REDESCRIPTION OF *PLANORBIS MOQUINI* REQUIEN, 1848 (GASTROPODA: PLANORBIDAE)

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Abstract *The conchological and anatomical characters of the topotypes of* Planorbis moquini *Requien, 1848 have been studied in detail. Comparisons with* Planorbis agraulus *Bourguignat, 1864 from Algeria revealed that these species are distinct from each other. In addition we examined additional* Planorbis *spp. from Sardinia and Crete showing that neither species are conspecific with* P. moquini *and* P. agraulus. *The question remains as to which* Planorbis *spp. live in the Mediterranean in addition to* P. moquini *and* P. agraulus.

Key words Planorbis moquini, *redescription, anatomy, topotype*

INTRODUCTION

Planorbis moquini Requien, 1848 has been confused for a long time. Westerlund (1885: 81) mentioned this species as a younger synonym of *Planorbis glaber* Jeffreys, 1830 while Kennard & Woodward (1926: 76) regarded *P. glaber* as a synonym of *Gyraulus albus* (O.F. Müller, 1774). Germain (1931: 538) lists *P. moquini* as a younger synonym of *Planorbis laevis* Alder, 1838, but anatomical studies of *Gyraulus* cf. *laevis* by Meier-Brook (1983: 38) revealed that the species from Mediterranean islands belong to the genus *Planorbis*.

Guisti (1976: 135-139, Figs. 5 A-F, 6 A-H) was the first to depict the anatomy of *P. moquini* and suggested that the species was conspecific with *Planorbis agraulus* Bourguignat, 1864. Glöer & Bouzid (2009) redescribed *P. agraulus* from Algeria and compared the anatomy of *P. agraulus* with that of the drawings given by Guisti (1968: 243, Fig. 2) and Guisti *et al.* (1995: 185, Fig. 125-127), and those by Girod *et al.* (1980: 52, Fig. 29) which showed that *Planorbis agraulus* and *P. moquini* to be distinct species. However, Guisti (1976: 135) stated that his dissected *Planorbis* specimens from Montecristo, Sardinia, and Corsica were conspecific and determined them as *Planorbis* cf. *moquini*. Beckmann (1987: 12) mentioned a small planorbid snail from Malta which he determined as *Gyraulus laevis* while Guisti *et al.* (1995: 185, Fig. 125-127) determined this (?) species from Malta as *Planorbis moquini*. Beckmann (2007: 51) lists *Planorbis moquini* from Majorca from many sampling sites and states that this is a widely distributed species in the Mediterranean. On the homepage of "Natura Mediterraneo" (http://www.naturamediterraneo.com 09.11.2007) *P.* cf. *moquini* is mentioned from Liguria, whereas Cossigniani T. & V. (1995: 54) state that the species under discussion is distributed from Liguria, Sardinia, to Sicily, and Bank *et al.* (2002: 98) add the islands La Gomera and Madeira.

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Owing to this taxonomic confusion it was necessary to study the topotypes of *P. moquini* more thoroughly and compare these with *P. agraulus* and *Planorbis* spp. from Italy and other Mediterranean regions, respectively.

This paper redescribes *Planorbis moquini* Requien, 1848 and discusses the species' distinctness from *P. agraulus* and from other *Planorbis* spp. of the Mediterranean.

MATERIAL AND METHODS

The snails were recently collected at 13 sampling sites by M. L. Zettler & D. Richard (2004: 10). The samples were put into 75% ethanol. The dissections and measurements of the genital organs and the shells were carried out using a stereo microscope (ZEISS); the photographs were made with a digital camera system (Leica R8).

To elucidate the taxonomic status of the *Planorbis moquini* we tried to find the syntypes. Dance (1986: 224) noted that Requien's collection of the mollusc species from Corsica was bequethed to A. Moquin-Tandon at Toulouse and was neglected and finally abondoned. Syntypes in the Muséum d'Histoire de Toulouse, were also unavailable to due reconstruction works at the museum.

