, Alps | 15 | 1.63-2.07 | 0.80-0.98 | 73 | 3 |

Table 2 - Measurements and rib counts of dentate *Truncatellina* species.

Appendix

Comparative material used for this study.

Truncatellina brandti : Libya, Wadi Halgh el asel between Tokra and Tolmeta; Wadi el Asra near Fargugha; Wadi milan and Wadi zuiana near Tolmeta (SMF/10 paratypes).

Truncatellina callicratis : Austria, Tirol, Lienzer Dolomiten, c. 1400m (CGM/1); France, Sète, cementary Paul Valéry (CGM/2); Hungary, Basdacsonyfordemic, Vesaprém, Csobánc Mountains (CGD/1); Italy, Abruzzi, 3km above Scanno in direction of Viletta Barrea (ZSM/15); Switzerland, Wallis, Sion, Tourbillon castle (CGM/12).

Truncatellina claustralis : Austria, Sixtenstein, rocks at road from Ternitz to Puchberg (CGD/21, CGM/4).

Truncatellina cylindrica : Germany, Hessia, Nature Reserve 'Griesheimer Sand' near Darmstadt (CGD/5); Bavaria, Nature Reserve '12 Apostel', Nördlinger Ries (CGD/5).

Truncatellina aff. cylindrica : Algeria: Prov. Oran, 12km SW of Oran, near entrance of 'Grotte de la quatriemesairee a la Ravin de la Vierge', 250m alt. (RMNH/12); Moulin St. Joseph, 4km NW of Misserghin, 125m alt. (RMNH/3); Prov. Bouira, Gorges de Beni-Amrane, 3km NNW of Lakhdaria (RMNH/1); Prov. Saida, Djebel Antar = 10km NE of Mecheria, 1450m alt. (RMNH/3); Prov. Tlemcen, 1km N of Ain Fezza = 8km. E of Tlemcen, 900m alt. (RMNH/7); 8km S of Sebdou, 1050m alt. (RMNH/1); 1.5km N of the Cascades d'El-Ourit = 3.5km E of Tlemcen (RMNH/15); 4km SSW of Honaine = 18km ENE of Chazaouet, 700m alt. (RMNH/1); 3km SW of Khernis, 1050m alt. (RMNH/3).

Truncatellina doumeti : Algeria, Oued Chair (SMF/2).

Truncatellina lardea : Abessinia, Rora-Beit-Andu, Hamaszen (SMF/8 syntypes).