

DESCRIPTION OF A NEW *PSEUDOBITHYNIA* N. SP. (GASTROPODA: BITHYNIIDAE) FROM NORTHWEST TURKEY

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Abstract The Family Bithyniidae widely distributed in the Balkans and is represented by two genera in Europe: Bithynia and Pseudobithynia. More recent data about the Bithyniidae shows that the majority of family members are distributed in the Balkans and especially Greece. Seven species of Bithynia but only one of Pseudobithynia is currently known from Turkey. This study is aimed at describing a new species, Pseudobithynia yildirimi n. sp. from the Biga Peninsula in northwestern Turkey. Pseudobithynia yildirimi n. sp. is compared to related taxa in Turkey, as well as in Greece and neighbouring Iran. The penis variability and status of pseudo-maleness in P. yildirimi were also investigated.

Key words Gastropoda, Bithyniidae, Pseudobithynia yildirimi n. sp., Biga Peninsula, Turkey.

INTRODUCTION

Members of the family Bithyniidae Troschel 1857 are characterized as having an ovoid conical, finely striated shell with a calcareous operculum (Glöer, 2002; Zhadin, 1965). The family is represented by two genera in Europe as well as Asia Minor: *Bithynia* Leach 1818; and *Pseudobithynia* Glöer & Pesic 2006 (Glöer *et al.*, 2007). Recent studies on Bithyniidae show that the majority of species in these genera are found in the Balkans and especially in Greece (Glöer *et al.*, 2007: p. 13; Glöer *et al.*, 2010: p. 179).

The Bithyniidae family is represented by 8 species in Turkey, seven of *Bithynia*, *B. tentaculata* (Linnaeus 1758), *B. leachii* (Sheppard 1824), *B. pseudemmericia* Schütt 1964, *B. phialensis* (Conrad 1852), *B. badiella* (Küster 1852), *B. pesicii* Glöer & Yıldırım 2006 and *B. yildirimi* Glöer & Georgiev 2012, and one of *Pseudobithynia*, *P. pentheri* (Sturany 1904) (Yıldırım, 1999; Glöer & Yıldırım, 2006; Glöer & Georgiev, 2012).

The genus *Pseudobithynia* was recently described from Iran by Glöer and Pesic (2006). Since this first description 16 *Pseudobithynia* spp. have been reported, 9 from Greece (Glöer *et al.*, 2007, 2010), 2 from Iran (Glöer & Pesic, 2006, 2009), 3 from Lebanon (Glöer & Bössneck, 2007) and 1 from Turkey (Glöer & Yıldırım, 2006) and Croatia (Glöer *et al.* 2007). Most of the *Pseudobithynia* recorded in the Balkans have a very restricted geographical distribution (Glöer

& Maassen, 2009: 41) except possibly *P. zogari* Glöer, Falniowski & Pesic 2010 which is thought to be widespread in Greece (Glöer *et al.*, 2010: 180).

According to Glöer & Pesic (2006) and Glöer *et al.* (2007) the most north-western site for members of this genus is Croatia (Krka National Park), while the most southeastern is Iran (Lorestan Province). This study is aimed at describing a new species from the Biga Peninsula in north-west Turkey.

MATERIAL AND METHODS

Gastropods were collected with a sieve from the bank of the stream and were put into 75% lab-grade ethanol. The measurements and dissections of the shell and the genital parts were carried out based on Glöer (2002) and Glöer & Meier-Brook (2002), using a stereomicroscope (Olympus SZX7). The measurements of the digital images of the shell and soft body parts were performed by QCapture Pro 7. The type material is deposited at the Limnology Museum of Çanakkale Onsekiz Mart University (COMULM) and Istanbul University, Science Faculty, Hydrobiology Museum, Istanbul (IUSHM), Turkey.

Field studies were carried out on Tuzla Stream which rises from the Kaz Dağı or Mount Ida (the ancient name), Biga Peninsula – north-western Turkey (Fig. 1). The 52-kilometer-long Creek has an estimated 15 m³ annual flow rate (Anonymous, 2007).



Figure 1 Map of the Biga Peninsula and its major streams with dots showing the collection localities: 1 Korubaşı Village vicinity where the materials densely collected; 2 Tuzla Village vicinity where the additional materials collected (Modified from Google Earth, 2012).

SYSTEMATICS

Family Bithyniidae Gray 1857

Genus *Pseudobithynia* Glöer & Pesic 2006

Type Species by designation *Pseudobithynia irana*
Glöer & Pesic 2006

Pseudobithynia yildirimi n. sp.

