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First record of five terrestrial snails in the State of Qatar

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Abstract: The present contribution outlines a first record of 5 encountered terrestrial gastropods new to Qatar. The preliminary account of these species and their zoogeographical origins are discussed. The species belong to 4 families: Subulinidae, with 2 genera, *Zootecus* and *Allopeas*; Polygyridae, with 1 genus, *Polygra*; Hygromiidae, with 1 genus, *Monacha*; and Helicidae, with 1 genus, *Eobania*.

Key words: Terrestrial snails, first record, Qatar

Introduction

Introduction of agricultural weeds into any country with agricultural and/or horticultural development is not an uncommon fact. The expansion in agriculture in Qatar since the late 1970s and the introduction of seasonal and ornamental garden and shade plants has increased the number of the recorded plant weeds (Abdel Bari, 1995). Serious invasion of alien weed species such as *Euphorbia* and *Convolvulus* became widespread all over Qatar (Abdel Bari, 1995).

Introduction of bird species and small pet mammals are equally common. Recent awareness of the dangers of these possible future pests has promoted the customs authorities to tighten import laws. However, the fact remains that these taxa already exist in Qatar and have now become naturalized. The common myna, *Acridotheres tristis* (Linnaeus, 1766), is a bird species native to India. The common myna has spread all over Doha since it was first recorded in 1986 (Warr, 1986).

Although not threatening to human health, alien species can cause serious agricultural or economical problems arising from loss of crops or general nuisance (e.g. the common myna and the feral pigeon, *Columba livia*). One serious pest group, of which there is no record as of yet, is the land snails. The purposeful introduction of some species (e.g. *Achatina fulica* and *Euglandina rosea*) in some countries has caused serious problems. A well-documented agricultural pest introduction is that of helicid *Theba pisana* (Müller, 1774) (Gastropoda: Helicidae), which causes defoliation of citrus plants and forms large populations on individual trees. In recent years, the infestation of garden plants, parks, etc. with land snails in Qatar has been increasing.

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Land and freshwater snails and slugs are being homogenized as a result of the decline of indigenous species (Kay, 1995; Cowie, 1998a, 1998b; McKinney and Lockwood, 1999; Robinson, 1999; Cowie, 2000), by predation or establishment of suitable modified habitats (Cowie, 1998a, 1998b). Introductions of nonindigenous species can result in substantial ecological, agricultural, medical, and economic problems and extirpation of native fauna (Rahel, 2002).

The investigation of malacofauna and its importance for zoogeographical analysis of the Arabian Peninsula in general and Qatar in particular has been neglected throughout history. Most studies undertaken by Paladilhe (1872), Martens (1889), and Jousseaume (1889, 1890, 1899) are relatively outdated. Pallary (1925, 1928) was the last to present a checklist of the Arabian terrestrial and freshwater mollusks until the recent checklist of Neubert (1998), with 11 species described as new to science, 7 species recorded as new to the malacofauna of the Arabian Peninsula, 3 generic or subgeneric combinations introduced, and 2 species designated. Just recently, Neubert (2002) recorded 9 species from the Socotra archipelago (Yemen), 8 of which were new to science.

Qatar is a developing country expanding in a number of sectors, including the agricultural and horticultural sectors. The present study deals with 5 exotic taxa recorded for the first time in Qatar. These species were possibly introduced in the soil of potted plants from neighboring countries.

Materials and methods

Live snails and empty shells were collected from various locations (house gardens, public gardens, farms, water pools) from Doha City, Al-Wakrah, and Al-Khor. The specimens were kept under laboratory conditions on moist soil with plant material as feed. Living specimens were sorted, classified, and described with notes on their distribution in Qatar (Figure 1). Nomenclature is in accordance with the work of Neubert (1998), it being the most recent and comprehensive for the Arabian Peninsula.

