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ORIGINAL ARTICLE

ADDITIONAL INFORMATION WITH A CHECKLIST OF LAND SNAILS IN IRAQ

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ABSTRACT

Land snails constitute an important group of mollusks distributed worldwide. This study reports on land snails found in Iraq. A survey of terrestrial gastropods was performed during their activity seasons in gardens, agricultural lands and nurseries in Iraq from March 2022 to September 2023. Fifteen terrestrial snails belonging to seven families were documented. The species *Euchondrus michonii* (Bourguignat, 1853) was identified and recorded based on several distinct conchological characters for the first time in Iraq. The recently collected specimens, along with those previously recorded in Iraq, were included in this checklist. Essential information on each species is also presented. As there is no previous checklist or study that provides an overview of land snails in Iraq, the results of this study fill the gap in our knowledge about this group and provide an important database for further research in this field in the country.

Keywords: Checklist, Gastropods, Iraq, Molluska, Terrestrial.

INTRODUCTION

The interest in Iraqi fauna, specifically mollusks, has increased with the number of field studies in recent years, including those concerning bivalves (Jihad, 2023). Certainly, many other important groups of mollusks, such as land snails, remain to be discovered and reported. Land snails are a familiar group of mollusks with several easily identifiable characteristics; they typically dwell on the ground, trees, or shrubs, and feed on decaying organic matter. Taxonomically, snails belong to the class Gastropoda, which contains more species than any other class in the phylum Mollusca (Holland, 2009).

Many terrestrial species from Iraq have been described, but this group of mollusks remains poorly investigated. The studies on the land snails of Iraq include some old studies, with only a few recent records scattered in the literature. Germain (1921) Pallary (1939) and Biggs (1959) reported several species in Iraq. More recently, Al-qaisi and Farman (2023) added the species *Rumina decollata* (Linnaeus, 1758), while Jihad and Ali (2021) added *Polygyra cereolus* (Megerle von Mühlfeld, 1818) and *Trochulus hispidus* (Linnaeus, 1758) to Iraqi malacofauna.

Additional information with a checklist

Three species of the family Enidae, which comprises several terrestrial snails belonging to the genus *Buliminus*, were recorded in Iraq; *Buliminus diminutus* (Mousson, 1861) (Neubert *et al*, 2015), *Buliminus alepensis* (L. Pfeiffer, 1841) and *Buliminus egregius* Nägele, 1902 (Bank and Neubert, 2016).

Our current study aims to document and update the land gastropod species in Iraq, as well as provide more information about the malacofauna of the region. However, this checklist must be continuously updated, as more related information becomes available.

MATERIALS AND METHODS

Many gardens, agricultural lands, and nurseries located in the provinces of Al-Sulaymaniyah, Baghdad, and Babylon were chosen for the purpose of studying terrestrial snail's biodiversity (Map1). A total of 168 specimens were collected by hand between March 2022 and September 2023. The collected specimens were cleaned and preserved in 70% alcohol (Forsyth, 1999). Terrestrial gastropod species were identified by their shell characteristics. Morphological characteristics were examined using a stereoscopic microscope for the purpose of conchological identification, and many identification keys and studies were used, including those by Neubert *et al*. (2015) and Jihad (2021). The newly recorded species were deposited in the Iraq Natural History Research Center and Museum-University of Baghdad. For the purpose of standardizing and correcting the scientific names, the taxon names were checked against the databases of GBIF Secretariat (2023) and Molluscabase (2023), and the original descriptions were verified based on the last reference.

Map (1): Showing the collection sites.

