NEW ADVENTIVE SPECIES - EOBANIA VERMICULATA IN THE FAUNA OF UZBEKISTAN

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Abstract: It was found from the collected materials in the territory of Khiva in 2020 that the species of E. vermiculata was unrevealed in the fauna of Uzbekistan. The process of anthropochory might be the main reason for the appearance of these species in the surrounding areas of Khiva, Uzbekistan. This article highlights the diversity of the conchological and anatomical features of abovementioned adventive species.

Key words: malacofauna, adventive species, conchological and anatomical variability, synanthropus, arid, habitats, Khiva.

INTRODUCTION

The works by E. Martens (1871, 1876, 1882, 1885) provides the initial information and details regarding the distribution of terrestrial molluscs in Central Asia. During the proceding period, more clearly, for 138 years, data concerning the region's malacofauna have been presented in the research works of I.M. Likharev, E.S. Rammelmeyer (1952), I.M. Likharev (1965), P.V. Matekin (1959), A.A. Shileiko (1978,1984), K.K. Uvalieva (1990), T.S. Rymzhanov (1986) A. Pazilov, D.A. Azimov (2003) and many other malacologists. Nevertheless, the malacofauna of Central Asia, encompassing Uzbekistan, has been fragmentarily studied. For instance, malacofauna in the northwestern part of Uzbekistan remains uninvestigated at all until now. In this regard, we conducted the first expedition to investigate the malacofauna of the northwestern part of Uzbekistan during the period of April-May in 2020.

During the period of the field work, Eobania vermiculata species (Muller, 1774) was discovered in the surroundings of the collected molluscs. It is important that they have been unknown to the fauna of Uzbekistan, but are native to the Mediterranean countries of Europe.

MATERIALS AND METHODS

Field observations were conducted in the historical monuments of Ichan Kala. The climate of the region is affected by the Kyzylkum and Karakum deserts. The winter here is relatively cold: the average January temperature ranges from -8^{0}C in the north to -20C in the south. Summer is long and hot here, the average July temperature is +28 +30^{0}C (Abdullaev et al., 2020).

The materials for this work corresponds to the collections, which were conducted in April and May, 2020 in the city of Khiva (Khorezm region) and its environs (Figure 1): Pakhlavan-Makhmud Street, along irrigated ditches in lawns (10 specimens); Islam-Hadji Street, among the hedgerows (8 specimens); in the surroundings of Ichan-Kala, in the herb gardens (16 specimens).

Determination of the shell, conchiometric measurement and anatomy were performed according to the generally accepted methods of A.A. Shileiko (1978) under an MBI-10 binocular microscope.

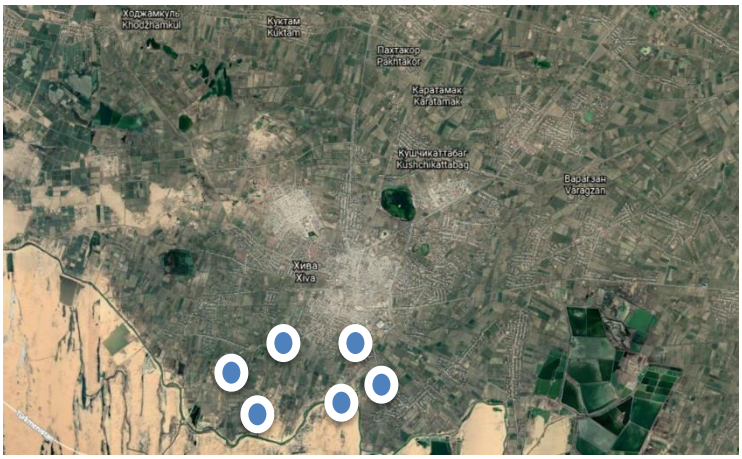

Figure 1. Map of findings of Eobania vermiculata in the territory of Khiva (Khorezm region) and its environs.

RESULTS AND DISCUSSION

At our disposal, the shell of Eobania vermiculata (Figure 2) has a rounded cone-shaped umbilicus, the height of the umbilicus slightly is less than the height of the aperture. There are 5 moderately convex whorls that gradually increases. The last whorl descends abruptly below the periphery of the shell, correctly rounded in profile, 2 times wider than the penultimate whorl, is vigorous towards the mouth, with a smooth spiral reconstruction. The background color can be brownish-yellow, and the shell often has 6 brownish-red bands or spots. The first and second (top) bands are the widest and is located above the periphery; the third band is poorly developed; the fourth band is clearly developed and even narrower than the first and second, which are located above the periphery; the fifth and sixth lie below the periphery. Sculpture in the form of a strong and uneven radial striation, in some places there is a lattice sculpture, in addition, an element of vermiculate sculpture is observed. The aperture is short-oval, very oblique, with a whitish lip. The edges of the aperture are sharp, strongly turned away. The lapel of the columellar edge is soldered to the lower shell wall.