Material examined 45 exx from Korubaşı Village Road of Tuzla Stream; N 39°31'30.8264" E 26°17'9.57" 81 m alt., 20.03.2011, Deniz Anıl Odabaşı & Serpil Odabaşı leg.

Additional material examined 7 exx from Tuzla Village Road of Tuzla Stream; 39°33'29.3714" E 26°17'9.57" 17 m alt..

Holotype Shell height 4.20 mm, width 3.10 mm, COMULM-G 0026.

Paratypes 4 ex. IUSHM 20131007–01, remainder in coll. D. A. Odabaşı.

Locus typicus Ayvacık district, west of Biga Peninsula, Çanakkale-Turkey, Tuzla Stream.

Etymology The species was named after Prof. Dr. M.Z. Yıldırım (Mehmet Akif Ersoy Univ. Burdur, Turkey) an outstanding Turkish malacologist specializing in freshwater gastropods.

Description Shell conical and horn-colored. Shell with 4½ stepped whorls with prominent body whorl, up to 5.5 mm height and 4.19 mm

width. Width to height ratio 0.79–0.83. Whorls slightly swollen and sutures deep. Spire moderate. Surface finely striate on last whorl. Umbilicus open. Shell height to spire is 0.08–0.31. Body whorl large and broad. Body whorl to shell height ratio 0.79–0.83. Outer edge of aperture simple and oblique. Aperture oval, slightly angulated at top. Aperture height to shell height ratio 0.83 and aperture width to shell width ratio 0.48–0.74. Operculum calcareous, oval, slightly concave at nucleus with close concentric lines and slightly rising conchioline line on surface (Fig. 2).

Anatomy Penis simple without appendix and flagellum. Tip of penis pointed and body broad-conical. A swelling in middle of penis slightly visible. Penis shape variable. Oviduct loop coiled twice in an S-shape (Fig. 2). Sexual dimorphism not visible ($p > 0.05$) (Fig. 3; Table 1).

Differential diagnosis There is only one other representative of *Pseudobithynia* sp. in Turkey. *Pseudobithynia pentheri* (Sturany 1904) is compared here with *Pseudobithynia yildirimi* n. sp. These species can be easily separated by whorl numbers and shell shape. While *P. yildirimi* has 4½ clearly stepped whorls, in *P. pentheri* this is less obvious. A more prominent shell feature of *P. pentheri* is the blunter shell apex than *P. yildirimi*. The latter also has a unique form of penis; broader body with an acutely separated, short-tapered tip, while the first has a tapered body narrower proximally. Both species show a swelling in the middle of the penis, but this is more prominent in *P. pentheri*. *P. hemmeni* and *P. euboensis* from the Balkans are more similar in terms of shell shape to *P. yildirimi* than *P. pentheri*. However, *P. hemmeni* is larger than *P. yildirimi* in shell height and separated by its flattened sutures, while *P. euboensis* differs in its convex whorls and deep sutures. *P. zogari* is similar to our species in appearance, but is separated by its more convex whorls and deeper sutures and greater whorls, 5–5½. The type species *P. irana* from neighboring Iran is adequately differentiated both in shell shape and penis shape.

Habitat The Tuzla Stream rises from the Kaz Dağı now in a National Park (established in 1993) on the Biga Peninsula, northwestern Turkey (Demirsoy *et al.* 2005) (Fig. 1). The stream is rather shallow stream but flows year-round and is dominated by submerged vegetation on a