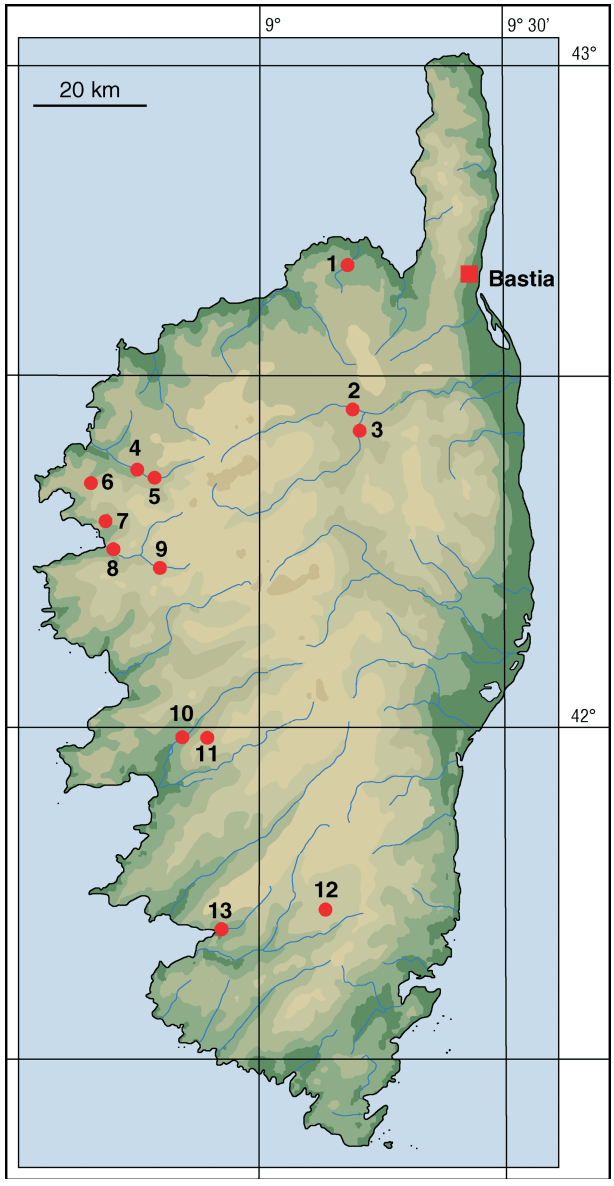

Fig. 1 The sampling sites of *Planorbis moquini* in Corsica.

(23) Testa planulata, centro-excavata, subtus profunde umbilicata, tenuis, pellucida, nitida, glabra, anfractibus ternis rotundatis.
Affinis hispido, sed toto cœlo differt.
Diam. 3. alt. 1.

Fig. 2 Faksimile of the original description of *P. moquini* Requien (1848: 50).

THE SAMPLING SITES

Location 1: Spring at street D 81, approx. 5 km west of Casta, leg. Zettler 08th Aug 2003; 42.654°N; 09.130°E. –Habitat: small spring with a basin of 150 x 50 cm and a water depth of 30 cm, harboured within a small rocky cave. – Associated species: *Pisidium casertanum*, *Potamopyrgus antipodarum*, *Radix labiata.*

Location 2: Tartagine River at street N 197 north of Ponte Rosso, leg. Zettler 04th Aug 2003; 42.497°N; 09.182°E. – Habitat: fast flowing river on rocky substrates. – Associated species: *Ancylus* cf. *fluviatilis*, *Potamopyrgus antipodarum*

Location 3: Golo River at Ponte Leccia, leg. Zettler 04th Aug 2003; 42.464°N; 09.206°E. – Habitat: fast flowing river on rocky substrates. – Associated species: *Ancylus* cf. *fluviatilis*, *Galba truncatula*, *Pisidium casertanum*, *P. personatum*, *Potamopyrgus antipodarum.*