Dimensions of the shell are as follows: the height of the shell is 21-23 mm; the large diameter of the shell is 28-30 mm; the small diameter of the shell is 22-24 mm.

Figure 2. The sl f Eobania vermiculata in the undings of Khiva (Khorez gion). Shells in different positions (A-B-C).

Internal structure: Materials of 4 specimens from Khiva, Pakhlavan-Makhmud Street.

The lower part of the spermatic duct and the upper part of the oviduct form a steep double bend. The lower part of the mucous glands is more or less narrowed, each gland bifurcates. These two main branches are always clearly expressed, and only above the middle they begin to disintegrate into branches of the second and subsequent orders. The stylophorum is relatively small and oval. The penis is cylindrical; the foam tubercle is small but clear. The papilla is long, without interpapillary cavities, the distal part forms a sharp double bend. The site of the bifurcation of the seminal receptacle is at the level of the middle part of the spermatic duct. The diverticulum is long, repeatedly convoluted and twisted.

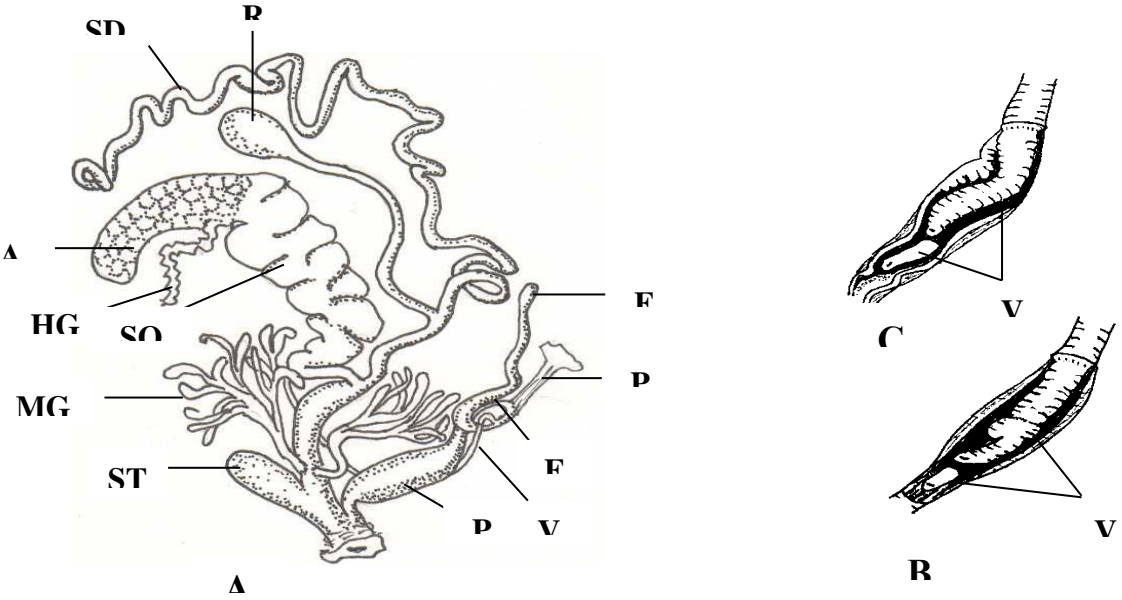

Figure 3. Eobania vermiculata. A-reproductive tract; B- open penis; C- open penis from the vicinity of Sevastopol; AG-albumen gland; HG-hermaphroditic gland; P-penis; PR-penial retractor; RS-reservoir of spermatheca; SD-spermathecal diverticle; VD-vas deferns; SOD-spermovidukt; ST-stylophor; E-epiphfllus; F-flagellum; V-verge; MG-mucous glands.

The research shows that the adventive species E. vermiculata found in Khiva (Uzbekistan) has a number of conchological differences in individuals living in the Mediterranean countries of Europe.

Variability is most evident in the color of the shell. For example, in the adventive species from Khiva (Figure 4.A), the color is brownish-yellow, there are 6 brownish-red bands, which, the first and second (upper) bands, are the widest; the third band is poorly developed; the fourth band is clearly developed and even narrower than the first and second, which are located above the periphery; the fifth and sixth bands are very thin than the rest. Whereas, E. vermiculata living in the Botanical Garden of Donetsk (Figure 4. B) have 5 bands, the second and the third merge with each other, the fifth band lying below the periphery is wide. In a type living in the open area of southern Europe (Figure 4 C, D), the shell is white or grayish-white.

Figure 4. V ility of the color shell of **Eobania iculata**: A – the su dings of Khiva; B- the Botanical Garden of Donetsk; C-D-Southern Europe.

The study showed that the variability of the shell color, as well as other traits, is directly related to the ecological factors of the environment in which the molluscs live.

