

# The first record of an invasive Caucasian land snail *Harmozica ravergiensis* in Central Ukraine (Stylommatophora, Hygromiidae)

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**ABSTRACT.** Large population of Caucasian mollusc *Harmozica ravergiensis* was found in the Gvozdiv village in Kyiv region. There were no reports of this species from Central Ukraine before and this locality is most northwestern for it. Population was monitored during 2015–2017 and evidently survived two winters on the open grounds in this period. Shell and reproductive anatomy of *H. ravergiensis* from Gvozdiv are described and illustrated. The presence of the species in area is discussed. Moreover, another new finding of *H. ravergiensis* is reported: in Petrykivka village (Dnipropetrovsk region, Southern Ukraine) in 2016.

## Introduction

Biological invasions are one of the most significant environmental issues of the 21st century and are known to have major negative consequences for both human enterprise and ecological systems [Pimentel *et al.*, 2000]. Many species of terrestrial molluscs are spread far from their natural ranges, often damaging agricultures as pests and sometimes also causing decline in local faunas [Cameron, 2016].

In Eastern Europe about 30–35 species of terrestrial molluscs are known to expand their natural ranges, which in nearly all cases are happening in two directions: from the south to north and from the west to east [Son, 2010; Balashov, 2016]. Considerable part of these invaders has Caucasian (or in some cases Caucasian-Crimean) origin and spreads in northern direction: *Oxychilus translucidus* (Mortillet, 1854), *Oxychilus mingrelicus* (Mousson, 1863), *Parmacella ibera* (Eichwald, 1841), *Limacus maculatus* (Kaleniczenko, 1851), *Deroceras subagreste* (Simroth, 1892), *Deroceras caucasicum* (Simroth, 1901), *Krynickyllus melanocephalus* Kaleniczenko, 1851, *Boettgerilla pallens* Simroth, 1912, *Harmozica ravergiensis* (Férussac, 1835) [Son, 2010; Gural-Sverlova, Timoshenko, 2012; Gural-Sverlova *et al.*,

2012; Balashov, Baidashnikov, 2012; Balashov *et al.*, 2013; Balashov, 2016]. The latter species is naturally distributed in the North Caucasus, Daghestan and Transcaucasia [Sysoev, Schileyko, 2009]. Since 1998 numerous populations of *H. ravergiensis* were found in Donetsk region of Ukraine [Gural-Sverlova, Timoshenko, 2012; Gural-Sverlova *et al.*, 2012; Balashov *et al.*, 2013] and in Belgorod region of Russia [Snegin, Adamova, 2016]. Moreover, in 2006 few specimens were collected in one locality on Podolian Upland in Ternopil region of Ukraine [Balashov, Gural-Sverlova, 2012].

Therefore, our new finding of *H. ravergiensis* in Kyiv region much expands its known range and documents its further spreading outside natural range.

## Material and methods

Main material was collected in Gvozdiv village (Vasylkiv district of Kyiv region), in several private estates and on the sidewalks along the roads (around 50.252226°N, 30.487501°E). First time *H. ravergiensis* was spotted here by us in September 2015 and for the last time specimens (including living ones) were collected on 18.06.2017.

One living specimen of *H. ravergiensis* was also collected in Petrykivka settlement (Petrykivka district of Dnipropetrovsk region, Ukraine) on 17.09.2016.

Material was collected, handled and identified using common methods of work with terrestrial molluscs [Schileyko, 1978; Balashov, 2016].

Material is kept in the Collection of terrestrial molluscs of I.I. Schmalhausen Institute of Zoology (Kyiv, Ukraine): under the numbers IZAN GT 6355 (Petrykivka) and IZAN GT 6490–6492 (Gvozdiv).

## Results and discussion

102 specimens of *H. ravergiensis* were collected in Gvozdiv, including 2 living ones in 2017, much more specimens were observed during 2015–2017. Width of shell of collected adult specimens is



FIG. 1. Shells of *Harmozica ravergiensis* from Gvozdiv village in Kyiv region (photo by I. Balashov).

РИС. 1. Раковины *Harmozica ravergiensis* из с. Гвоздов Киевской области (фото И. Балашов).

11-16 mm, height – 9-12 mm at 6-7 whorls. Sculpture of shells is granulated. Umbilicus is around  $\frac{1}{10}$  of shell's width. Nearly all shells have white band on the periphery above aperture, which in our case is better visible in partly depigmented empty shells of the specimens that died naturally (Fig. 1). Specimen from Petrykivka is subadult, of 11.9 mm width and 8.8 mm height at 5.25 whorls, with granular sculpture and white band on the shell's periphery, umbilicus is  $\frac{1}{12}$  of shell's width. All collected shells are within known variability of *H. ravergiensis* [Schileyko, 1978; Balashov, 2016].