Specimens were collected from March 2002 to May 2002 and in May 2007. All samples were collected by hand from an area of 1 m^2 with 3 replicates in each sampling process. Specimens were cleaned, and the width and total height and length of each was measured from the umbo to the ventral edge of the shell to the nearest millimeter using a vernier caliper. Cleaned specimens were photographed at the Multimedia Unit of the Environmental Studies Center of Qatar University. The identification of the taxa was based mainly on the work of Neubert (1998). Specimens of 4 species were sent to the Natural History Museum (London, UK) to confirm their identity.

The mean numbers of each taxon within the study sites were noted to determine the density of the individual species. Habitat preference was observed in the field. In most cases, the date of snail species' introduction is considered to be the date of its first record, or the earliest date of its collection in Qatar or documented observation. An annotated checklist is included.

Results

The specimens collected were found to belong to 5 species of 5 different genera, each represented by 1 species only. These were *Zootecus insularis* (Ehrenberg, 1831), *Allopeas gracilis* (Hutton, 1834), *Polygyra cereolus* (Mühlfeldt, 1816), *Monacha obstructa* (Pfeiffer, 1842), and *Eobania vermiculata* (Müller, 1774). Of the 5 species, *Zootecus insularis* is the most common and widespread, being collected from houses, parks, and agricultural fields (Figures 2a and 2b). Throughout, moist soil and shade were the preferable habitats. These included areas beneath potted plants in earthenware or plastic pots, in cracks at wall edges, subsurface moist areas, and sometimes roots or leaves (Figure 3). The other 4 species were also collected mostly from the same habitats as *Zootecus insularis*, but with lesser abundance (Table 1).

Annotated checklist

Class **Gastropoda** Cuvier, 1795

Family **Subulinidae**

I - Genus ***Zootecus*** Westerlund, 1887

Species ***Zootecus insularis*** (Ehrenberg, 1831)

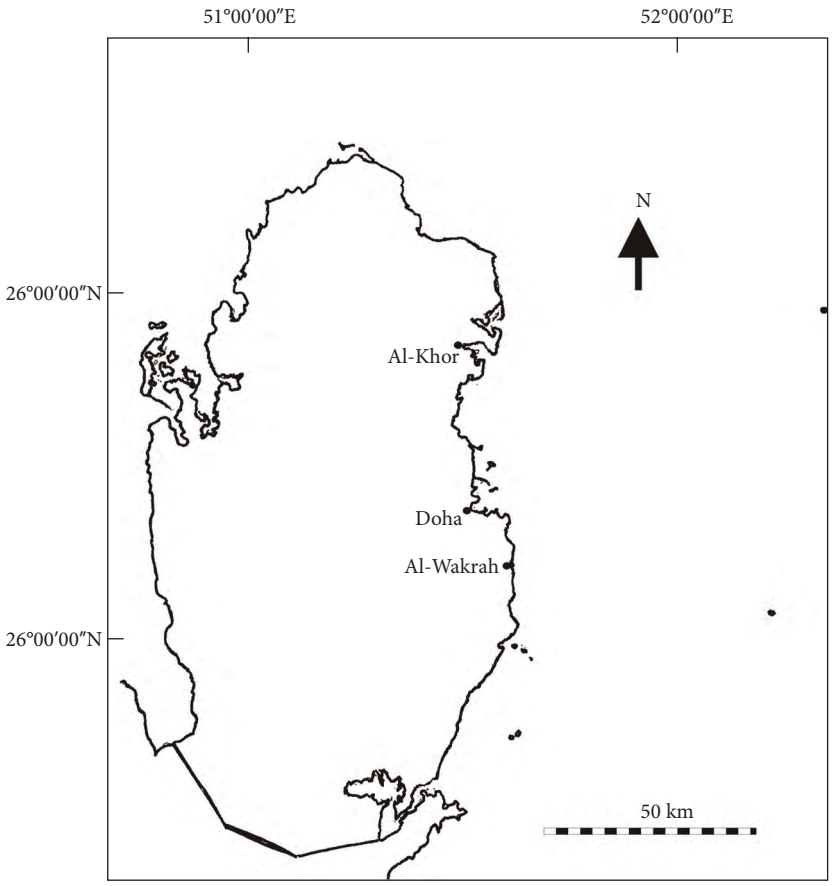

Figure 1. Distribution of terrestrial snails in 3 Qatari cities.

