



## First record of the invasive snail *Myosotella myosotis* (Draparnaud, 1801) in coast Shatt al-Arab estuary/ Al-Faw District, Basrah-Iraq

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### ARTICLE INFO

#### Article History:

Received: March 23, 2021

Accepted: April 29, 2021

Online: May 30, 2021

#### Keywords:

Invasive,  
Mouse ear snail,  
*Myosotella myosotis*,  
Al-Faw District.

### ABSTRACT

The present study investigated the first record of invasive mouse ear snail *Myosotella myosotis* (Draparnaud, 1801) (Pulmonata: Basommatophora: Ellobiidae) in Shatt al-Arab estuary coast north the District of Al-Faw, Basrah, Iraq. During a period from January to December 2019, one sample was collected monthly from two selected sites in Shatt al-Arab estuary shoreline. Some biological, and ecological notes on this ellobiid gastropod from Iraqi coast in addition to photographs, were provided to confirm the identification of the snail, provided with brief comments on its measured morphological features. Results showed that the mean population density of both the two study sites of *M. myosotis* ranged from 66 ind./m<sup>2</sup> during April at site 1 and 0 ind./m<sup>2</sup> in some other months at site 2.

### INTRODUCTION

Phylum Mollusca are probably the third most important animal group after the arthropods and vertebrates (Desoky, 2018). Gastropoda is the only class of Mollusca which have successfully invaded land. They are one of the most diverse groups of animals, both in shape and habit. Among Gastropods, land snails (subclass: Pulmonata) are one of the most numerous with almost 35,000 described species of the world (South, 1992). Considerably, the snail *M. myosotis* prefers to reside in certain salty coastal areas in the intertidal zone (Welter-Schultes, 2012).

Though several recent studies have addressed the aquatic and land snails (Abdul-Sahib, 2005; Al-Khafaji, 2009; Naser *et al.*, 2009; Naser, 2010; Al-Waaly *et al.*, 2014; Al-Khafaji *et al.*, 2016a,b; Ali *et al.*, 2019), only few have been conducted on the aquatic and land snails of Iraqi coasts.

This snail species is mainly found in most coasts of Europe continent, along the coasts of Ireland, Scotland, the United Kingdom and Denmark, and also reaches the coasts of the Mediterranean countries and the shores of the Black Sea, the Aegean Sea and the Sea

of Marmara (Golikov & Starobogatov 1972; Wilter Schultz 2012). Later, the occurrence of this snail was recorded in North America, Bermuda, Uruguay, Jamaica, the Azores, South Africa, Australia and New Zealand (Martins 1999; Morton & Britton, 2000; Orensanz *et al.*, 2002; Fofonoff *et al.*, 2003; Scarabino 2004; Cohen 2005).

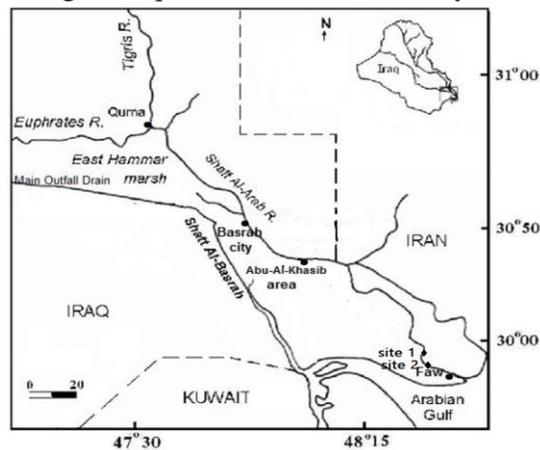
The abundance and success of *M. myosotis* (also reported as *Ovatella myosotis*) is related to mainly its ability to occupy a semi-terrestrial environment than to its potential to outcompete native snails for resources. (Herbert, 2012).

During the last two decades, land and coastal waters of Iraq was attacked by many invasive organisms, including this species recorded for the first time in the coastal areas of Shatt al-Arab estuary, perhaps due to the impact of climate changes.