RESULTS

More than 168 collected specimens, representing 15 terrestrial mollusk species, were reported as follows:

Class: Gastropoda

Order: Stylommatophora

1-Family: Achatinidae

Allopeas gracile (T. Hutton, 1834)

Bulimus gracilis T. Hutton, 1834. On the land shells of India. The Journal of the Asiatic Society of Bengal, 3 (26): 81-93

Synonyms: *Bulimus apex* Mousson, 1849

Lamellaxis gracilis (Hutton, 1834)

Aclis californica Bartsch, 1927

Achatina mandralisci Calcara, 1840

Distribution: In Iraq, this species was recorded under the name *Allopeas gracilis* (Hutton, 1834) (Naser, 2010) along the Arabian Gulf coast (Neubert, 1998); Asia, Australia, and Central and South America (Capinera, 2017).

Rumina decollata (Linnaeus, 1758)

Helix decollata Linnaeus, 1758 Linnaeus, C. 1758. Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1: 824 pp.

Synonyms: *Bulimus decollatus* (Linnaeus, 1758)

Stenogyra bavouxi (Coquand, 1862)

Materials examined: 35 specimens, Baghdad, Botanical Garden- Al Zawra Park, February 2023.

Distribution: Iraq (Al-qaisi and Farman, 2023); Jordan (Neubert *et al*., 2015). It is native to the Mediterranean, China and USA (Prévot *et al*., 2014).

2-Family: Enidae

Buliminus diminutus (Mousson, 1861)

Bulimus labrosus var. *diminutus* Mousson, A. (1861). Coquilles terrestres et fluviatiles recueillies par M. le Prof. J.R. Roth dans son dernier voyage en Orient. Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich, 6 (1): 1-34; 6 (2): 124-156.

Synonyms: *Bulimus labrosus* var. *diminutus* Mousson, 1861

Distribution: Iraq and Jordan (Neubert *et al*., 2015).

Buliminus alepensis (L. Pfeiffer, 1841)

Bulimus alepensis L. Pfeiffer, 1841. Pfeiffer, L. (1841). Symbolae ad historiam Heliceorum. Sectio prima [1]. Kassel: Th. Fischer. 88 pp.

Synonyms: *Bulimus alepensis* L. Pfeiffer, 1841

Buliminus (*Buliminus*) *alepensis* (L. Pfeiffer, 1841)

Petraeus halepensis (L. Pfeiffer, 1841)

Material examined: Four specimens, Al- Sulaymaniyah, near Dokan Lake Garden, May 2023.

Distribution: Iraq and Türkiye (Gümüs and Neubert, 2012) Syria and Iran (Bank and Neubert, 2016).

Euchondrus michonii (Bourguignat, 1853)
Pupa ledereri L. Pfeiffer. 1868. Monographia Heliceorum viventium. Sistens descriptiones systematicas et criticas omnium huius familiae generum et specierum hodie cognitarum. Volumen sextum. 1-598.
Synonyms: *Euchondrus ledereri* (L. Pfeiffer, 1868)
Pupa ledereri L. Pfeiffer, 1868
Diagnostic characters: A small sized species of *Euchondrus*, white shell, with wide aperture and four teeth, two palatalis and two parietal.
This species is similar to *Euchondrus paucidentatus*, has reduced dentation, but, smaller shell (Gümüs and Neubert, 2012).

Description: dextral small shell, elongate oval, white in colour; teloconch consists of five flat whorls, finely striated. Aperture wide subquadrate in shape provided with four teeth: two palatalis and two parietal; peristome reflected. Shell high ranges between 10-13 mm (Pl. 1).
Materials examined: Three specimens, Al- Sulaymaniyah/near Dokan Lake, garden, April 2022.
Distribution: Turkey and Lebanon (Gümüs and Neubert, 2012); Jordan (Neubert *et al*., 2015). In this study, this species was reported from Iraq for the first time.

3-Family: Geomitridae
Cochlicella barbara (Linnaeus, 1758)
Helix barbara Linnaeus, C. 1758. Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. 1: 824 pp.
Synonyms: *Cochlicella ventricosa* (Draparnaud, 1801)
Bulimus ventricosus Draparnaud, 1801
Materials examined: 14 specimens from Baghdad, Palestine Street, nursery, April 2022.
Distribution: Africa (Herbert, 2010), Europe, and Australia (Bank, 2011). Iraq (Dohi and Mahmood, 2024).

