NEW RECORDS OF FRESHWATER GASTROPODS FROM ALGERIA WITH THE RE-DESCRIPTION OF *BITHYNIA NUMIDICA* BOURGUIGNAT 1864 (GASTROPODA: BITHYNIIDAE)

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Abstract Recently (2009–2010) collected freshwater molluscs in NE Algeria revealed 8 species of freshwater gastropods, of which Stagnicola fuscus *(C. Pfeiffer 1821) is new for this region. In addition we found* Bithynia numidica *Bourguignat 1864, which has not been mentioned in the literature since its original description, which we compared with syntypes of* Bithynia numidica. *So we can provide the anatomy of the species under discussion for the first time.*

Key words redescription, anatomy, syntypes, Bithynia numidica

INTRODUCTION

The co-author collected freshwater molluscs at various sampling sites in the regions of Skikda (Guerbes-Sanhadja wetlands), Annaba and El Tarf (El-Kala National Park), terra typica of *Bithynia numidica* Bourguignat 1864, to find *Bithynia* spp.

The freshwater mollusc fauna of Algeria is not well investigated (Glöer, Bouzid & Boeters, 2010). Concerning the distribution of many species in Algeria Van Damme (1984) and Brown (1994) refer to Bourguignat (1864). Mekroud *et al.* (2002) could only list *Galba truncatula* (O.F. Müller 1774) and *Physella acuta* (Draparnaud 1805) from north-eastern Algeria.

In 1864 Bourguignat described the species *Bithynia numidica* from Oued Sanhadja (Oued El Kébir), 20 km south west of Bône (Annaba), Algeria. He compared it with *Paludina ventricosa* Gray 1821, cited by Morelet 1853 and *Bythinia leachi* Sheppard 1823 cited by Bourguignat 1862. *B. numidica* was mentioned by Westerlund 1886 (p. 18), but not by Van Damme (1984: 14) nor by Brown (1994: 82). Kristensen (1985: 9) also lists *Bithynia tentaculata* (Linnaeus 1758), as the only *Bithynia* sp. which occurs in N-Africa. Van Damme (1984: 14) referred to Bourguignat (1864), who found *Bithynia tentaculata* in the region of Algiers (Bourguignat, 1864: 224). Thus *Bithynia numidica* has been overlooked since its original description.

This paper is intended to (i) improve the knowledge about the freshwater mollusc fauna of Algeria and (ii) to re-describe *Bithynia numidica*.

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MATERIAL AND METHODS

The snails were collected with a sieve from the shore of different freshwater bodies of the study area, in north-eastern Algeria (Fig. 1). The samples were preserved in 75% ethanol prior to examination in the laboratory. The dissections and measurements of the genital organs and the shells were carried out using a stereo microscope (Zeiss); the photographs were made using a digital camera system (Leica R8).

The critical taxa *Radix auricularia* (Linnaeus 1758), *Stagnicola fuscus* (C. Pfeiffer 1821) and *Planorbis planorbis* (Linnaeus 1758) have been identified anatomically following the identification key of Glöer (2002).

To clear up the taxonomic status of *Bithynia numidica* described by Bourguignat we borrowed the syntypes from the Muséum d'Histoire Naturelle, Genève. Voucher specimens of recently collected material of *Bithynia numidica* is stored in the Zoological Museum Hamburg (ZMH 79345).

Study area The study area is located in the coastal plains of north-eastern Algeria, and has a Mediterranean climate featuring hot, dry summers and mild winters with a precipitation mainly concentrated in the winter months. A set of water bodies in north-eastern Algeria have been investigated:

Guerbes-Sanhadja wetlands consisting of scattered freshwater ponds and marshy areas including Garaet Aïn Nechma, Garaet Sidi Makhlouf , Garaet Messaousa, Garaet Zaouia and Garaet Hadj Tahar.