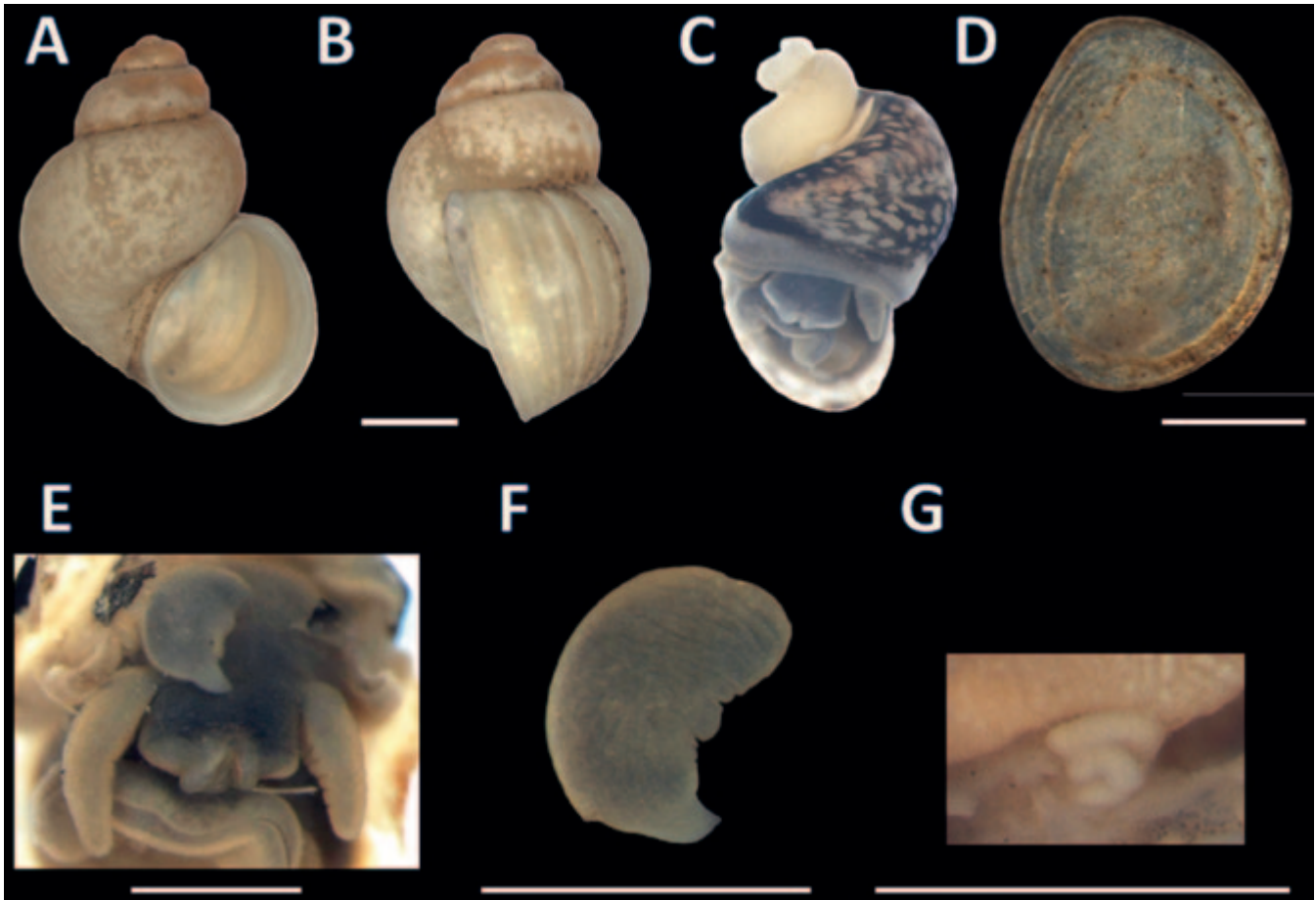


Figure 2 *Pseudobithynia yildirimi* n. sp.: A–B shells in front and side views; C operculum; D pigmentation of the mantle and visceral sac; E pigmentation of head and penis; F penis; G oviductal loop.

coarse-sand substrate. Water temperature varies between about 8.8 and 28.2°C depending on season and was 15.2°C at the time of the sampling. The banks are fairly open but surrounded by *Cyperus* sp., *Phragmites* sp. swamps and woody vegetation. Waste water discharges have been observed near an olive oil mill in the harvest season. The *Pseudobithynia* n. sp. is found associated with *Melanopsis praemorsa* (Oliver 1801), *Valvata* sp., *Physa acuta* (Draparnaud 1805), *Gyraulus piscinarum* (Bourguignat 1852) and *Planorbis intermixtus* Mousson 1874.