Xeropicta krynickii (Krynicki, 1833)
Helix krynickii Krynicki, J. A. 1833. Novae species aut minus cognitae e Chondri, Bulimi, Peristomae Helicisque generibus praecipue Rossiae meridionalis. *Bulletin de la Société Impériale des Naturalistes de Moscou*. 6: 391-436.
Synonyms: *Helix* (*Xerophila*) *vestalis* L. Pfeiffer, 1841
H. (*Xerophila*) *homoleuca* Brusina, 1870
H. (*Xerophila*) *joppensis* Schmidt, 1855
Materials examined: 16 specimens, Baghdad and Babylon, agricultural field, nursery, Al Mahawil, May 2022.
Distribution: In Iraq, it is recorded as *Xerophila vestalis* (Kennedy, 1937). Italy, Iran, Syria, Egypt and Lebanon (De Mattia and Pešić, 2014). Jordan and Mediterranean Region (Neubert *et al*., 2015).

Xeropicta mesopotamica (Mousson, 1874)
Helix (*Xerophila*) *mesopotamica* Mousson, 1874. Coquilles terrestres et fluviatiles recueillies par M. le Dr Alex. Schlæfli en Orient. *Journal de Conchyliologie*, 22: 5-60.
Synonyms: *Helix* (*Xerophila*) *mesopotamica* Mousson, 1874
Material examined: 3 specimens, Baghdad, Bab Al Muadham, garden, March 2023.
Distribution: Iraq, Saudi Arabia and Oman (Neubert, 1998).

4-Family: Helicidae
Eobania vermiculata (O.F. Müller, 1774)
Helix vermiculata O. F. Müller, 1774. Vermium terrestrium et fluviatilium, seu animalium infusorium, Helminthicorum, et testaceorum, non marinorum, succincta historia. 2: 1-36, 1-214.
Synonyms: *Helix vermiculata* O. F. Müller, 1774
Helix bonduelliana Bourguignat, 1863
Massylaea vermiculata (O. F. Müller, 1774)
Otala vermiculata (O. F. Müller, 1774)

Material examined: 15 specimens, Baghdad, Palestine Street, nursery, April 2022 and Babylon, Al Mahawil, farmers, September 2023.
Distribution: Iraq (Al Khafaji *et al*., 2016); Mediterranean, Spain, Türkiye, Hungary, Germany, Netherlands, Japan, USA, South Africa, Australia, Saudi Arabia, Egypt, Iran and Jordan (Ronsmans and Neucker, 2016).

Helix salomonica Nägele, 1899
Helix (*Pomatia*) *Salomonica* Naegele, 1899. Eine neue Pomatia aus Persien. - Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft, 31 (1/2): 28-29.
Synonyms: *Helix* (*Naegelea*) *salomonica* Nägele, 1899
H. (*Pelasga*) *salomonica* Nägele, 1899
H. (*Pomatia*) *salomonica* Nägele, 1899
Distribution: Iraq, Iran, and Türkiye (Neubert, 2014).

Theba pisana (O. F. Müller, 1774)
Helix pisana O. F. Müller, 1774. Vermivm terrestrium et fluviatilium, seu animalium infusoriorum, helminthicorum, et testaceorum, non marinorum, succincta historia, 2:1-36, 1-214.
Synonyms: *Helix albella* Linnaeus, 1758
Theba lucostoma Risso, 1826
Distribution: Türkiye (Yildirim *et al*., 2004); Algeria, Albania, Italy, Tunisia, Egypt, Libya, Morocco, Namibia, Netherlands, Serbia, Syria, Jordan, Lebanon, Yemen, France, Greece, and Iraq (Eppo, 2024).