For example, E. vermiculata, which are living in more humid and shaded habitats, such as hedges (Khiva, Uzbekistan) and in grasses of botanical gardens (Donetsk, Ukraine), are characterized by a brownish yellow or dark brown shell. It should be noted that these molluscs live in more humid and shaded habitats, where, due to microclimate conditions, there is no need to reflect the bright rays of the sun. This is probably why these molluscs have a brownish yellow or dark brown shell. Another example, E. vermiculata, which are living in open biotopes on xerophile plants and bushes (Southern Europe), have white or grayish-white shell.

It should be noted that these molluscs live on the stems of semi-shrubs and shrubs. Apparently, the light shell is clearly an adaptive feature that allows shielding the sun's rays.

As can be seen from the above data and Figure 4, depending on the habitat, the spiral bands of E. vermiculata varies to a different extent. For example, E. vermiculata, which are living in more humid and shaded habitats, such as hedges (Khiva, Uzbekistan), the peripheral band is developed to varying degrees, which is barely noticeable. Whereas in grasses of botanical gardens (Donetsk, Ukraine), the spiral band is clearly expressed and runs along the periphery of the latter and at the seam of previous whorls. Apparently, the degree of development of the peripheral bands makes it possible to achieve a very fine adjustment of the amount of heat received.

Hence, the variability and color of the shell is of an adaptive nature, on the one hand, reflecting their adaptability to certain bio topic features of habitats, on the other hand, landscape and climatic conditions.

The adventive species of E. vermiculata in the city of Khiva has an anatomical difference. For example, according to A.A. Shileiko (1978), there is a distal and very long proximal papilla inside the penis of the molluscs in the vicinity of Sevastopol (Figure 3.C); the inner surface of the penis sheath in the parts of the proximal papilla is covered with very high, narrow folds, expressed unevenly. Whereas, the distal papilla of E. vermiculata in the city of Khiva is very short, and the proximal papilla in the distal part forms a double bend (Figure 3B); the distal and proximal papilla is covered with loose parenchyma.

The natural range of E. vermiculata is considered to be the Mediterranean region, which is distributed from eastern Spain to the Crimea. The following species was introduced to southeastern Australia, England, USA, Turkmenistan and Uzbekistan.

For the first time, Z. Izatullaev (1996) discovered two specimens of Central Asian E. vermiculata on October 14, 1986 in Ashgabat, the Republic of Turkmenistan, not far from the hotel along the irrigation ditch in lawns. However, it is unknown whether the colony of the species was formed or not at that time. In Uzbekistan, we were able to find the formed populations of the species in the 5 places of the Khiva city.

In our opinion, the penetration of E. vermiculata into the territory of Central Asia, more precisely, Turkmenistan and Uzbekistan, occurred in an anthropochory way.

At present, it is not known how and when this species penetrated Central Asia, however, pines, which were possibly brought from the Caucasus, were planted at the site of collecting materials. Most likely, the eggs of E. vermiculata or juveniles might come with the seeds. Secondly, recently some hobbyists have begun to keep “exotic” animals such as snails in their home terrariums. It should be noted that, over the past 20-25 years, the flow of tourists from Central Asia to Europe has increased several times, apparently one of the tourists brought live snails to be kept in the house. However, then he released the snails, near the house where there were hedges. This is confirmed by the places where molluscs were found mainly in anthropogenic biotopes.

It should be noted that adventive species are easily synanthropized under the conditions of Central Asia, as a result of which the range rapidly expands and forms dense populations. For example, M. carthusiana was first discovered (Pazilov, 1992) in Etti-Kechuu-suu in the People's Park (north-western part of the Turkestan ridge). This species quickly adapted to arid conditions and, forming dense populations year after year, expanded their range, which at this time can be found more than 100 km radius. For example, in the vicinity of Khuzhamushkent, along ditches and alfalfa plantations, it forms a dense population: about 100 specimens can be found in 1 m^2 (Figure 5).

The study shows that E. vermiculata easily synatropized as M. carthusiana in the arid conditions of Uzbekistan, this is confirmed by its modern range in Khiva, which covers more than 25 km and year after year expands its range, which extends outside the city.

Meanwhile, many cases are known when adventive species become serious pests of agricultural crops. For example, according to K.K. Uvalieva (1992) Deroceras caucasicum, D. reticulatum, D. sturanyi (imported from the Caucasus and Europe) are serious pests of agricultural crops in the republics of Central Asia.

It should be noted that E. vermiculata, which was introduced into the United States, is believed to pose a potentially serious threat as a pest, an aggressive species that could adversely affect agriculture and natural ecosystems.

Therefore, a new adventive species - E. vermiculata in the fauna of Uzbekistan, can become dangerous pests of agricultural crops, increasing the number and distribution area.

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