Notes on the Ecology and Conservation Tusla stream rises on the western slopes of Mount Ida in the vicinity of Ayvacık. Although the town has one of the lowest population growths in the region, the stream is exposed to some untreated domestic discharges from the surrounding villages. According to a preliminary study by Odabaşı (2011) and our field observations, the main risk factor is seasonal discharges from the processing of olive waste at various points on

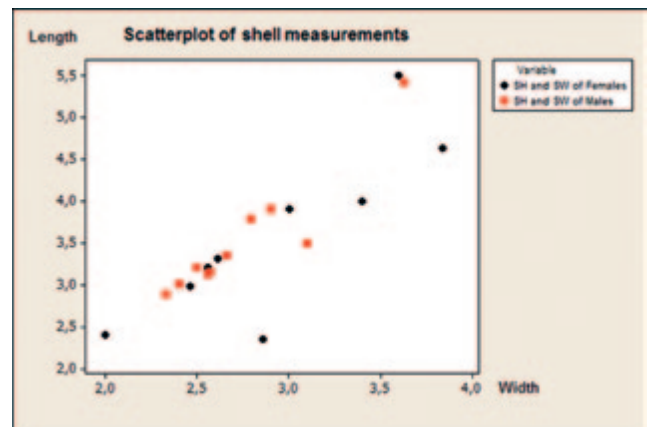
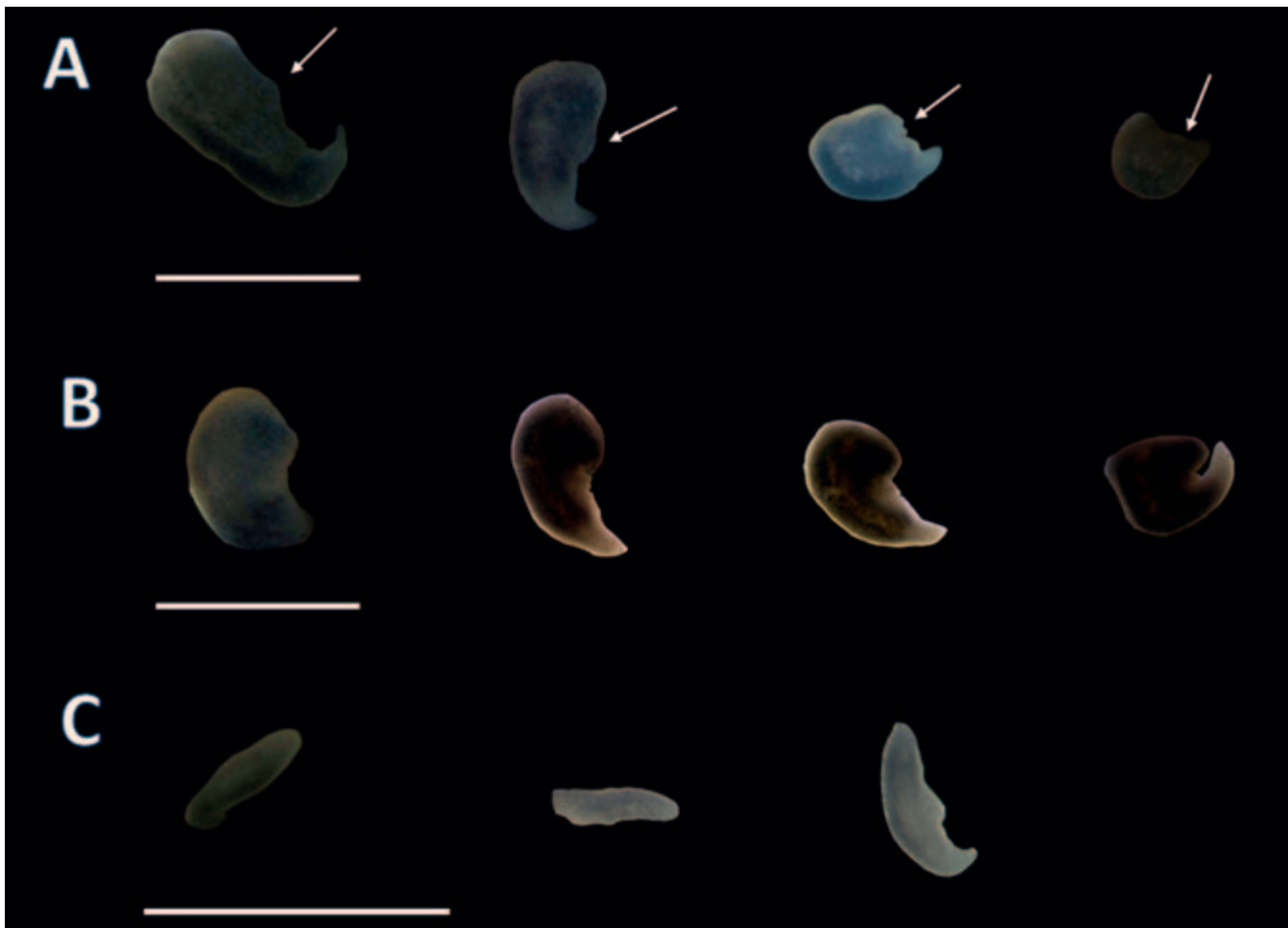