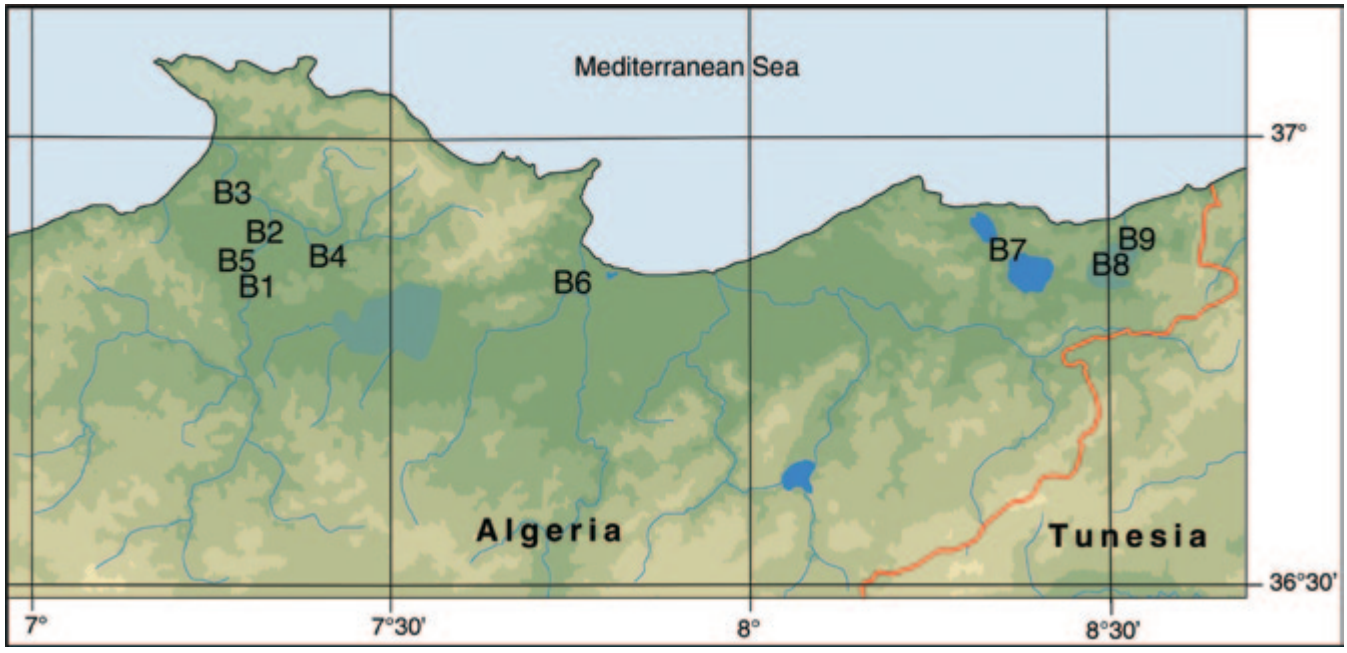

Figure 1 Sampling sites of *Bithynia numidica* in north-eastern Algeria. For codes see Table 1.

Table 1 Sampling sites of *Bithynia numidica* with their geographic co-ordinates and altitudes above sea level. Codes refer to Fig. 1.

Code	Sampling site	Date of sampling	Altitude [m]	Latitude N	Longitude E	Locality
B1	Garaet Aïn Nechma	29.VI.2009	17	36° 50.261′	007° 16.907′	Ben Azzouz (Skikda)
B2	Garaet Sidi Makhlouf	29.VI.2009	9	36° 53.172′	007° 18.190′	Ben Azzouz (Skikda)
B3	Garaet Messaousa	01.VII.2009	11	36° 56.261′	007° 14.915′	Ben Azzouz (Skikda)
B4	Garaet Zaouia	04.VII.2009	2	36° 52.131′	007° 22.788′	Ben Azzouz (Skikda)
B5	Garaet Hadj Tahar	04.VII.2009	8	36° 51.629′	007° 15.940′	Ben Azzouz (Skikda)
B6	Boussedra	26.VI.2010	9	36° 50.761′	007° 43.505′	El Bouni (Annaba)
B7	Oued Bouarroug	07.VII.2009 08.VI.2010	1	36° 51.691′	008° 20.057′	El Kala (El Tarf)
B8	Lac Tonga	24.VI.2010	6	36° 52.780′	008° 31.809′	El Kala (El Tarf)
B9	Canal Messida	24.VI.2010	3	36° 53.138′	008° 31.743′	El Kala (El Tarf)

Annaba region contains Boussedra, a temporary freshwater pond located near El Bouni, and the site is under ever-increasing pressure from spreading urbanization by urban dwellers.