Reproductive anatomy was studied in one specimen from Gvozdiv (Fig. 2), it is clearly corresponding to existing descriptions of *H. ravergiensis* [Schileyko, 1978; Balashov, 2016]: vagina with 2 vaginal appendages and 4 mucus glands, muscular bands of penis are well developed, long flagellum is present.

In Gvozdiv *H. ravergiensis* was found in the several private estates and on the sidewalks along the roads at the distance of about 500 meters, where it is distributed continuously in large number. We were not trying to make mapping of the whole occupancy area of *H. ravergiensis* in Gvozdiv, probably it is distributed even more widely here. Therefore, invasive snail has occupied considerable part of the village, which means that invasion has hap-

pen at least few years earlier than it was found by us in 2015. The village is composed by the private estates, most of which have gardens. Therefore, these habitats of *H. ravergiensis* are moderately shadowed by sparsely placed trees. Most specimens were collected on the hill in relatively dry conditions, but there are humid ravines around. Snails were probably introduced here with some cultivated plants, there are lots of the various not indigenous plants present in the gardens of the studied area.

In Petrykivka a specimen of *H. ravergiensis* was collected in the outskirts of the settlement on the high humid grass along the channel on the edge of large pasture.

New findings of *H. ravergiensis*, especially large population that evidently successfully exists in Gvozdiv for the several years, testify that this species should be expected to invade during further decades at least across most part of Ukraine and maybe in the other regions of Europe or elsewhere. Probably it will become a common component of anthropogenic environment in Eastern Europe, as it already happens during last decades with such molluscs species of Caucasian origin as *Oxychilus translucidus*, *Limacus maculatus*, *Deroceras caucasicum*, *Krynickyllus melanocephalus* and *Boettgerilla pallens*. This tendency apparently demonstrates mov-

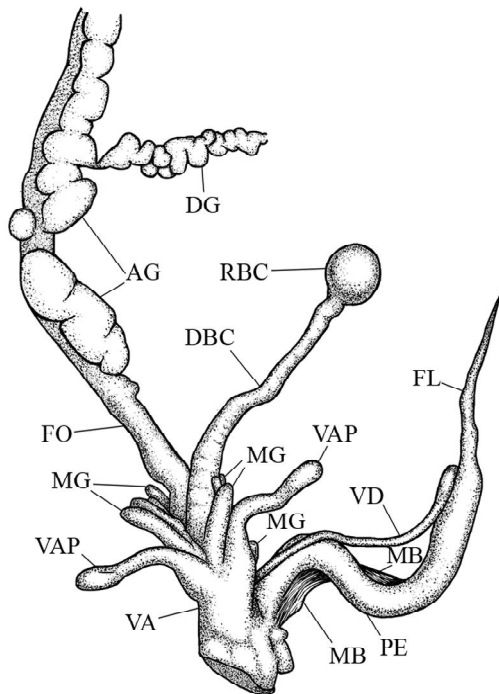


FIG. 2. Reproductive system of *Harmozica ravergiensis* from Gvozdiv village in Kyiv region (drawing by Z. Shvydka). AG – albumen gland; DBC – duct of bursa copulatrix; DG – duct of gonad; FL – flagellum; FO – free oviduct; MB – muscular bands of penis; MG – mucus glands; PE – penis; RBC – reservoir of bursa copulatrix; VA – vagina; VAP – vaginal appendix; VD – vas deferens.

РИС. 2. Половая система *Harmozica ravergiensis* из с. Гвоздов Киевской области (рисунок З. Швидкая). AG – белковая железа; DBC – проток семяприемника; DG – проток гермафродитной железы; FL – флагеллум; FO – яйцевод; MB – мускульные ленты пениса; MG – слизистые железы; PE – пенис; RBC – резервуар семяприемника; VA – вагина; VAP – вагинальные придатки; VD – семяпровод.

ing of southern faunas to the north in the regions that becoming warmer due to the global climate change.

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Первая находка инвазивной кавказской наземной улитки *Harmozica ravergiensis* в Центральной Украине (Stylommatophora, Hygromiidae)

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**РЕЗЮМЕ.** Крупная популяция кавказских моллюсков *Harmozica ravergiensis* была найдена в селе Гвоздов Киевской области. Ранее не было сведений о находках этого вида в Центральной Украине, и это местонахождение является его самым северо-западным. Был проведён мониторинг популяции в течение 2015–2017 годов и подтверждено выживание этого вида на открытом воздухе на протяжении двух зим. Проиллюстрированы и описаны раковина и половая система *H. ravergiensis* из села Гвоздов. Присутствие вида в районе обсуждается. Кроме того, описана еще одна новая находка *H. ravergiensis*: в селе Петриковка (Днепропетровская область, Южная Украина) в 2016 году.