Hence, To detect the occurrence of this invasive species *M. myosotis* in the Iraqi coast in the intrtidal zone of Shatt al-Arab estuary north the district of Al-Faw was targetted in the present study. It is noteworthy that the preset work investigated the first occurrence of this species in the Iraqi coast and the Arabian Gulf.

## MATERIALS AND METHODS

The present study worked on 304 specimens of snail *M. myosotis*; hand-collected by authors in Marine Biology Dep./ Marine Science Center, from two selected sites in Shatt al-Arab estuary shoreline. Both sites are north of Al-Faw District, located 29° 58' 49" N, 048° 28' 01" E (Fig. 1). For the population density purposes, the samples were collected by using the quadrat (100 cm<sup>2</sup>). during the extended period from January 2019 to December 2019 with one sample per month. The snail specimen was identified visually using digital microscope as well as available identification guides and keys of Demir (2003), Mitov *et al.* (2003) and Mitov (2016). All snail specimens were brought to the laboratory and kept alive in glass aquarium for further study.



**Fig. 1:** A map represents two selected sites in the study area, north Al-Faw District.

## RESULTS AND DISCUSSION

### 1. The taxonomy:

Phylum : Mollusca

Class : Gastropoda (Cuvier, 1797).

Order : Basommatophora (Schmidt A., 1855).

Family : Ellobiidae (L. Pfeiffer, 1854 (1822)).

*Myosotella myosotis* (Draparnaud, 1801).

### 2. Description:

The mouse ear snail has a yellow-brown color shell with a shiny appearance. Magnified microscopically of samples revealed that the upper flats are slightly streaked and sometimes even hairs are visible. The shell has a pronounced oval mouth with a white lip. On the upper side there is often a white layer (callus) as shown in Fig. (2). The upper wall is made of lamella 1) clearly and extending horizontally. There is often a second wall (Lamella 2). The lower (vertical) lamella 2 on the shell spindle is also clearly constructed. The navel is usually covered. The body color is distinctive for the soft snail being light brown to light gray and slightly opaque, visible on the upper side. Small dark eyes are placed at the base of the tentacles towards the midline of the body.

The body color of the soft snail is light brown to light gray, and it is usually slightly darker on the upper side. Small dark eyes are placed at the base of the tentacles, towards the midline of the body (Fig. 3).

Measurements: The shell length ranged between 5-16 mm and the width ranged from 3-6 mm (Fig. 2).



**Fig. 2:** Specimens of *Myosotella myosotis* plate 1.



Fig. 3. Shows the size and color of the snail body *Myosotella myosotis* plate 2.

### 3. Habitat and distribution:

Snails always live on beaches that are slightly affected by tides, where small snails of the *M. myosotis* can be found under stones and driftwood. Mouse ear snail habitats are usually found in areas with brackish water, but not entirely in marine water. The optimum salinity level of a snail is about 1.8‰, and the salinity tolerance of a mouse ear snail is between 1.1 and 6.5‰, so it is rather broad. Mouse ear snails mainly feed on brown algae, decomposing water plants and other organic matter (Peychev & Dimitrov, 2012). Mouse ear snails can be found along the Mediterranean coast (Spain, Italy, Istria, Dalmatia, Albania, Greece, western and southern Turkey, as well as near the Black Sea. (Öztürk & Çevik, 2000; Öztürk *et al.*, 2014). Additionally, along the coasts of Western Europe, *M. myosotis* is found so far as Ireland and Scotland, in a sporadic pattern in the north Germany (also on the Baltic Sea coast) mouse ear snails have been introduced to Cuba, as well as in Bermuda (Scarabino, 2004; Cohen, 2005).

In the study area, the mean monthly density of the snail *M. myosotis* ranged from 0 Individuals / m<sup>2</sup> recorded during some months in site 2 to 66 Individuals / m<sup>2</sup> in April 2019 in site 1 (Table 1).

