



(REVIEW ARTICLE)

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## Review of the freshwater snail *Melanoides tuberculata* (O. F. Müller, 1774) (Gastropoda, Thiaridae)

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### Abstract

*Melanoides tuberculata* (O. F. Müller, 1774), a freshwater snail native to eastern Mediterranean, eastern Africa, southeast Asia, southern Asia, India, and Malaysia, it is an effective invader and is now nearly globally distributed. This snail has been studied with interest because of its rapidly distributed, and because of being can serve as compatible intermediate host for many of trematodes in the world.

We have summarized information from many articles in order to highlight the most important aspects of this invader snail life.

**Keywords:** Snail; *Melanoides tuberculata*; Gastropoda; Thiaridae

### 1. Introduction

The family Thiaridae Gill, 1871(1823) is a family of freshwater snails, their members identified with turreted thick shell in varying sizes, with many moderately rounded whorls, smooth in some species and sculptured in others, and ovate aperture closed by corneous concentric or paucispiral operculum, with nearly marginal nucleous [1].

Thiarid snails were invaded most continents (South America, North America, parts of Africa) and many islands with mild climates from their original distributions [2]. Among them *Melanoides tuberculata* (O.F.Müller, 1774), a freshwater snail native to eastern Mediterranean, eastern Africa, southeast Asia, southern Asia, India, and Malaysia [3]. and invade regions outside of its natural range by human activities, particularly by the aquarium trade or the introduction of aquatic plants [4]. It has the potential to rapidly expand its population in new suitable habitats [2].

This snail presenting high inheritable phenotypic variation in the shell shape, pigmentation and sculptures [5]. *M. tuberculata* adapted to local conditions causing environmental influences producing ecophenotypic alterations [6].

The average of adults sizes within their native regions is between 20-40 mm, although some specimens as large as 80mm have been recorded [7]. Four possible factors strongly influence the growth of the shell explaining its variation among different populations: the genetic variation, the conditions of microhabitat, the chemistry of water and temperature [6].

The life span of this snail is between 2.0-3.5 years [7].

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### 1.1. Taxonomy

- Kingdom: Animalia
- Phylum: Mollusca
- Class: Gastropoda
- Family: Thiaridae
- Genus: *Melanoides* Olivier, 1804
- Species: *M. tuberculata* (O.F.Müller, 1774) [8].

### 1.2. Synonyms

- *Nerita tuberculata* O.F.Müller, 1774
- *Thiara tuberculata* (O.F.Müller, 1774)
- *Melania cancellata* Say, 1829
- *Melania layardi* Dohrn, 1858 [8].

### 1.3. Description

Elongate right handed shell, the length more than twice the width [9]. Rounded whorls which bearing spiral grooves and fine ridges, and bearing transverse lines that may develop into costae in older snail; groove/ridge intersections with transverse costae may give a tuberculate appearance [10]. The number of shell whorl about 8-11, featured by axial lines of rust- coloring patches [11]. The aperture of oval shape and approximately of 1/3 the length of the shell, the inner lip is slightly thickened and the outer one thin [12]. Because of the base color of the shell, this species is commonly known as "red rimmed melania [4].



**Figure 1** *M. tuberculata* (size 17-24mm) [13].

### 1.4. Ecology and Habitat

Inhibit aquatic environments at depths between 0.25-3.7 m [5], with salinity over of 33% [11]. associated with different types of substrates, macrophytes and man-made substrates, the observations showed that this snail is absent in fast current velocities streams and rivers [5] and it is restricted to waters of temperature between 18-31°C, when the water temperature exceed 35°C the snail is primarily crepuscular or nocturnal spending most of the daylight time buried in sand or mud [7].

### 1.5. Reproduction

*M. tuberculata* can reproduce by parthenogenesis [7]. The males in population extremely rare or absent [10], within their native range, some populations contain 10 to 33 % males and show the ability of sexual reproduction [7]. *M. tuberculata* become fertile when reaching 15-16 mm at the age of six months [6].