El Kala National Park has Oued Bouarroug, an intermittent freshwater stream flowing to the southern side of Lac Mellah (a Ramsar site) where it forms a delta.

Lac Tonga is a shallow freshwater marshy basin having a surface area of 2.700 ha and a maximum water depth of 2.6–2.8 m, and is a Ramsar site of international interest due to its bird fauna. It was sampled at four stations located on the northern and northeastern shores of the lake.

Canal Messida is a man-made channel connecting Lac Tonga with the Mediterrannean Sea.

Table 2 List of freshwater malacofauna taxa collected in association with *Bithynia numidica* during this study.

Sampling site	Collected Taxa
Garaet Aïn Nechma	***Bithynia numidica***, *Physella acuta, Planorbis planorbis*
Garaet Sidi Makhlouf	***Bithynia numidica***, *Stagnicola fuscus, Planorbis planorbis, P. agraulus*
Garaet Messaousa	***Bithynia numidica***, *Planorbis planorbis, Hydrobia sp.*
Garaet Zaouia	***Bithynia numidica***, *Physella acuta, Bulinus truncatus*
Garaet Hadj Tahar	***Bithynia numidica***, *Planorbis planorbis, Musculium lacustris*
Boussedra	***Bithynia numidica***, *Bulinus truncatus, Physella acuta, Planorbis planorbis, Hippeutis complanatus, Musculium lacustris*
Oued Bouarroug (2009)	***Bithynia numidica***, *Planorbis agraulus*
Oued Bouarroug (2010)	***Bithynia numidica***, *Stagnicola fuscus*
Lac Tonga (1st station)	***Bithynia numidica***, *Radix auricularia, Physella acuta, Bulinus truncatus, Planorbis planorbis, Musculium lacustris*
Lac Tonga (2nd station)	***Bithynia numidica***, *Radix auricularia, Physella acuta , Planorbis planorbis*
Lac Tonga (3rd station)	***Bithynia numidica***, *Stagnisola fuscus, Radix auricularia, Physealla acuta, Planorbis planorbis, Musculium lacustris*
Lac Tonga (4th station)	***Bithynia numidica***, *Planorbis planorbis, Galba truncatula, Hippeutis complanatus, Musculium lacustris*
Canal Messida	***Bithynia numidica***, *Stagnicola fuscus, Planorbis planorbis, Musculium lacustris*

This channel was built during the French colonial period in order to drain the lake.

RESULTS

Thirteen of the samples from these nine areas were found to contain *Bithynia numidica*, with eight other gastropod species and the bivalve *Musculium lacustris* (O.F. Müller 1774).

The other gastropods occurred as follows: *Planorbis planorbis* (Linnaeus 1758), found in 77% of the sampling sites; *Physella acuta* (Draparnaud 1805), found in 46%; *Stagnicola fuscus* (C. Pfeiffer 1821), in 31%; *Radix auricularia* (Linnaeus 1758) and *Bulinus truncatus* (Audouin 1827), in 23%; *Planorbis agraulus* Bourguignat 1864 and *Hippeutis complanatus* (Linnaeus 1758) in 15%, *Galba truncatula* (O.F. Müller 1774) in 8%, respectively (Table 2). All these species are common in the Mediterranean.

In the box of *Bithynia numidica,* which we borrowed from the Muséum d'Histoire Naturelle Genève, we found two samples which contained one specimen each (Fig. 3.4). One of these could be indentified by us as the holotype, because the two samples have been collected at different sampling sites (holotype: "près Bone" (Fig. 3.3), the other: "env.[irons] de Bone prov.[ince] Const.[antine]" (Fig. 2, label). In his original description Bourguignat referred to *Paludina ventricosa* (Fig. 2), which is also written on the label of the holotype (Fig. 3.3).

SYSTEMATICS

Family Bithyniidae Gray 1857

Genus ***Bithynia*** Leach 1818
Type species *Bithynia tentaculata* (Linnaeus 1758)

Bithynia numidica Bourguignat 1864

Type locality "Cette Bythinie habite dans les cours d'eau des evirons de la Calle et dans l'Oued-Sanhadja [Oued El Kébir], à 20 kilomètres sud-ouest de Bône dans la direction de Jemmapes [Azzaba]." (Fig. 2).

