

**First record of *Fulvius oxycarenoides* (Reuter, 1878) from Hungary  
(Hemiptera: Heteroptera: Miridae)**

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**Abstract** – Adult individuals of *Fulvius oxycarenoides* (Reuter, 1878) (Hemiptera: Heteroptera: Miridae: Cylapinae: Fulviini) were observed and collected in July 2022 and March, May and July 2023 in Domaszék, Csongrád-Csanád county, Hungary. They were found in a woodpile and attracted to artificial light at night. This is the first Hungarian record of the species, the genus *Fulvius* Stål, 1862, the tribe Fulviini and the subfamily Cylapinae. Features of the behaviour of the species are briefly described based on observations made on three individuals kept in captivity.

**Key words** – plant bugs, Palearctic Region, new record, distribution, bionomics, behaviour, area expansion

## INTRODUCTION

*Fulvius* Stål, 1862 is a genus of plant bugs in the subfamily Cylapinae (Hemiptera: Heteroptera: Miridae). It contains more than 80 species worldwide (WOLSKI *et al.* 2018). Two species of the genus are native to the West Palearctic: *Fulvius oxycarenoides* (Reuter, 1878) is distributed all over the European part of the Mediterranean Basin (KERZHNER & JOSIFOV 1999), whilst the taxonomically closely related *Fulvius anatolicus* Çerçi *et* Gorczyca, 2021 was recently described from southern Turkey (ÇERÇI *et al.* 2021). Three additional species of the genus, *Fulvius anthocoroides* (Reuter, 1875), *Fulvius subnitens* Poppius, 1909 (both of circumtropical distribution) and *Fulvius carayoni* Pluot-Sigwalt *et* Chérot, 2013 (native in West and Central Africa) have occasionally been introduced to various countries of western Europe usually via tropical wood shipments, but they apparently could not establish (KERZHNER & JOSIFOV 1999, RABITSCH 2008, CHÉROT *et al.* 2011, DETHIER & CHÉROT 2014). Another species, *Fulvius*