Figure 3 View of shell height (SH) and shell width (SW) measurements of both sexes.

the stream. Since some prosobranch snails can be intolerant of physical and chemical changes in the water (Yıldırım *et al.*, 2006), they may be vulnerable to negative anthropogenic factors. Thus, many prosobranchs including *Pseudobithynia yildirimi* n. sp. believed to be endemic to this area will be at risk, unless preventative measures

Table 1 Measurements of some shell characters of *P. yildirimi* n. sp. with Morphometric Index values (n: sample numbers, SE: Standard Error).

Features Min.–Max (Average±SE)	Male (n=10)	Female (n=10)	Interval of Importance (p Values of Student–t test)
Shell Height (SH)	2.89–5.43 (3.53±0.24)	2.35–5.5 (3.617±0.31)	p=0.83
Shell Width (SW)	2.33–3.63 (2.74±0.12)	2–3.84 (2.93±0.18)	p=0.39
SW/SH	0.69–0.89 (0.79±0.02)	0.66–1.22 (0.83±0.05)	p=0.34
AH/SH	0.45–0.59 (0.55±0.01)	0.51–0.80 (0.59±0.03)	p=0.15

**Figure 4** Penes of *Pseudobithynia yildirimi* n. sp.: **A** penis types having a visible swelling; **B** penis types without swelling; **C** types with penes less than half normal size in some females (imposex).

are taken. Hopefully the present discovery will provide an impetus towards developing conservation awareness of the freshwater resources of this region.

DISCUSSION

Pseudobithynia Glöer & Pesic 2006 is a recently described genus in which there is a simple penis