This translates to: "This *Bithynia* lives in watercourses around El Kala and in Oued-Sanhadja [Oued El Kébir] 20 kilometers south-west of Bône [Annaba] towards Jemmapes [Azzaba]." Despite extensive research in different stations of Oued El Kébir surrounding the road bridge between Annaba and Azzaba, *Bithynia numidica* was not re-found.

Description Shell yellowish horn-coloured, 4.5 convex whorls with a deep suture, aperture oval with a blunt angle, umbilicus closed to slit-like (Fig. 4.1). Shell height 4.8–10.0 mm (mainly 6–7 mm), width 3.0–5.7 mm (Fig. 4.1, 4.2). The operculum is oval with a blunt angle and concave at the nucleus. The border of the aperture is in dorsal view sinuate. The height of the shell is very variable. Sexual dimorphism was not recorded.

— 226 —

BYTHINIA NUMIDICA.

Paludina ventricosa (1), *Morelet*, Cat. Moll. Alg., in *Journ. Conch.*, t. IV, p. 297, 1853.

Bythinia Leachi, *Bourguignat*, Not. Palud. de l'Algérie. in *Spicil. malac.*, p. 114. (Mars) 1862 (2).

Testa vix perforata, elongata, ventricosa, subnitida, fulvo-nigrescente, argute striata ac concentrice duabus zonulis albidulis obscure circumcincta ; — spira lanceolato-conica ; apice minuto, lævigato, sæpissime eroso : — anfractibus 6 tumidis, ventricosissimis, regulariter crescentibus, sutura perprofunda separatis ; ultimo 1/3 altitudinis paululum superante ; — apertura verticali, ovata, leviter superne subangulata ; peristomate simplici, atro, continuo — operculo castaneo-nigrescente : nucleo fere centrali, ac striis concentricis numerosi circumcincto.

Coquille à peine perforée, allongée, ventrue, assez brillante, d'un fauve noirâtre finement striée et entourée, à sa partie inférieure, de deux petites zonules spirales blanchâtres. Spire conique, lancéolée, terminée par un sommet lisse, petit, ordinairement érosé. Six tours renflés, très-ventrus, s'accroissant avec une grande régularité et séparés par une suture très-profonde. Dernier tour parfaitement convexe, dépassant un peu le tiers de la hauteur. Ouverture verticale, ovale, légèrement anguleuse à sa partie supérieure. Péristome simple, aigu, noirâtre et continu. Opercule d'un noir-marron, affleurant le bord péristomal, à nucléus presque central et orné d'une quantité de striations concentriques peu saillantes.

Hauteur.	8 millimètres.
Diamètre.	4 1/4 —

Cette Bythinie habite dans les cours d'eau des environs de la Calle (Morelet) et dans l'Oued-Sanhadja, à 20 kilomètres sud-ouest de Bône dans la direction de Jemmapes. (Joba fils.)

La Bythinia Numidica se distingue de la *tentaculata* par son test plus lancéolé, non obèse ; par ses striations plus prononcées ; par ses tours bien détachés, excessivement renflés et convexes ; par sa croissance plus régulière ; par sa suture bien plus profonde ; par son opercule dont les nombreuses stries concentriques peu prononcées entourent un nucléus presque central.

42 43

(1) Non Paludina ventricosa, *Gray*, Med. Reposit., p. 239 (sans descript.), 1821, qui est une espèce différente, spéciale à l'Europe centrale. Cette même espèce a encore été éditée sous les noms suivants : *Turbo Leachi*, Sheppard, Desc. Brit. Shells, in *Trans. Linn.*, vol. XIV, p. 252, 1823. (*Bythinia Leachii*, de Moquin-Tandon, Moll. France, t. II, p. 627, pl. XXXIX, f. 20-22, 1855.) — *Paludina similis* (non *Similis* de Michaud, 1831), Desmoulins, Cat. Moll., in *Bull. Soc. Linn. Bord.*, p. 65, 1827. — *Paludina decipiens* Millet, in *Mém. Soc. Angers*, p. 123, pl. 1, f. 2, 1844. — *Paludina Kickxii*, Westendorp, Desc. Pal. nouv., p. 5, 1835. — *Paludina Michaudii*, Duval, Desc. Coq. nouv., in *Rev. Zoolog.*, p. 211, 1845. — Etc., etc.