### 1.6. Impact on human and animal health

*M.tuberculata* has been reported as transmission vector and intermediate host for parasitic trematodes that affect human, wild animals and livestock [5]. The most important species are: *Clonorchis sinensis*, *Paragonimus westermani*, *Centrocestus formosanus*, *Philophthalmus gralli*, deleted name[7]. *Haplorchis pumilio*, *Haplorchis taichui*, *Acanthatrium hitaense*, *Loxogenoides bicolor*, deleted neme, *Cloacitrema philippinum*, *Cardicola alseae*, *Alaria mustelae*, *Transversotrema patialense*, *Apatemon gracilis*, *Mesostephanus appendiculatus* [6] *Echinocasmus pelecani*, *Gastrothylax crumenifer*, *Cercaria caribea* LXVIII and *Podocotyle (Podocotyle) leporis* [14].

*M.tuberculata* has competitive abilities in some habitats allowed it to be used as a biological control agent for Biomphalaria species, the intestinal Schistosomiasis intermediate hosts in many tropical regions [4]. Workers have noted declines and even extinctions of Biomphalaria, as this thiarid species has spread [15].

### 1.7. Ecological impacts

*M. tuberculata* may displace other gastropods that are found in the same geographical boundary, fortunately, it is not known to destroy aquatic plants, additionally, it is found to be good bioindicators of water quality for its ability to accumulate heavy metals in its body [16].

### 1.8. Distribution

*M.tuberculata* is an effective invader and is now nearly globally distributed except in the coldest areas [17], this snail had been described from the Coromandel coast of India in 1774 [B]. it has been detected in tropical climates all over the world [18], also invaded temperate regions wherever waters with tropical characteristics may be found [18].

*M.tuberculata* current distribution is Southern Asia, Indo-Pacific region, Northern Australia, Arabia, Near East, Carrebian area and much of Africa [19].

## 2. Conclusion

*M.tuberculata* is an invasive species, has successfully colonized a wide variety of aquatic habitats over a wide geographic range, many factors made the species a successful invader and ensure their rapid spread such as Parthenogenetic reproduction, the rapid growth rate. This snail serve as a vector for many parasitic trematodes that affect human and his animals.

### Compliance with ethical standards

#### Disclosure of conflict of interest

No conflict of interest.

### References

- [1] Clarke A. H. The Freshwater Molluscs of Canada. Ottawa: Canadian Museum of Nature Library / Bibliothèque du Musée canadien de la nature;1981.
- [2] Work K and Mills C. Rapid population growth countered high mortality in a demographic study of the invasive snail, *Melanoides tuberculata* (Müller, 1774), in Florida. Aquatic Invasions. 2013, 8(4): 417–425.
- [3] Quirós-Rodríguez JA, Yépes-Escobar J, Santafé-Patiño G. The invasive snail *Melanoides tuberculata* (Müller, 1774) (Gastropoda, Thiaridae) in the lower basin of the Sinú River, Córdoba, Colombian Caribbean. Check List. 2018, 14 (6): 1089–1094. <https://doi.org/10.15560/14.6.1094>
- [4] Duggan I.C. First record of a wild population of the tropical snail *Melanoides tuberculata* in New Zealand natural waters. New Zealand Journal of Marine and Freshwater Research. 2002, 36(4):825-829.
- [5] Vogler RE, Núñez V, Gregorio D, Beltramo A and Peso J. *Melanoides tuberculata* : the history of an invader. In, Hämäläinen E M and Järvinen S, eds. Snails blogy, ecology and conservation. New York: Nova Science Publishers, Inc; 2012. P. 61-84.
- [6] Okumura DT. and Rocha O. Life history traits of the exotic freshwater snail *Melanoides tuberculata* Müller, 1774 (Gastropoda, Tiaridae), and its sensitivity to common stressors in freshwaters. Acta Limnologica Brasiliensia, 2020, vol. 32, e19.
- [7] Rader R B, Belk MC and Keleher M J. The Introduction of an Invasive Snail (*Melanoides tuberculata*) to Spring Ecosystems of the Bonneville Basin, Utah. Journal of Freshwater Ecology. 2003, 18(4): 647-657. <https://doi.org/10.1080/02705060.2003.9664007>
- [8] GBIF Secretariat. GBIF Backbone Taxonomy. Checklist dataset <https://doi.org/10.15468/39omei> accessed via <https://www.gbif.org/species/4362965> on 2022-07-10.