Location 4: Fangu River near Tuvarelli, at the Genoise bridge „Ponte Vecchia", leg. Zettler 03rd Aug 2003, 42.392°N; 08.715°E. – Habitat: fast flowing river on rocky substrates. – Associated species: *Ancylus* cf. *fluviatilis*, *Potamopyrgus antipodarum.*

Location 5: Fangu River near Monte Estremo, leg. Zettler 03rd Aug 2003; 42.366°N; 08.800°E. – Habitat: fast flowing river on rocky substrates. – Associated species: *Ancylus* cf. *fluviatilis*, *Potamopyrgus antipodarum.*

Location 6: Spring at street D 81, approx. 8 km north of Osani, leg. Zettler 05th Aug 2003; 42.348°N; 08.666°E. – Habitat: small spring[1] with a basin of 200 x 50 cm and a water depth of 30 cm, tailed by Eucalyptus trees. – Accompanied species: *Ancylus* cf. *fluviatilis*, *Pisidium casertanum*, *P. personatum*, *Potamopyrgus antipodarum*

Location 7: Spring at street D 81 at Partinello, leg. Zettler 05th Aug 2003; 42.313°N; 08.684°E. – Habitat: small spring with a basin of 200 x 50 cm and a water depth of 30 cm at the edge of the town. – Associated species: *Ancylus* cf. *fluviatilis*, *Galba truncatula*, *Pisidium casertanum*, *Potamopyrgus antipodarum.*

Location 8: Porto River at Porto near the camping ground, leg. Zettler 05th Aug 2003; 42.264°N; 08.701°E. – Habitat: medium flowing river on rocky substrates, several rock pools tailed by floodplain trees. – Associated species: *Ancylus* cf. *fluviatilis*, *Potamopyrgus antipodarum.*

Location 9: Spring approx. 4 km south of Evisa, leg. Zettler 07th Aug 2003; 42.243°N; 08.783°E. – Habitat: small spring with a basin of 200 x 50 cm and a water depth of 30 cm, tailed by Eucalyptus trees. – Associated species: *Pisidium casertanum*, *Potamopyrgus antipodarum.*

[1] Most of the Corsican street springs have a typical size and were built in a very similar form at all.