(2) — Lorsqu'en 1862 nous avions signalé cette espèce sous l'appellation de *Bythinia Leachi*, d'après l'autorité de M. Morelet, nous ne l'avons fait que sous bénéfice d'inventaire en faisant suivre la note relative à cette coquille du mot dubitatif « *Quid.* » Depuis cette époque, après avoir reçu ce mollusque de l'Algérie, nous avons reconnu facilement que M. Morelet s'était trompé en l'assimilant à la Paludina ventricosa de Gray, 1821 (Turbo Leachi de Sheppard, 1823). Aussi est-ce pour ce motif que nous établissons cette espèce algérienne sous le nouveau nom de Bythinia Numidica.

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Figure 2 Facsimile of the original description of *Bithynia numidica* (scaled-down).

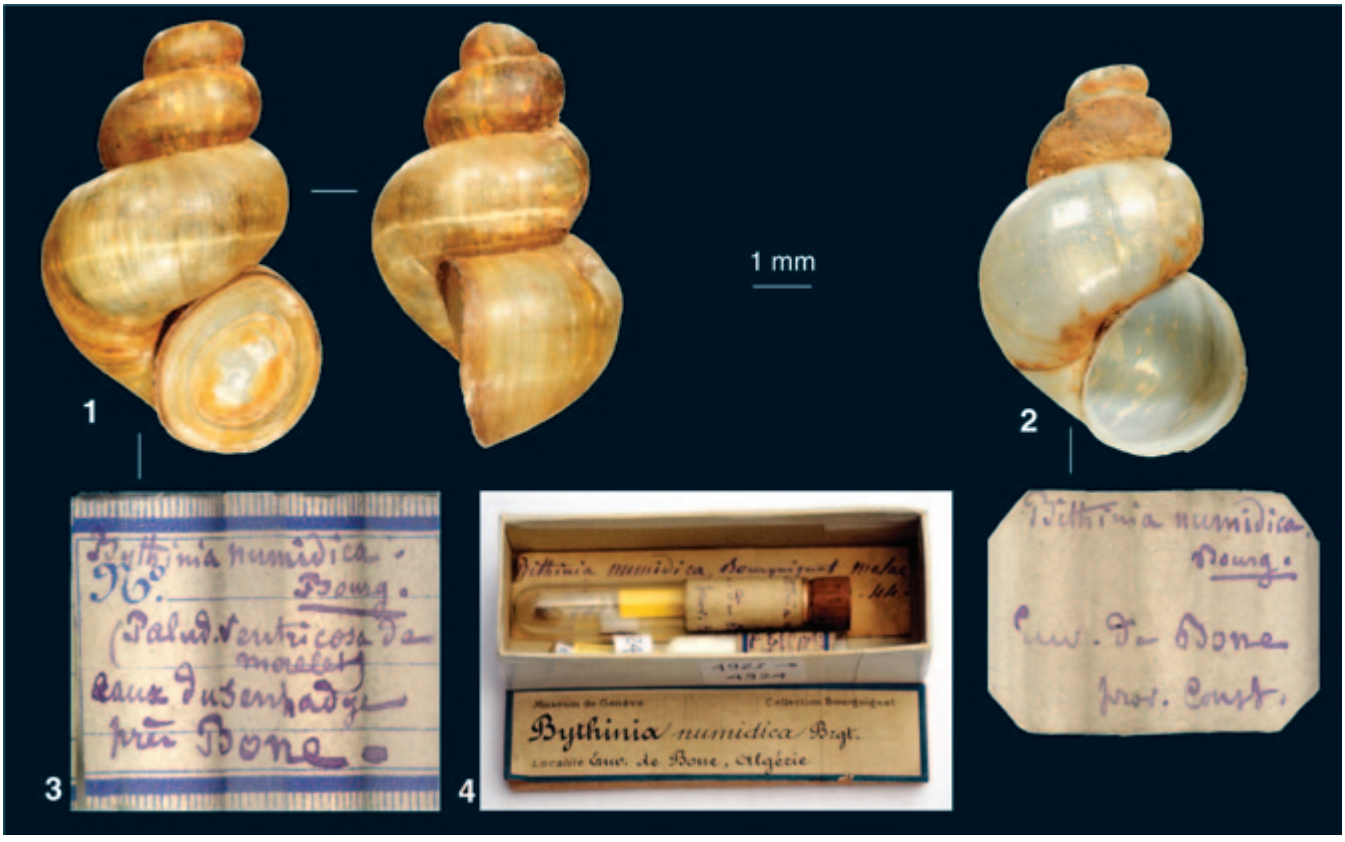

Figure 3 Types of *Bithynia numidica*: **1** holotype; **2** shell from another sampling site; **3** original label of the holotype; **4** label of the 2nd shell.

Figure 4 Topotypes of *Bithynia numidica:* **1** large shell (height = 10.0 mm); **2** small shell (4.8 mm); **3** penis with flagellum; **4** penis in situ.

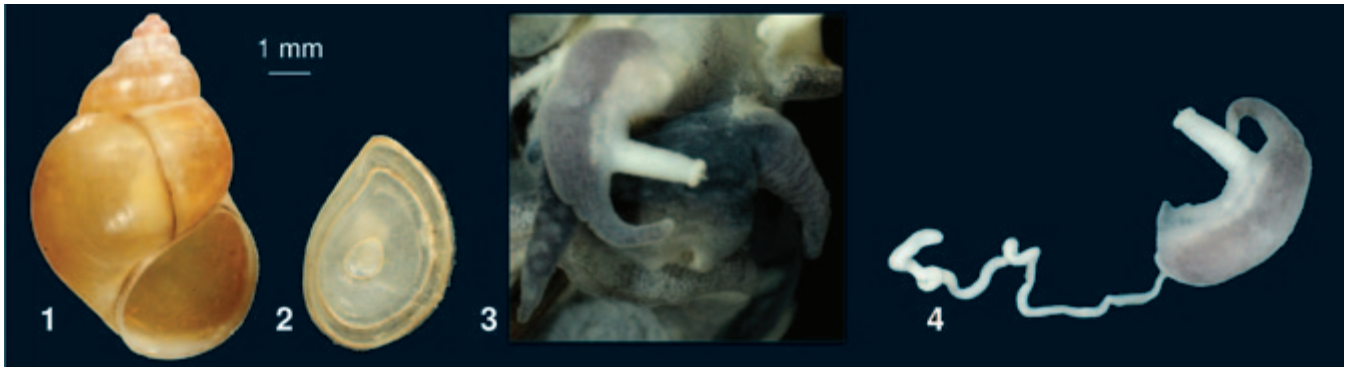

Figure 5 *Bithynia tentaculata* (topotype, Öland, Sweden): **1** shell; **2** operculum; **3** penis in situ; **4** penis with flagellum.