**Table 1.** Mean monthly densities (ind./m<sup>2</sup>) of the snail, *Myosotella myosotis* from two sites in study area of Shatt Al-Arab estuary in Al-Faw District / Basrah- Iraq during Jan. to Dec. 2019 (site 1 north study area, site 2 south study area).

Species	Jan. 2019	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Spt.	Oct.	Nov.	Dec.
<i>Myosotella myosotis</i>												
Site 1	42	44	45	66	8	12	18	12	10	16	28	22
Site 2	20	34	11	0	0	0	0	0	6	6	4	0

#### 4. Biological and Ecological notes:

It was mentioned that individuals of this species prefer to live under or on the rocks and plants found in the coastal area of Shatt al-Arab estuary that reaches the highest daily tide. Furthermore, the presence of this snail has been recorded under rocks outside the water (Kaneva-Abadjieva, 1960; Marinov, 1990; Hubenov, 2005, 2007). It is also found among decomposing plants on marine silt in the coastal area (Damyanov & Likharev, 1975; Gruev, 2000) because these animals feed on the remains of decomposing plants while crawling over the surfaces (Jaeckel, 1986; Cohen, 2005; Wiese & Rrichling, 2008).

Monthly samples were collected continuously during the year 2019 from *M. myosotis* individuals in the highest water-reaching area from the intertidal coastal area of Shatt al-Arab estuary. They were found under the rocks that are partially submerged and which are always wet containing growths from species of algae.

Mouse ear snail/salt marsh snail was found throughout in many saline intertidal zones of the world. In the USA, this snail was first identified in the San Francisco estuary in 1871, and was likely introduced to the bay through shipments of Atlantic oysters (Cohen & Carlton, 1995). Since this species lacks a planktonic larval phase, its spread would have resulted from the movement of adults and/or eggs (Berman & Carlton, 1991). Remarkably, it is a euryhaline species due to its existence in estuarine habitats subjected to a wide range of salinities. On salt-rich coasts, such as the North Sea coast, the shell is thicker, larger, and longer than on salt-poor coasts, such as the Baltic Sea coast.

#### CONCLUSION

This snail *M. myosotis* is considered an invasive species and is fast and widely spreading in many countries of the world. It is found in Turkey and most of the European countries. The collection of live samples of this snail with various sizes for the first time from the coastal areas of Shatt al-Arab estuary, is an evidence of its speedy spread and ability to resist difficult environmental conditions. Moreover, the occurrence of this snail species is due to the fact that this species can easily be distributed by human activities. To sum up, the present record adds to the land and aquatic snail fauna of Iraq.

#### REFERENCES

- Abdul-Sahib, I.M.** (2005). A new record of a white terrestrial snail *Monacha obstructa* (Pfeiffer, 1842), (Gastropoda: Pulmonata) from the Iraqi marshes. *Journal of Basrah Researches (Sciences)*, 32: 70-73.
- Al-Waaly, A.B.M.; Mohammad, M.K. and Al-Miali, H.M.** (2014). Freshwater snails Diversity in the Middle and South Regions of Iraq. *Adv. Biores.*, 5 (3): 166-171. DOI: 10.15515/abr.0976-4585.5.3.166171.