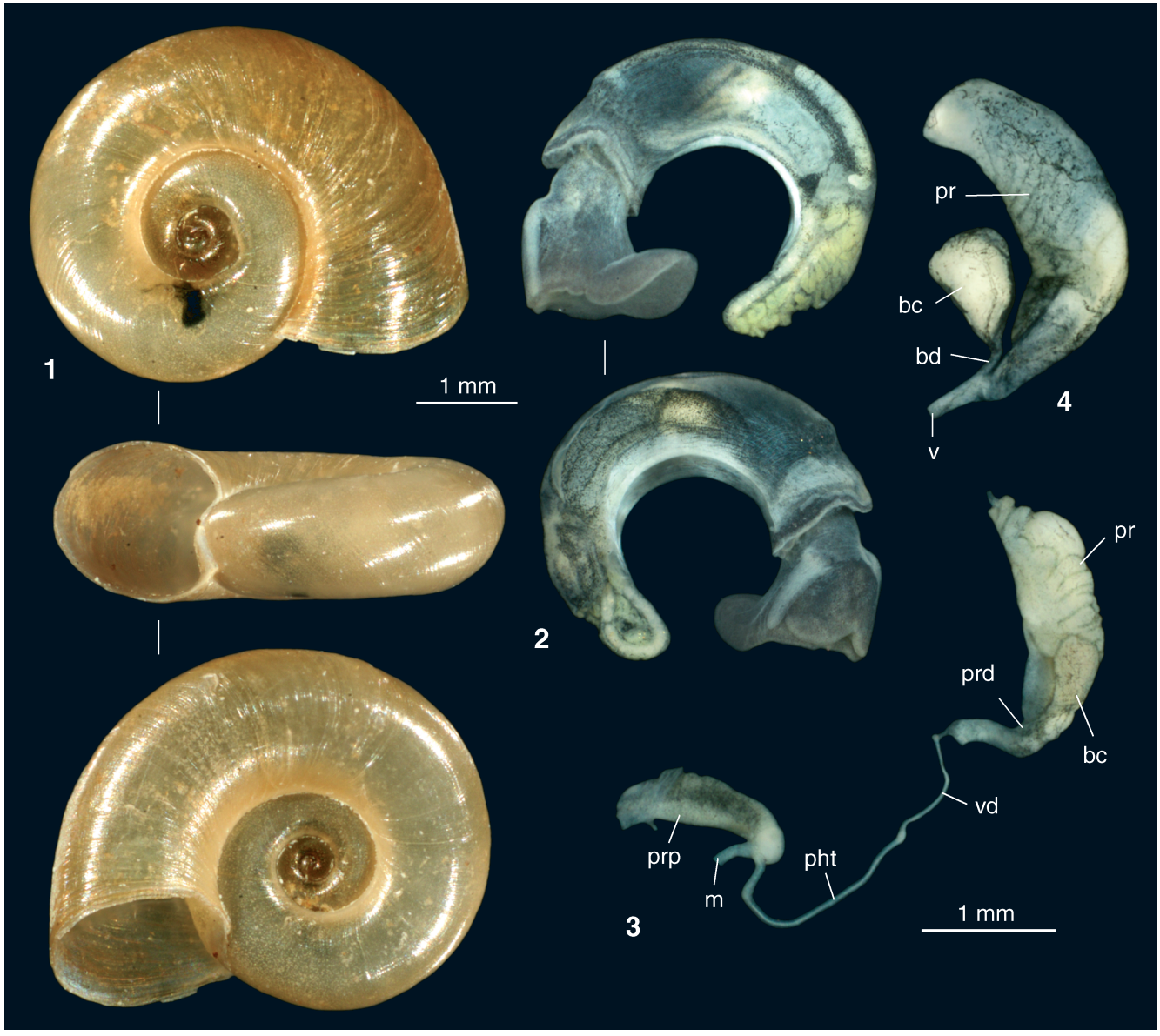

Fig. 3 The shell, the animal and the anatomy of *Planorbis moquini*. **1:** The shell, **2:** mantle pigmentation, **3-4:** copulatory organs. – bc = bursa copulatrix, bd = bursa duct, m = muscle, pht = phallotheca, pr = prostata, prd = prostata duct, prp = praeputium, vd = vas deferens, v = vagina.

Location 10: Prunelli River near Eccica, leg. Zettler 09th Aiug 2003; 41.932°N; 08.916°E. – Habitat: fast flowing river on rocky substrates. – Associated species: *Ancylus* cf. *fluviatilis*, *Physella acuta*, *Pisidium casertanum*, *P. personatum*, *Potamopyrgus antipodarum.*

Location 11: Gravona River 3 km west of Peri at street D 229, leg. Zettler 14th Aug 2003; 42.004°N; 08.886°E. – Habitat: fast flowing river on rocky and sandy substrates. – Associated species: *Ancylus* cf. *fluviatilis*, *Physella acuta*, *Potamopyrgus antipodarum.*

Location 12: Fiumicicoli River 2 km north of Levie at street D 268, leg. Zettler 12th Aug 2003; 41.725°N; 09.143°E. – Habitat: small creek with medium flowing waters on rocky substrates. Associated species: *Pisidium casertanum*, *Potamopyrgus antipodarum*, *Radix labiata.*

Location 13: Baracci River north of Bains de Baracci at street D 557, leg. Zettler 13th Aug 2003; 41.697°N; 08.954°E. – Habitat: Rock pools of a small creek with more or less stagnant waters at sampling time. – Associated species: *Ancylus* cf. *fluviatilis*, *Potamopyrgus antipodarum*, *Theodoxus fluviatilis.*

RESULTS

All *Planorbis* samples collected in Corsica belong to one species, *Planorbis moquini* Requien, 1848. The sample from the locality 1 (Fig. 1) is ca. 20 km apart from the type locality (Bastia), and because all *Planorbis* sp. in Corsica are conspecific we can define the specimens from locality 1 (Fig. 1) as topotypes.