Male copulatory organ The flagellum is not very long, the distal part of the penis is broad, and at the tip pointed, the penial appendix is as long as the penis and is situated in the middle part of the penis (Fig. 4.3, 4.4). In some females we found a pseudo-penis, which is not unusual in *Bithynia* spp. Maybe this is developed due to hormonal malfunction.

Associated species *Planorbis planorbis*, *Physella acuta*, *Radix auricularia*, *Stagnicola fuscus*, *Hippeutis complanatus*, *Bulinus truncatus*, *Galba truncatula* (Table 2). This species composition indicates that *B. numidica* prefers water bodies which are rich in nutrients.

Distribution Because this species is recorded by Bourguignat only from north-eastern Algeria, we believe that it is endemic to this region.

DISCUSSION

The shell and internal anatomy of *B. numidica* are very different from those of *Bithynia tentaculata*

(Fig. 5). The two species may be distinguished easily by the swollen whorls and the deep suture of *B. numidica* compared to *B. tentaculata.*

The variability of the shell height (about 5–10 mm) in this species is large. But the penis morphology and the operculum, two important features in distinguishing between *Bithynia* spp., are similar. Most of the specimens from different sampling sites are small (5–6 mm). Perhaps the larger specimens are infected by internal parasites.

ACKNOWLEDGEMENTS

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