5-Family: Hygromiidae
Monacha obstructa (L. Pfeiffer, 1842)
Helix obstructa Pfeiffer, L. 1842. Symbolae ad historiam heliceorum. Sectio altera, 1-147.

Synonyms: *Helix schotti* L. Pfeiffer, 1857
H. (*Fruticicola*) *obstructa* L. Pfeiffer, 1842
Material examined: (52 specimens), Material examined:33 specimens, Baghdad Province, Botanical Garden- Al Zawra Park, February 2023 and 19 specimens, Babylon Province, Al Mahawil, farmer, September 2023.
Distribution: Iraq (Abdul-Sahib, 2005), Western Palearctic, Northern Mediterranean Basin, Middle East to Iran (Ali and Robinson, 2020).

Trocholus hispidus (Linnaeus, 1758)
Helix hispida Linnaeus, C. (1758). Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1: 824.
Synonyms: *Fruticicola hispida* (Linnaeus, 1758)
Trochulus sericeus (Draparnaud, 1801)
Material examined: 6 specimens, Babylon Province, Al Mahawil District, farmer, November 2022.
Distribution: Europe (Prockow, 2009), Iraq (Jihad, 2021).

6-Family: Oxychilidae
Eopolita derbentina (O. Boettger, 1886)
Hyalinia (*Polita*) *derbentina* Boettger, O. (1886). Neuntes Verzeichniss (IX) von Mollusken der Kaukasusländer nach Sendungen des Hrn. Hans Leder, z.Z. in Helenendorf bei Elisabetpol (Transkaukasien). Jahrbücher der Deutschen Malakozoologischen Gesellschaft, 13 (2): 121-156
Synonyms: *Hyalinia* (*Polita*) *derbentina* O. Boettger, 1886
Hyalinia (*Polita*) *siraphora* Westerlund, 1897
Distribution: Iraq, Iran and Türkiye (Šešen and Schütt, 2002).

7-Family: Polygyridae
Polygyra cereolus (Megerle von Mühlfeld, 1818)
Helix cereolus Mühlfeld, 1818. Beschreibung einiger neuen Conchylien. Magazin der Gesellschaft Naturforschender Freunde zu Berlin, 8(1): 3-11.
Synonyms: *Polygyra carpenteriana* (Bland, 1860)
Helix febigeri Bland, 1866
Polygyra septemvolva var. *floridana* Hemphill, 1892
Material examined: 20 specimens, Baghdad Province, Palestine Street, nurseries, April 2022.
Distribution: Iraq (Jihad and Ali, 2021), Türkiye (Frank, 2016), Saudi Arabia (Neubert, 1995), Qatar (Al-Khayat, 2010), and Egypt (Ali and Robinson, 2020).

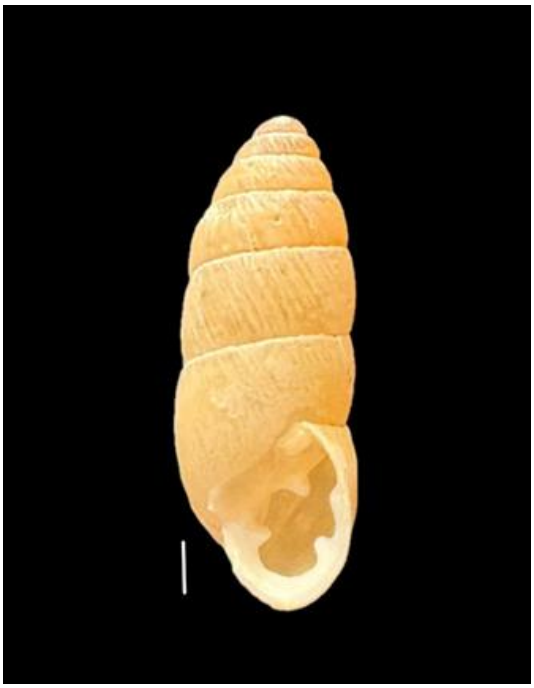

Plate (1): *Euchondrus michonii* [scale bar: 1 mm].