Figure 2. (a) Live specimen and (b) dead shells of *Zootecus insularis* in a local garden in Doha.

Description: Shell height ranges between 11-15 mm and shell diameter ranges between 5-6 mm with a thick white conical shell. The teleoconch whorls are nearly cylindrical and display very fine axial riblets. Irregular spiral grooves may interrupt the axial sculpture. The aperture is subquadrate with a thickened peristome (Figure 4).

Figure 3. Live specimen of *Zootecus insularis* attached to leaves.

Figure 4. *Zootecus insularis*.

Table 1. Terrestrial snails collected from different locations in Qatar.

Species	Mean abundance/m^2 (± S.D.)	Locality	Date of collection
Zootecus insularis (Ehrenberg, 1831)	752 ± 40	Doha, Al-Khor, & Al-Wakrah	March 2002-May 2003, December 2005, & December 2005
Allopeas gracilis (Hutton, 1834)	80 ± 16	Doha	March 2002-May 2003
Monacha obstructa (Pfeiffer, 1842)	152 ± 28	Doha	March 2002-May 2003 and April 2004
Polygyra cereolus (Mühlfeldt, 1816)	252 ± 32	Doha	March 2002-May 2003
Eobania vermiculata (Müller, 1774)	N.R.	Doha	May 2007

N.R. = Not Recorded

Remarks: This species is widespread with high abundance at the study sites (Table 1). In house gardens, it was found at different soil depths, reaching down to 25 cm.

Distribution: Widespread in the Saharo-Sindian region. In the Arabian Gulf states, it was reported from Saudi Arabia and Oman (Neubert, 1998).

II - Genus ***Allopeas*** H.B. Baker, 1935

Species ***Allopeas gracilis*** (Hutton, 1834)

Description: A conical elongated shell with height ranging between 8-13 mm and a diameter ranging between 2-4 mm. The teleoconch whorls are nearly rounded with a deep suture. The whorls' surface is covered by fine and dense axials. The aperture is oval-shaped (Figure 5).

Figure 5. *Allopeas gracilis*.

Remarks: This species was recorded in Doha City with 80 ± 16 individuals/m^2 (Table 1).

Distribution: Widespread in the Indo-Pacific region. It is spread easily by human activities. In the Arabian Gulf states, it was reported from Saudi Arabia and Oman (Neubert, 1998).

Family **Polygyridae**

Genus ***Polygyra*** Say, 1818

Species ***Polygyra cereolus*** (Mühlfeldt, 1816)

Description: The shell is brown and discoid with a low conical spire. Shell height ranged between 4-6 mm and the maximum shell diameter was 13 mm, much broader than long. The teleoconch whorls are narrowly coiled and shed by a deep suture. The surface is covered by coarse and regularly spaced ribs (Figure 6).

Figure 6. *Polygyra cereolus*.

Remarks: This species was recorded in Doha City with 252 ± 32 individuals/m^2 (Table 1).

Distribution: *Polygyra cereolus* is native to Florida (USA), but it has been easily spread by human activities. In the Arabian Gulf states, it was reported from Saudi Arabia, in Jubail and north of Dhahran, by Neubert (1998).

Family **Hygromiidae**

Genus ***Monacha*** Fitzinger, 1833

Species ***Monacha obstructa*** (Pfeiffer, 1842)

Description: The shell is small, ear-shaped, much broader than long, with a half-moon-shaped aperture. Shell height ranges between 5-6 mm and shell diameter ranges between 10-12 mm. The teleoconch is opaque and the whorls are evenly rounded. The species color is cream-white (Figure 7).

Figure 7. *Monacha obstructa*.

Remarks: This species was recorded in Doha City with 152 ± 28 individuals/m^2 (Table 1).

Distribution: This species is known mainly from southern Turkey and Syria to Jordan. In the Arabian Gulf states, it was reported from Saudi Arabia, particularly from oases (Neubert, 1998).