Guisti (1976: 135-139, Figs. 5 A-F, 6 A-H) studied *P. moquini* from Corsica, but only from one sampling site. His anatomical drawings correspond with our results.

In the Planorbidae the features of distinct species are sometimes not well pronounced, so we have to find out which are the disctinctive features. One suitable feature to distinguish planorbid species is the number of prostate diverticules which is not correlated with the age or size of a species (Meier-Brook 1976: 113). Because the shells of *P. moquini* from different habitats of Corsica show no phenotypical plasticity, we can state that the shell shape is also a good feature to distinguish *P. moquini* from other small planorbid species.

Genus ***Planorbis*** O.F. Müller, 1773

Type species *Planorbis planorbis* (Linnaeus, 1758)

Planorbis moquini Requien, 1848

Type locality Bastia.

Description The shell is glossy and horn-coloured, finely striated, with 3.5 regularly increasing whorls. The whorls on the upper side are regularly convex and steeped at the deep suture, and the whorls on the under side are slightly flattended. The first whorls on the upper side are deep and the underside is widely umbilicated. There are no spiral lines visible. The aperture is circular and not deflected, the last whorl is a little descende. The diameter of the shell is 3.5 mm, and the height of the last whorl is 0.8 mm.

Animal The animal is black, the mantle pigmentation is dark grey and shows no patterns.

Anatomy The preputium is on the dorsal side darkly pigmentated, the penis sheath is a little longer than the preputium, and as slender as the vas deferens. The prostate gland bears 11 – 13 diverticules. The bursa is of elongated sphaerical type with a short and thin bursa duct.

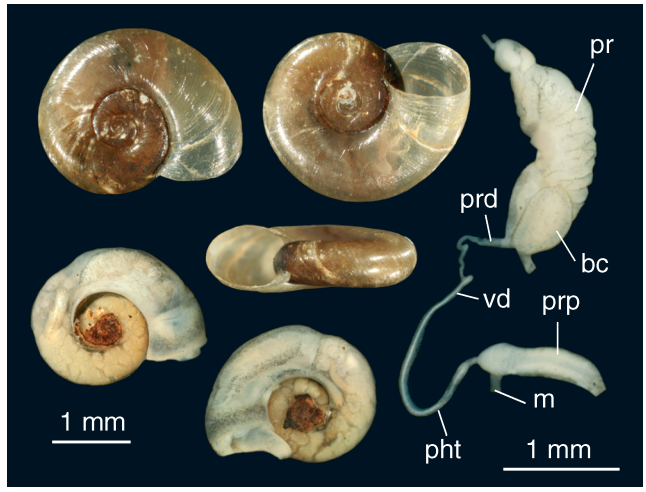

Fig. 4 *Planorbis* sp. from Sardinia. – bc = bursa copulatrix, m = muscle, pht = phallotheca, pr = prostata, prd = prostata duct, prp = praeputium, vd = vas deferens.

Remarks All shells from the 13 sampling sites of different habitats (small springs to fast flowing rivers, small creek and rock pools) are the same, showing that there is no variability visible in the features mentioned in the description above.

DISCUSSION

Guisti (1995: 184) gives *Planorbis moquini* as having a Holomediterranean distribution with *P. agraulus* as a younger synonym of *P. moquini*. Glöer & Bouzid (2009: p.717) and the present paper show that *P. moquini* and *P. agraulus* are distinct species, on the basis of differences in both their shells and anatomy.

M.L. Zettler collected small *Planorbis* spp. on Sardinia and Crete which are distinct from *P. moquini*, too. The *Planorbis* sp. from Sardinia (Fig. 4) is similar to *P. moquini* in its anatomy, but the shells are, however, variable. The shell of this *Planorbis* sp. from Sardinia is more flat, the aperture is ovate and the last whorl is less high than in *P. moquini*. The animal is light grey and the mantle pigmentation is light.