- Al-Khafaji, K.K.; Abdul-Sahib, I.M. and Aziz, N.M.** (2016a). First record of terrestrial snail *Eobania vermiculata* (O. F. Muller, 1774) (Gastropoda: Helicidae) from Basrah, Iraq. *Arthropod* 5(3): 125- 129.
- Al-Khafaji, K. K.; Al-Maliki, G. M. and Al-Shemary A.S.**(2016b). The ecological habitats and density of invasive Apple Snail *Pomacea canaliculata*, Lamarck,1822 (Gastropoda: Ampullariidae) at the banks of Shatt Al-Arab River, Basrah, Iraq, *Journal of Basrah Researches ((Sciences))*. 4 2 (2):10-20.
- Al-Khafaji, K.S.** (2009). The First record of *Xeropicta mesopotamica* (Mousson, 1874) from Hareer region, southern marshes of Iraq. *Mesopotamian Journal of Marine Science*, 24(2): 122-125.
- Berman, J. and Carlton, J.T.** (1991). Marine invasion processes: interactions between native and introduced marsh snails. *Journal of Experimental Marine Biology and Ecology*, 150:267-281.
- Cohen, A. and Carlton, J.T.** (1995). Nonindigenous aquatic species in a United States estuary: A case study of the biological invasion of the San Francisco Bay and Delta. Report prepared for the US Fish and Wildlife Service and the National Sea Grant College Program. Accessed 25 May 2016: <http://nsgl.gso.uri.edu/conn/connt95002/connt95002main.pdf>
- Cohen, A.N.** (2005). Guide to the Exotic Species of San Francisco Bay. San Francisco Estuary Institute, Oakland, CA, Available at: [www.exoticguide.org](http://www.exoticguide.org). Last updated: June 7, 2005. (Accessed on 03 July 2011).
- Damyanov, S. and Likharev, I.** (1975). Fauna Bulgarica, Gastropoda terrestria, vol. IV. Sofia (Bulgarian Academy of Sciences). 425 p. (In Bulgarian).
- Demir, M.** (2003). Shells of Mollusca Collected from the Seas of Turkey. – *Turkish Journal of Zoology*, 27: 101-140.
- Desoky, A.E.-A.S.S.** (2018). Identification of terrestrial gastropods species in Sohag Governorate, Egypt. *Archives of Agriculture and Environmental Science*, 3(1), 45-48. <https://doi.org/10.26832/24566632.2018.030105>
- Fofonoff, W.; Ruiz, G.M.; Steves, B.; Hines, A.H. and Carlton, J.T.** (2003). National Exotic Marine and Estuarine Species Information System. <http://invasions.si.edu/nemesis/>. Accessed on 06 January 2011.
- Golikov, A.N. and Starobogatov, Y.I.** (1972). Tip Mollyuski – Mollusca, klass bruhonogie molluski – Gastropoda Cuvier, 1797. In: Mordukhai-Boltovskoi F.D.

- (ed.): Fauna of the Black and Azov Seas, 3, Kiev (Naukova Dumka), 65-166. (In Russian).
- Gruev, B.A.** (2000). About the Atlantic faunistic element in Bulgaria. – Travaux Scientifiques d'Université de Plovdiv, Animalia, 36 (6): 67-72 (in Bulgarian, English Summary).
- Herbert, D.** (2012). *Myosotella myosotis* (Mollusca: Ellobiidae) - an overlooked, but well-established introduced species in South Africa, South African Journal of Marine Science 34(3):459. DOI: 10.2989/1814232X.2012.716374
- Hubenov, Z.** (2007). Faunistic review, distribution and zoogeographical characteristic of the Bulgarian Black Sea mollusks (Mollusca: Polyplacophora, Gastropoda et Bivalvia). – Annuaire de l'Université de Sofia "St. Kliment Ohridski", (Zoology), 96/98: 17-38.
- Hubenov, Z.** (2005). Malacofaunistic diversity of Bulgaria. – In: Petrova A. (ed.): Current state of Bulgarian biodiversity – problems and perspectives. Sofia (Bulgarian Bioplatform, "Dragon" Publishing House): 199-246, (In Bulgarian, English summary).
- Jaecke, L.S.H.** (1986). Mollusca – Weichtiere. In: Stresemann E. (ed.): Exkursionsfauna für die Gebiete der DDR und der BRD. Wirbellose I. Berlin (Volk und Wissen Volkseigener Verlag), 102-229.
- Kaneva-Abadjieva, V.** (1960). Materials to the study of the mollusc fauna in the Black Sea at the Bulgarian shores. – Travaux de l'Institut de recherches scientifiques sur la pêche et les industries s'y rattachant (Varna), 2: 149-172. (In Bulgarian, Russian and English Summary).
- Marinov, T.M.** (1990). The zoobenthos from the Bulgarian sector of the Black Sea. Sofia (BAN), 195 pp. (In Bulgarian, Russian and English summary).
- Martins, A. M. Def.** (1999). On the generic separation of *Ovatella Bivona*, 1832 and *Myosotella Monterosato*, 1906 (Pulmonata: Ellobiidae). – Iberus, 17 (2): 59-75.
- Mitov, P.; Dedov, I. and Stoyanov, I.** (2003). Teratological data on Bulgarian Gastropoda (Mollusca). – Linzer Biologische Beiträge, 35 (1): 263-272.
- Mitov, P.G.** (2016). New data on *Myosotella myosotis* (Draparnaud, 1801) (Pulmonata: Basommatophora: Ellobiidae) from Bulgaria, Acta zool. bulg., 68 (3), 2016: 321-330.
- Morton, B. and Britton, J.C.** (2000). Origins of the Azorean intertidal biota: The significance of introduced species, survivors of chance events. Arquipélago – Life