Family **Helicidae**

Genus ***Eobania*** Hesse, 1913

Species ***Eobania vermiculata*** (Müller, 1774)

Description: Maximum shell height of 15 mm and maximum shell diameter of 30 mm, appearing almost spherical. Underside creamy white with glossy earlobe-shaped aperture. The sides are banded with 2 honey-colored bands and 2 creamy white and striated bands (Figure 8).

The teleoconch is cream with recurved pale brown rim.

Figure 8. *Eobania vermiculata*.

Remarks: Only one sample was encountered. The specimen resembles species *Helix aspera*, but differs in shell pattern, banding, and color.

Distribution: Widespread in the Mediterranean region. It is spread easily by human activities. In the Gulf states, it was reported from Wadi Hanifa in central Saudi Arabia (Mordan, 1980).

Discussion

The 5 terrestrial snail species recorded in Qatar are not native. There is no doubt that the dates given as first records are underestimated. Snail eggs and/or juveniles are less readily detected than adults. Their introduction was probably through imported soil, natural fertilizers, and/or other plant products.

Effective quarantine measures may be needed to examine potting and garden soils and to prevent the introduction and spread of exotic taxa. Once found, they should be eradicated.

A total of 70 terrestrial species and 27 fresh water mollusks have been recorded as valid taxa of the Arabian Peninsula. This number of species is remarkably low because of geological and climatological factors, as well as insufficient knowledge of many parts of the Arabian Peninsula from a malacological point of view (Neubert, 1998).

The Arabian malacofauna is composed of several groups that invaded the peninsula at different times and originated from different zoogeographical units. These are the Palearctic, the Afro-tropical, and the Saharo-Sindian groups. The groups are still represented by species that show a similar distribution pattern.

As shown in Table 2, the Palearctic group comprises species and genera that are well-known representatives of the western Palearctic. Within this group, only *Monacha obstructa* has been recorded in Qatar. It belongs to the Levantinian fauna that spread from Syria and Jordan to the south.

The Saharo-Sindian group comprises a few species that are known from a vast area, from northern Africa and the Arabian Peninsula to the Middle East and northern India. It comprises the holo-Saharo-Sindian group, including *Pupoides coenopictus* and *Zootecus insularis* (Neubert, 1998). The latter species was recorded in Qatar during the present study.

Polygyra cereolus and *Allopeas gracilis* were both introduced from the New World, the former from Florida and the latter from Central America (Neubert, 1998). In the present study, *Polygyra cereolus* was found to adapt to the artificial environments of house gardens around Doha City. Most of these house gardens are irrigated regularly and, combined with the hot climate, a permanent tropical microclimate is produced which will eventually support the population growth of *Polygyra cereolus*. The species population has been reported as well-established in the gardens of the industrial city north of Jubail in

Table 2. Introduced terrestrial snail species in Qatar, with date of the first record and zoogeographical origin*.

Species	Date	Saharo-Sindian	Palearctic		Afro-tropical	Introduced
		(holo)	Lev.	West	(Et.H.)	
Zootecus insularis	March 2002	●		●	❍	
Allopeas gracilis	May 2002					●
Monacha obstructa	May 2002		●			
Polygyra cereolus	May 2002					●
Eobania vermiculata	May 2007			●		●

* Zoogeographical origin modified from Neubert (1998).

● Species also presented outside the Arabian Peninsula.

❍ With generic affinities, or present generically.

Saudi Arabia. It is likely that it was introduced by American employees of oil companies (Neubert, 1995, 1998). The remaining species, *Eobania vermiculata*, was frequently dispersed by soil adhering to the roots of plants. Introduction of allochthonous vegetation, in particular in private gardens, recreational areas, or simply in plantings along roadsides, supports successful settlements of alien faunal elements (Neubert, 1998).

Moreover, the rate of introduction of alien species such as snails and slugs appears to be on the increase in the region and was particularly noticed in Qatar. Five snail species were recorded from different parts of mainland Qatar.

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