"Natura Mediterraneo" (http://www.naturamediterraneo.com, 09.11.2007) includes a photo of a living specimen of *P.* cf. *moquini* from Sardinia with a light animal and a mantle pigmentation with distinct dark spots. This species looks

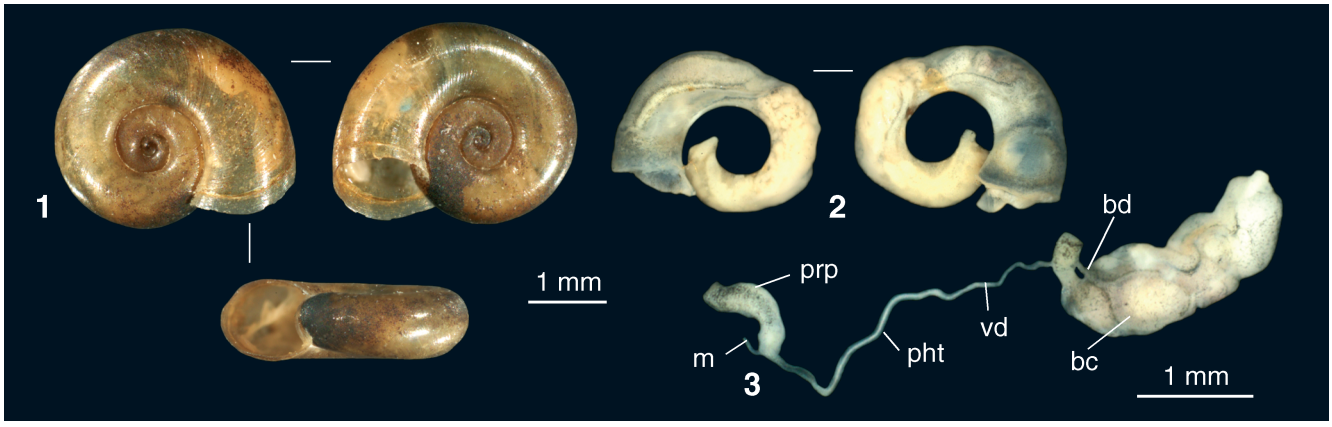

Fig. 5 *Planorbis* cf. *atticus* from Crete. – bc = bursa copulatrix, bd = bursa duct, m = muscle, pht = phallotheca, prp = praeputium, vd = vas deferens.

distinct from *P. moquini* and from the species depicted in Fig. 4, as well, while the shell of the species depicted by Girod *et al.* (1980: 52, Fig. 29) looks similar to the species in Fig. 4, shown below. Sparacio (1992: 131, Fig. 1) studied a small Planorbid snail from Sicily with a diameter of 4 mm and 11-13 prostate diverticules. But the photo of the shell is inadequate to determine this species. Thus it is unclear which species he had.

The species from Crete has a prostate gland which bears ca. 20 diverticula, the phallotheca is twice the length of the praeputium, the mantle pigmentation is light, the animal is light grey and the last whorl is not deflected.

This species has nothing in common with *Planorbis moquini* or *P. agraulus*, neither, but corresponds to the shell diameter and the number of whorls, as well the number of prostate diverticules mentioned by Meier-Brook (1976) for *Planorbis atticus* Bourguignat, 1852 from Crete. However, Bourguignat (1852: 22) described *Planorbis atticus* as a large *Planorbis* sp. with a diameter of 8 mm and a shell height of 2.5 mm.

It may be summarised that the Planorbidae of the Mediterranean are poorly known and more diverse than is currently understood and their remains a number of taxonomic problems to be resolved. Following the work of Glöer & Bouzid (2009: 717) and the present study, the two species *Planorbis moquini* and *P. agraulus* are clearly defined. It seems that at least two or three more species occur in the Mediterranean region.

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