- and Marine Sciences. Ponta Delgada. Supplement 2 (Part A): 29-51. Fauna and Flora of the Atlantic Islands. Proceedings of the 3rd Symposium, Ponta Delgada, 21-25 September 1998.
- Naser, M.D.** (2010). New record of the land snail *Allopeas gracilis* (Hutton, 1834) (Gastropoda: Subulinidae) from Basrah area, Iraq. *Jordan Journal of Biological Sciences*, 3(2): 55-56.
- Naser, M.D.; Yasser, A. G.; Al-Khafajil, K. Kh.; Aziz, N. M. and Gmais, S. A.** (2008) The genus *Lymnaea* (Lamarck, 1799) from southern Mesopotamia: Are the morphological and anatomical studies enough to solve its complexity?. *Marina Mesopotamica*, 23 (2): 349-362.
- Orensanz, J.M. (L.); Schwindt, E.; Pastorino, G.; Bortolus, A.; Casas, G.; Darrigran, G.; Elías, R.; Gappa, J.J.L.; Obenat, S.; Pascual, M.; Penchaszadeh, P.; Piriz, M.L.; Scarabino, F.; Spivak, E.D. and Vallarino, E.A.** (2002). No longer the pristine confines of the world ocean: a survey of exotic marine species in the southwestern Atlantic. – *Biological Invasions*, 4: 115-143.
- Öztürk B. and Çevik, C.** (2000). Molluscs fauna of Turkish Seas. – *Club Conchylia Informationen*, 32 (1/3): 27-53.
- Öztürk B.; Doğan, A.; Bitlis-Bakir, B. and Salman, A.** (2014). Marine molluscs of the Turkish coasts: an updated checklist. – *Turkish Journal of Zoology*, 38: 832-879.
- Psychev, V.D. and Dimitrov, D.P.** (2012). *Oceanology*. Varna (Ongul), 476 p. (In Bulgarian). scarabino F. 2004 Lista sistemática de los gastropoda marinos y estuarinos vivos de Uruguay. – *Comunicaciones de la Sociedad Malacológica del Uruguay*, 8 (84-85/86-87): 305-346.
- Scarabino, F.** (2004). Lista sistemática de los gastropoda marinos y estuarinos vivos de Uruguay. – *Comunicaciones de la Sociedad Malacológica del Uruguay*, 8 (84-85/86-87): 305-346.
- South A.** (1992). *Terrestrial Slugs: Biology, Control*. Dept. of Biological Sciences, City of London Polytechnic. Chapman & Hall London, New York, Tokyo, Melbourne.
- Welter-Schultes, F.** (2012). *European non-marine molluscs, a guide for species identification*. Göttingen (Planet Poster Editions), 760 pp.
- Wiese, V. and Rrichling, I.** (2008). Das Mäuseöhrchen *Myosotella myosotis* (Draparnaud, 1801). Weichtier des Jahres 2008. – *Club Conchylia Informationen*, Ludwigsburg, 39 (3/4): 2-6.