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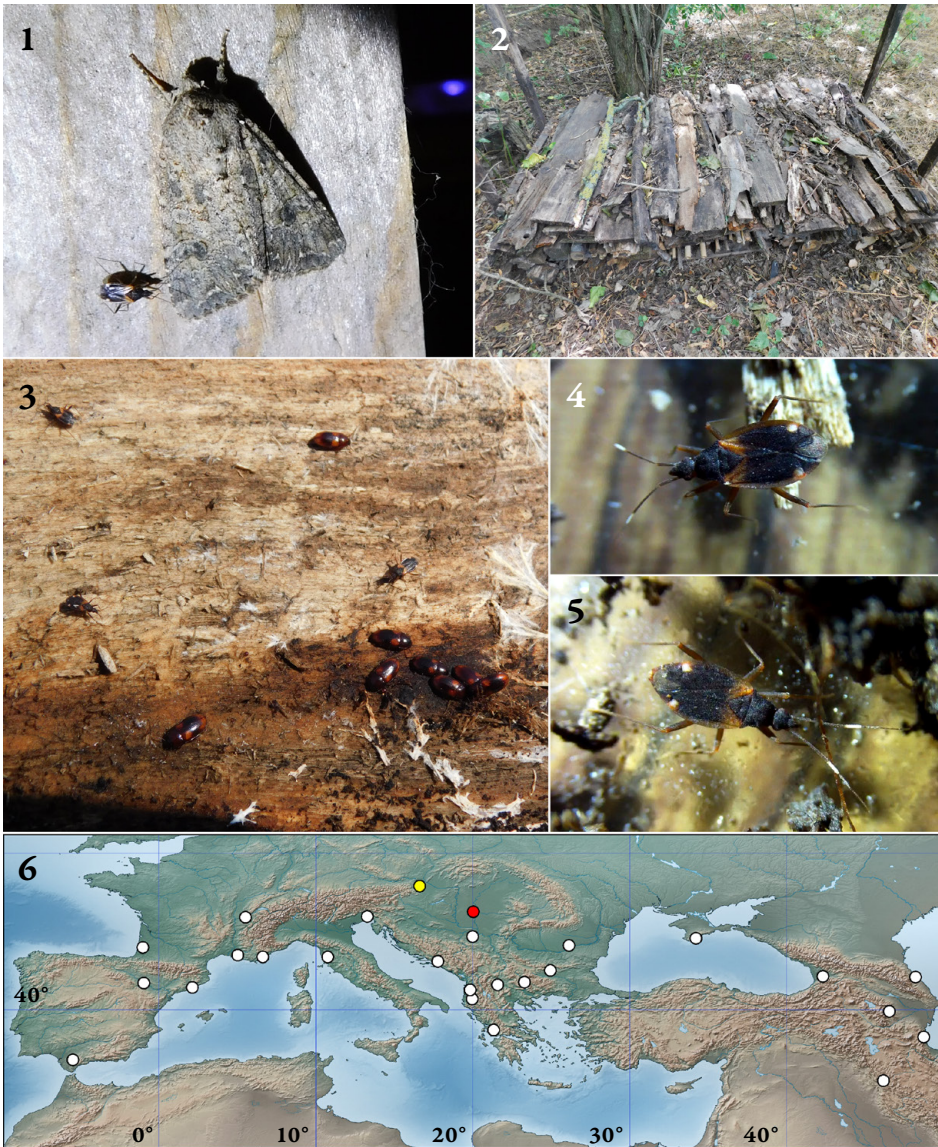
*borgesi* Chérot, Ribes et Gorczyca, 2006 was reported from the Balears, the Canary Islands and northern parts of peninsular Spain; based on taxonomic considerations this species is probably of South American origin, but it has not yet been detected in its presumed native area of distribution (CHÉROT *et al.* 2006, CHÉROT & PAGOLA-CARTE 2012, ROCA-CUSACHS *et al.* 2016). No species of the genus has been reported from Hungary so far.

Published information on the habits of *Fulvius* species is scarce. Most species occur on or under the bark of rotting logs, where they possibly feed on fungi (SCHUH 1976, WHEELER 2001). However, observations on species feeding on eggs and larvae of various insects and on mites are relatively abundant (CHINA 1935, ZIMMERMAN 1948, WOODROFFE & HALSTEAD 1959, KELTON 1985, CHÉROT *et al.* 2011), suggesting that at least some species are at least partly or facultatively predacious. Records of various *Fulvius* species among dead leaves (USINGER 1946), withered branches of trees (YASUNAGA 2000) or even from carrions (PAYNE *et al.* 1968) also possibly imply predacious feeding habits. So far the most portentous evidence on the matter was provided by PLUOT-SIGWALT & CHÉROT (2013) who successfully maintained a colony of *Fulvius carayoni* on eggs and young caterpillars of the Mediterranean flour moth (*Ephestia kuehniella* Zeller, 1879, Lepidoptera: Pyralidae) for four years, unquestionably demonstrating that at least this species can develop exclusively on a predatory diet; this might be the primary feeding strategy in the genus as it was suggested by WHEELER (2001). Unlike other cylapines, *Fulvius* species are often attracted to light, sometimes in large numbers (SCHUH 1976, YASUNAGA 2000, YASUNAGA & MIYAMOTO 2006, ÇERÇİ *et al.* 2021).

The present paper documents the first known occurrence of *Fulvius oxycarenoides* in Hungary, representing a new country record not only for the species, but in the same time also for the genus *Fulvius*, the tribe Fulviini, and the subfamily Cylapinae. Based on observations made on three individuals kept in captivity, some aspects of the bionomics and behaviour of the species are presented.

