



## INTRODUCTION OF *ULOMOIDES DERMESTOIDES* (CHEVROLAT, 1878) (COLEOPTERA) TO NORTH MACEDONIA: UNVEILING THE FIRST HUMAN-INDUCED RECORD OF A NOVEL SPECIES – SHORT COMMUNICATION

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### Abstract

This short communication presents first record of *Ulomoides dermestoides* (Coleoptera, Tenebrionidae, Diaperinae) in North Macedonia. The problem of the introduction of this non-native darkling beetle as alternative medicine is briefly discussed. Prior to this study, no data exist about the presence of *U. dermestoides* on the territory of the former Balkan countries as well.

**Key words:** *Tenebrionidae*, *Diaperinae*, new data, Balkan

### INTRODUCTION

Brief taxonomic history: *Ulomoides dermestoides* is a cosmopolitan species, non-native for Europe, known under a variety of different names, according Flores et al. (2002), *Histeropsis dermestoides* by Chevrolat (1878). Later on, Doyen et al. (1989) named the species *U. dermestoides* (Chevrolat, 1878).

Brief history of species distribution: It is considered native for Asia, with prevalence in China, but meets other oriental countries: Japan, Taiwan and Australia as well (Löbl et al., 2008). Until 1988, it was only known for the Oriental region, while later it was introduced in the United States and Latin America, as well as in Europe (Lourenço et al., 2022), with first records in Sweden (Ferrer, 1988).

*U. dermestoides* is widely used as a traditional medicine in the countries of South-East Asia, Africa, Australia, and particularly in Latin America. There are many scientific papers related to their breeding behavior, biology and life cycle (Garcés Molina et al., 2009; Marinoni & Ribeiro-Costa 2001; Morillo-García et al. 2016), as well as the effects caused by the beetle diet and their usage in traditional medicine (Aguilar-Toalá et al., 2022; Deyrup et al., 2021; Jasso-Villagomez et al., 2018). That is the main reason for its introduction in other countries of the world, including our country.

This paper presents the first record about the presence of the species *U. dermestoides* and its use as an alternative medicine in the Republic of North Macedonia.

<sup>†</sup> Deceased 11.12.2023

## MATERIAL AND METHODS

During February 2023, specimens of *U. dermestoides* were brought at the Department of Animal Ecology (Institute of Biology, Faculty of Natural Sciences and Mathematics in Skopje, Ss. Cyril and Methodius University) for identification. The identification was made according to Gorham (1987). Studied specimens

are deposited in the Macedonian National Collection of Invertebrates. A stable colony of this species is still maintained under laboratory conditions at the same department (Fig.1).

Photographs of *U. dermestoides* (Fig. 1, 2, 3, 4) were taken under the WILD M3Z stereo microscope.

## RESULTS AND DISCUSSION

The specimen was identified as *U. dermestoides* based on the head, which was widest at eyes; large eyes, separated by distance subequal to width of eye; asymmetrical and broad antennal segments; and the pronotum which was without anteromedial bead (Fig. 1, 2, 3, 4).

The colony of *U. dermestoides* was introduced in North Macedonia through illegal transport from Sweden and was deliberately grown and reared in captivity by the local people in Negotino city (41.48419, 22.09108) for alternative medical treatment of cancer and diabetes. Later on, locals were breeding and growing this beetle at home for personal use or commercial purpose.

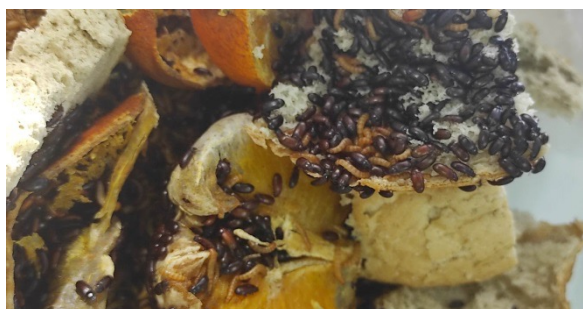
Local people believe that consumption of *U. dermestoides* may treat some heavy diseases. According to the breeder, there is a protocol in the therapy of using beetles, in which the first day only one live beetle with a glass of water should be drunk, the second day two, the third day three, and then every day the number increases up to 40 beetles, then from 40 backwards. Thus, exactly 1,640 beetles should be consumed in 80 days. Although this practice is already well known among the local population, this paper reports the practice of using *U. dermestoides* as a medicine in North Macedonia for the first time.

The abdominal glands of the species *U. dermestoides* release secrete with quinones, which has some anti-inflammatory, cytotoxic,

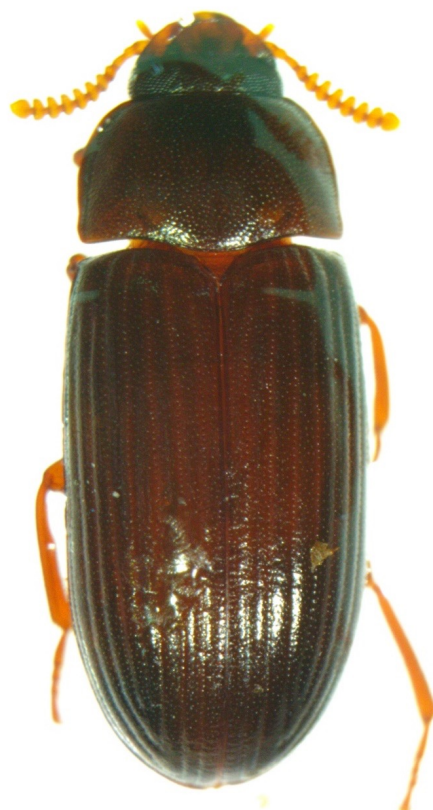
genotoxic, antiproliferative, antidiabetic, antioxidant and antimicrobial effects causing reduced cell viability and DNA damage (Cázares-Samaniego et al. 2021). Therefore, these beetles are used by locals for medical treatments. But the problem is that the influence of quinones is not selective, i.e. they act both on damaged and healthy tissues, and long-term consumption of these beetles in larger amounts can lead to serious health problems. However, there are no data related to the negative effects of this species on human health in North Macedonia.