DISCUSSION

The knowledge concerning the biodiversity of land snails in Iraq is relatively unsatisfactory, and large portions portions of the country remain unexplored or have been rarely explored, especially in the northern regions. Thus, the current number of documented species may represent only a fraction of the total actual snail species in Iraq. When comparing the results of this study (15 species) with the number of land snail reports from adjacent countries, such as Türkiye, which has approximately 750 (sub) species (Bank *et al*., 2016), and Iran, which has 22 species reported in just one province (Tehran) (Siahkalroudi *et al*., 2024), significant differences are revealed.

In recent years, two exotic species, *Polygyra cereolus* and *Rumina decollate*, have been introduced to the country (Jihad and Ali, 2021; Al-qaisi and Farman, 2023). To date, these species are known only in Baghdad and Diyala. *Polygyra cereolus* is a snail native to Florida, has spread with ornamental plants and agricultural products (Charles and Lenoble, 2020). This species has been observed in dense populations in many nurseries in Baghdad (Jihad and Ali, 2021), whereas *Rumnia decollata* likely entered the country through imported plants and fruits (Al-qaisi and Farman, 2023).

The two species, *Ena* (*Cirna*) *macfadyeni* Pallary, 1939, belonging to the family Enidae, has been reported from Iraq (specifically from sinjar mountain) as *Turanena macfadyeni* (pallary, 1939) (Bank *et al*., 2016), and *Xerophila connollyi* Pallary, 1939, belonging to the

family Helicidae, have also been reported from Iraq as *Cernuella connollyi* (Pallary, 1939) (Šešen and Schütt, 2002). According to Molluscabase, the validity of these taxa is uncertain, so they are not included in the checklist.

CONCLUSIONS

Our study suggests that Iraq has a diverse malacofauna within the land snail group. To date, 15 valid species have been identified and recorded in the country, some of which are exotic. *Euchondrus michonii* is expected to occur in Iraq, as the species is distributed in the neighboring country of Türkiye. The present records contribute to the documentation of Iraqi land snail fauna.

There is a significant difference between the biodiversity of land snails of Iraq and that of neighboring countries. However, further surveys and studies on terrestrial snails in Iraq are necessary. Additionally, molecular analysis will serve as a valuable tool to confirm certain species and potentially reveal new ones.

CONFLICT OF INTEREST STATEMENT

"The author has no conflicts of interest to declare".

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Additional information with a checklist

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معلومات اضافية مع قائمة مرجعية للقواقع الأرضية في العراق

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الخلاصة

الحلزونات الأرضية هي مجموعة مهمة من الرخويات موزعة في أنحاء العالم. تتناول هذه الدراسة الحلزونات الأرضية في العراق. تم إجراء مسح للقواقع الأرضية خلال موسم نشاطها في الحدائق والحقول الزراعية والمشاتل في العراق، للفترة بين اذار 2022 وأيلول 2023. تم جمع 168 عينة، وتم توثيق 15 نوعًا من الحلزونات الأرضية تنتمي إلى سبع عائلات، شخصت الانواع من خلال خصائص أصدافها. تم تشخيص وتسجيل النوع *Euchondrus michonii* (Bourguignat,1853) بناءً على بعض الصفات المميزة للصدفة لأول مرة في العراق. اشتملت القائمة على العينات التي تم جمعها إلى جانب العينات المسجلة سابقًا في العراق. كما تم تقديم معلومات أساسية عن كل نوع. لا توجد قائمة أو دراسة سابقة تعطي نظرة عامة عن القواقع الأرضية في العراق، ولهذا السبب فإن نتائج هذه الدراسة سوف تسد الفجوة في معرفتنا حول هذه المجموعة وتوفر قاعدة بيانات مهمة لمزيد من الأبحاث في هذا المجال في البلاد.