## RESULTS

An adult individual of *Fulvius oxycarenoides* (Fig. 1) was observed by the first author next to an individual of *Hadula trifolii* (Hufnagel, 1766) (Lepidoptera: Noctuidae) at lamplight at night in Domaszék (Csongrád-Csanád county, Hungary, 46.2387°N, 20.0151°E), on 3.VII.2022. The location is a privately owned farm housing diverse habitats from grasslands to forest. The hemipteran was not the primary photo subject, and it only became the focus of attention several months later, in 2023, when subsequent observations were made at the same location.



**Figs 1–6.** *Fulvius oxycarenoides* (Reuter, 1878). 1 = the first adult that was observed in Hungary (Domaszék, 3 July 2022) (source: izeltlabuak.hu, license: CC BY 4.0); 2 = habitat in Domaszék; 3 = three adults on a rotting board accompanied by individuals of *Diaclina testudinea* (Piller et Mitterpacher, 1783); 4–5 = adults kept in a terrarium during May 2023; 6 = distribution (white circles represent previous literature records, red circle indicates the new country record from Hungary, yellow circle the record from Austria by MELBER *et al.* (1991) likely based on a human-mediated introduction) (photos by Lili Lajtár)

On 18–19.III.2023 eight individuals of *Fulvius oxycarenoides* were found under a woodpile made of black poplar (*Populus nigra* L., Salicaceae) boards in the territory of the same farm (Fig. 2). The pile and the surrounding area have been undisturbed for a long time and the wood has been considerably decomposed. Several adults that did not move even after lifting the boards were observed and photographed; they quickly ran away when the boards were put back. They were only found relatively close to the surface of the pile, and they were missing in deeper, wet and cool layers with progressing fungal decomposition. *Diaclina testudinea* (Piller et Mitterpacher, 1783) (Coleoptera: Tenebrionidae) (Fig. 3), *Myrmecophilus nonveilleri* (Ingrisch et Pavićević, 2008) (Orthoptera: Myrmecophilidae), and an unidentified *Aradus* species (Heteroptera: Aradidae) occurred in large numbers in the microhabitat as well. Although various types of rotting wood were abundant all over the farm, the first author so far only found *Fulvius oxycarenoides* in the above documented pile.

Five additional individuals were found at the same location on 1.V.2023, two of which were captured alive and placed in a terrarium containing pieces of rotting bark from their habitat, covered by plexiglas in order to prevent escape of the individuals and humidity (Figs 4–5). Water was added regularly to maintain humidity. The individuals were checked every day for a period of 23 days.

According to the first author's observations, the two captive individuals avoided direct sunlight, they mainly hid under pieces of bark and were fairly inactive in the daytime. They apparently were unable to climb on the glass and they were not seen to fly. In the late afternoon and early evening they left their shelters and started feeding by piercing the surface of the rotten wood with their rostrum, particularly the relatively wet parts, whilst drier parts were avoided. The two individuals often fed in close proximity with each other. They were not seen to attack individuals of pseudoscorpions, collembolans and mites that were present in the terrarium, and they did not accept individuals of an aphid which were offered from them on a leaf of elder (*Sambucus nigra* L., Adoxaceae) as an experiment. Feeding was often interrupted by self-cleaning, particularly their labium using their two fore legs.

Approximately 20°C or above was found to be optimal for them; in lower temperatures the activity of the individuals decreased and they become motionless. After a few days they considerably got used to human disturbance and the proximity of humans and exhibited less and less strong escape response, although they still ran when they were touched by finger.

On 18.V.2023 one of the two individuals escaped in an unknown way. On 23.V.2023 the other individual died after having starved for two days. It was preserved in 70% ethanol.

No more individuals could be found after the first few days of May in spite of repeated efforts throughout May and June of 2023. However, on 18.VII.2023 eleven individuals were attracted to a white LED (4000 K) and UV-LED (395 nm) set up in the immediate proximity of the above documented woodpile,

demonstrating an excellent flight ability. On 20.VII.2023 seven individuals were observed in the same way, one of which was captured and placed in the same terrarium, but it died after two days by drowning in a drop of water; it was also preserved in 70% alcohol and will be deposited in the collection of the Hungarian Natural History Museum, Budapest. On 23.VII.2023 three, on the 24.V.2023 five, on each of the days 3–4.VIII.2023 one individual were observed at the above described light in the same location. The weather was relatively warm (over 20°C) in these nights.