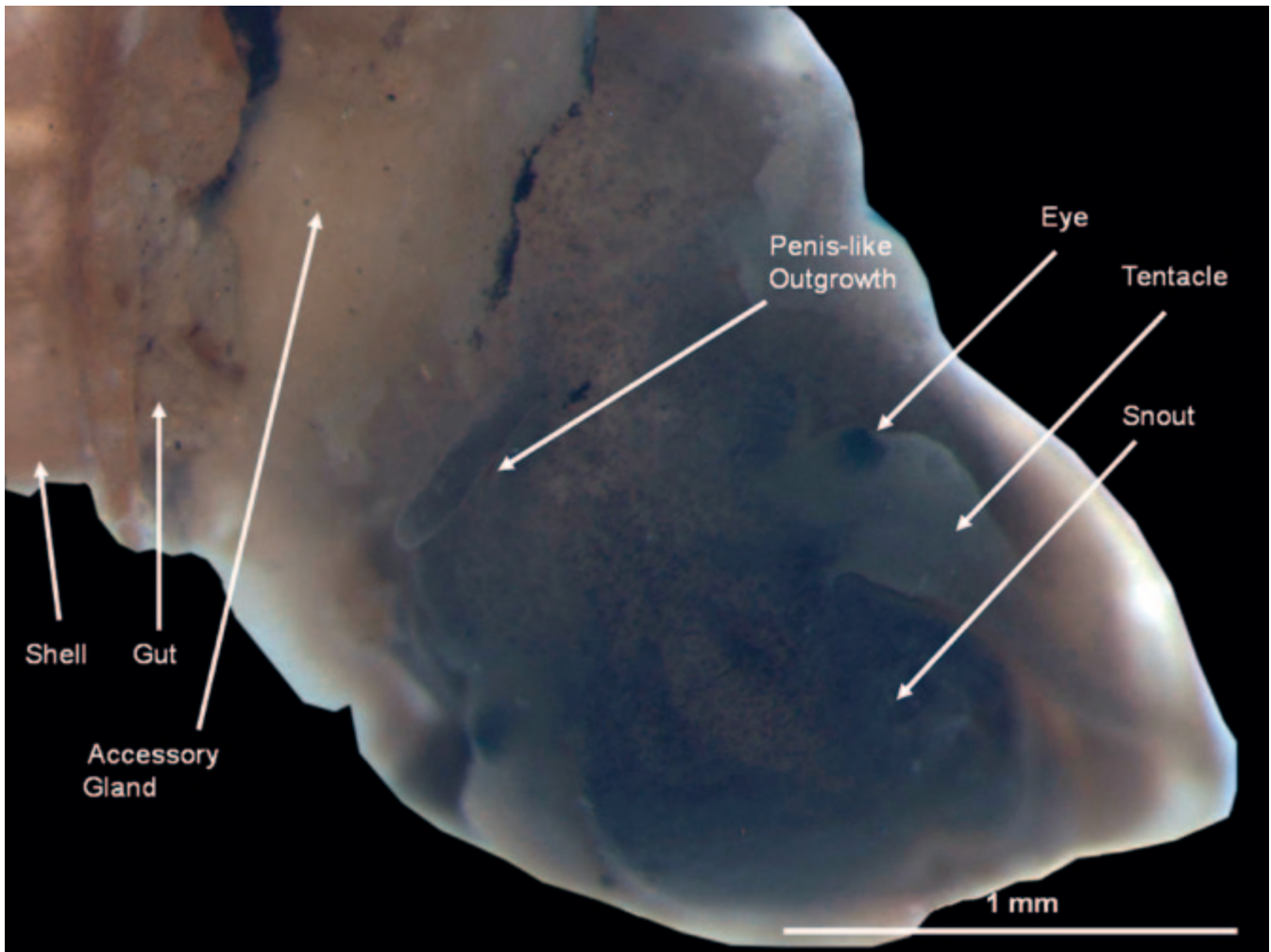


Figure 5 An adult female of *P. yildirimi* n. sp. with a penis-like outgrowth.

with no flagellum (Glöer & Pesic, 2006: 31) while *Bithynia* Leach 1818, a closely related genus has both an appendix and flagellum. Conchological characters are mainly used in the identification of bithyniids, in addition to penis morphology and sexual dimorphism (Glöer & Maassen, 2009: 41–42). As can be seen in the differential diagnosis section, *Pseudobithynia yildirimi* is apparently separated by conchological and anatomical characters (penis morphology) from other species of this genus found in Turkey and neighbouring countries.

Dispersal of the Bithyniidae has been well-studied issue in recent years especially in the Balkan Region (Glöer *et al.*, 2007; Glöer & Maassen, 2009; Glöer *et al.*, 2010). According to Glöer *et al.*, (2007) and Glöer & Maassen (2009), most of the *Bithynia* and *Pseudobithynia* species that live in Balkans have a very restricted distribution. Only *B. hellenica* and *P. zogari* are seem to be widespread in the lowlands of Greece

(Glöer *et al.*, 2010: 180). Sturany (1905) reported that “The new species found by Dr. Penther in Soisaly, Erdschias-Dagh on 6./VI. 1902, is an isolated species within the genus *Bithynia*” (Glöer & Yildirim, 2006). Thus, the *P. pentheri* described by Glöer & Yildirim, 2006 after dissections of the topotypes regarded it as an isolated species in the type locality. According to the our own extensive field samplings, *P. yildirimi* seems to be restricted to its type locality, and is probably a relict species in the Biga Peninsula basin.

Penis variability issue has drawn very little attention since this was noted for the *P. zogari* population (Glöer *et al.*, 2010). In our study, the penis variability within *P. yildirimi* was examined (Fig. 4). We report two types of penis morphology based on this examination. The first has a broad conical shape with tapered tip and with a small swelling in the middle (Fig. 4A). The second lacking this the swelling is much less common (Fig. 4B). On the other hand, a penis-like outgrowth

were observed in some of the adult females, an abnormality called “imposex” (Figs 4C, 5). The imposex or pseudo-maleness in female gastropods is a well known phenomenon that is frequently encountered in marine gastropods and caused by the toxic effects of certain pollutants e.g. tributyltin (Ruiz *et al.*, 1998). But there is no information available about masculinization of freshwater gastropods so far. Although, the genital abnormality observed in this study is in another field of research, it is thought to be possibly a result of pollution from wastes, but needs further research.

Although, there has been numerous studies performed on the freshwater mollusc fauna of Turkey, the distribution patterns and taxonomic status of Bithyniidae in Asia Minor have not been fully elucidated (Glöer *et al.*, 2007). In conclusion, more comprehensive researches focusing on the Bithyniidae should be performed in Turkey. Recent studies carried out by Glöer & Yıldırım (2006) and Glöer & Pesic (2006) as well as Glöer & Georgiev (2012), indicate the potential presence of many more new species.

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