The presence of a new allochthonous species in the country is a matter of concern among the scientific community, especially regarding the ability of the species to live outside the controlled conditions created by humans. Due to people's inadequate knowledge of species ecology and biology and their strong beliefs that these beetles have healing power, they are mass selling and breeding the beetles in domestic conditions, thereby increasing the likelihood of species dispersal in the environment.

Unfortunately, there is currently no documentation on the species' occurrence outside of captivity or in any of the nearby Balkan countries. Therefore, in this paper we base our observations on the potential risk of adaptation of the species in its natural habitats in the country solely on the literature data that refer to its biology within its range of distribution.



**Figure 1.** Colony of *U. dermestoides*.



**Figure 2.** Dorsal view of *U. dermestoides*.



**Figure 3.** Dorsal part of the head of *U. dermestoides*.



**Figure 4.** Antennae of *U. dermestoides*.

**Biology of the species:** This species has complete metamorphosis with four life stages presented with egg, seven larval instars, pupa and adult stage (Morillo-Garcia et al., 2016). The average life cycle (from egg to adult stage) has duration of 67.63 days. The semi-mobile pupae stage lasts 3-5 days after the larval stage, which lasts about 60 days (Morillo-Garcia et al., 2016).

In its native range this species is typically found in warm and humid environments, such as tropical and subtropical forests, but it is able to thrive in areas with temperatures ranging from 20 to 30 °C and relative humidity above 50% (Marinoni & Ribeiro-Costa, 2001; Garcés Molina et al., 2009). Given that the climate of North Macedonia, with annual average temperature 15°C and humidity around 70% (Lazarevski, 1993), partially matches the climatic preferences of this species, climatic conditions are not anticipated to restrict the distribution of *U. dermestoides*. In addition to this statement is the presence of the species in Sweden (Ferrer, 1988), as an indication of its wide tolerance to different climatic conditions.

In general, the adult and larval stages of *U. dermestoides* are highly adaptable. They can persist high temperatures and low precipitations through morphological, physiological and behavioral adaptations. During the unfavorable winter conditions this beetle hibernates by burrowing in the soil (Garcés Molina et al., 2009).

Probably, fast growth and high reproductive potential contribute in overcoming physiological or other barriers in order to reproduce successfully in a wide range of climates and habitats, including stored products as secondary habitats. This behavior enhances potential persistence of the species and its invasiveness. However, little is known about species invasive potential (Lourenço et al., 2022). Therefore, the possibility of its survival in natural conditions is not excluded, especially in southern and eastern parts of North

Macedonia where the climate is continental-submediterranean. So, it is quite obvious that this species can maintain self-sustaining populations in the country, although there are no published data.

The dispersion of this species is mainly the result of human activity i.e. worldwide commerce. Potential pathways for dispersion are trade, transportation, use as pets' food, medical treatments, and climate change as well. The transport of the species is mainly as an adult, but the possibility of the larval presence in the containers in which the adults are kept is not excluded. Since North Macedonia is a small country, high rate of distribution and adaptability makes the presence of this species concerning by itself, because there is high probability that the species can very easily expand its distribution to other parts and habitats of the country. So far, this situation can only be assumed because no additional modelling of the possible spread (habitats, climate, altitude, etc.) was done.

It is also well known that the species that act as a strong allergen, can host endoparasites and infests stored products such as peanuts, oat, soybeans, corn, rice and bread (Vergara et al., 1997). Worldwide, this pest is treated with insecticides which can cause series of health problems in humans, biodiversity loss and reduced habitat quality (Plata-Rueda et al., 2020; Plata-Rueda et al., 2022).

So far, there is no literature data that *U. dermestoides* does not suppress the growth of native taxa, nor has large negative impact on flora and fauna, i.e. on the environment in general. But it possesses a strong biotic potential and great adaptability, and if it is introduced can very easily displace the native species from their ecological niches and cause disturbance in food chains and ecosystem functioning which will cause ecological as well as series of social and economic problems.

### CONCLUDING REMARKS

This short communication presents first confirmed record of the presence and use of the species *U. dermestoides* as an alternative medicine in the Republic of North Macedonia. We truly hope that it will raise public awareness

and provoke a reaction among the competent institutions to solve the problem of species introduction in the country and its illegal commerce.

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**ИНТРОДУКЦИЈА НА *ULOMOIDES DERMESTOIDES* (CHEVROLAT, 1878) (COLEOPTERA)  
ВО СЕВЕРНА МАКЕДОНИЈА: ПРВ ПОДАТОК ЗА НОВ ВИД ИНТРОДУЦИРАН  
ОД СТРАНА НА ЧОВЕКОТ - КРАТКА КОМУНИКАЦИЈА**

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**Резиме**

Овој труд претставува прв запис за присуството на видот *Ulomoides dermestoides* (Coleoptera, Tenebrionidae, Diaperinae) во Северна Македонија. Даден е краток приказ на интродукцијата на видот во Република Северна Македонија и неговата примена како алтернативен лек. Вреди да се истакне дека досега не постојат податоци за присуство на *U. dermestoides* на територијата на останатите балкански земји.

**Клучни зборови:** *Tenebrionidae*, *Diaperinae*, нов податок, Балкан.

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