- [9] Quirós-Rodríguez JA, Yepes-Escobar J, Santafé-Patiño G. The invasive snail *Melanoides tuberculata* (Müller, 1774) (Gastropoda, Thiaridae) in the lower basin of the Sinú River, Córdoba, Colombian Caribbean. Check List. 2018, 14 (6): 1089–1094.
- [10] Thorp JH and Rogers DC . Phylum Mollusca. In: Thorp, James H. and Rogers, D. Christopher,(1st Ed.). Field Guide to Freshwater Invertebrates of North America. USA: Elsevier; 2011. P: 189-221.
- [11] Bolaji D.A., Edokpayi C.A., Samuel O. B., Akinnigbagbe R.O. and Ajulo A.A. Morphological characteristics and Salinity tolerance of *Melanoides tuberculatus* (Muller, 1774). World Journal of Biological Research; 2011.4(2).
- [12] Silva EL, Leal MF, Santos O, Rocha AJ, Pacheco ACL, Pinheiro TG. New records of the invasive mollusk *Melanoides tuberculata* (Müller, 1774) (Gastropoda, Thiaridae) in the Brazilian Northeast. Check List; 2019. 15 (3): 479–483. <https://doi.org/10.15560/15.3.479>
- [13] Ponder W. F., Hallan A., Shea M. E., Clark S. A., Richards K., Klunzinger M. W., and Kessner V. Australian Freshwater Molluscs. The Australian Museum ; 2022[Revision 1A; cited 2022 June 18]. [https://keys.lucidcentral.org/keys/v3/freshwater\\_molluscs/](https://keys.lucidcentral.org/keys/v3/freshwater_molluscs/)
- [14] Kralas D, Namchote S, Koonchornboon T, Dechruksa W and Boonmekam D. Trematodes obtained from the thiarid freshwater snail *Melanoides tuberculata* (Müller, 1774) as vector of human infections in Thailand. Zoosyst. Evol; 2014. 90 (1): 57–86.
- [15] Dillon JR Robert T. The Ecology of Freshwater Molluscs. Cambridge, United Kingdom: The press syndicate of the university of Cambridge; 2004.
- [16] Jonathan Ho Kit Ian. *Melanoides tuberculata* – red rimmed melania. Wiki.nus;2020 [cited 2022 June 18] available at: <https://wiki.nus.edu.sg/display/TAX/Melanoides+tuberculata+++Red-rimmed+Melania>
- [17] Rogers DC and Thorp JH. Phylum Mollusca. In: Rogers, D. C. and Thorp, J. H.(Eds). Keys to Palaearctic Fauna, Thorp and Covich's Freshwater Invertebrates (4th edition). USA: vol.4. Kansas Biological Survey and The Biodiversity Institute; 2019. p189-221.
- [18] Harding SF. Range expansion of an exotic Asian snail (*Melanoides tuberculata* ) into central Texas rivers, and the parasitological consequences thereof. USA: Texas State University; 2016. <https://digital.library.txstate.edu/bitstream/handle/10877/6967/HARDING-THESIS-2016.pdf?sequence=1&isAllowed=y>.
- [19] De Kock K and Wolmarans C. Distribution and habitats of *Melanoides tuberculata* (Müller, 1774) and *M. victoriae* (Dohrn, 1865) (Mollusca: Prosobranchia: Thiaridae) in South Africa. Water SA; 2009. 35: 713–720.