## DISCUSSION

### Identification

*Fulvius* species are fairly different from all other mirids present in Hungary, and their unusual habitus allows an easy recognition; their porrect head far produced anteriorly, the eyes and the elongate pronotum are particularly remarkable. Among the congeners that have been reported from Europe, *Fulvius oxycarenoides* is readily recognisable on the basis of the combination of the presence of a conspicuous, contrasting pale annulus occupying approximately the distal one third of the pedicel; the proximal one third of the sclerotised part of the fore wings (including both the corium and the clavus) being reddish brown; the presence of a large whitish patch on the corium immediately proximal of the cuneal fracture; cuneus being uniformly dark; and the pedicel being distinctly (about 1.25 times) longer than the humeral width of the pronotum (Figs 4–5). Genitalia of the two sexes were adequately figured by KERZHNER (1972), SADOWSKA-WODA *et al.* (2006), PLUOT-SIGWALT & MATOCQ (2017) and ÇERÇİ *et al.* (2021).

### Distribution and dispersal

*Fulvius oxycarenoides* has been reported from most countries of the European part of the Mediterranean Basin, the Crimea, the Caucasus, and western Iran. Its distribution was reviewed by EHANNO (1987), KERZHNER & JOSIFOV (1999) and GORCZYCA (2006). Published records from Croatia are probably erroneous (PAJAČ *et al.* 2010), those from Turkey are partly erroneous and partly doubtful due to actual or potential confusion of this species with *Fulvius anatolicus* (ÇERÇİ *et al.* 2021). Based on the references listed by GORCZYCA (2006) and adding the records of SERVADEI (1967), MATOCQ (1989), RIBES (1990), LINNAVUORI (2009), PROTIĆ (2011), GHAHARI & CHÉROT (2014) and ROCA-CUSACHS & GOULA (2021), but omitting the erroneous or doubtful records mentioned above, a revised map was compiled (Fig. 6).

The species was reported from Austria based on individuals found under bark of logs in the zoo of Schützen am Gebirge, Burgenland, in 1976 (MELBER *et al.* 1991); it has not been detected in the country subsequently (RABITSCH 2012). The locality in concern is by far the northernmost known occurrence of the species (Fig. 6), but considering the vast distance between it and the probable northern boundary of the native area of the species as of 1976, this isolated finding is most probably based on an accidental introduction.

The origin of the first individuals of *Fulvius oxycarenoides* detected in Hungary and reported in the present paper is unknown. A human-mediated transportation cannot be excluded. However, judging from the fact that many other hemipterans that are similarly native in the Mediterranean have recently expanded their area in the north and became established in Hungary (KONDOROSY 2012, OROSZ & VÉTEK 2017), arrival via natural migration seems also possible. Considering the fact that in contrast of many other rapidly expanding non-native species that were first detected around major transportation hubs in Hungary (KONDOROSY 1995, RÉDEI & TORMA 2003, KÁROLYI & RÉDEI 2017, TÓTH *et al.* 2017, KORÁNYI *et al.* 2018, KÓBOR *et al.* 2021), *Fulvius oxycarenoides* was found along the southern border of Hungary, natural migration seems to be more likely.

The fact that despite the cryptic habits of the species a targeted search could detect numerous individuals over a period of five months during the spring and summer of 2023 suggests that a considerable population might already be present at least in the investigated location, but potentially in other nearby areas of southern Hungary. This probably represents the northernmost border of the area of the species (where a stable population can exist) at the present.

The species apparently adapts well to human disturbance, and with the rapidly changing climate in the region a further expansion of this species is predicted. Due to its fungivorous or probably partly predatory habits associated with dead wood or small invertebrates feeding on it, the species apparently does not represent a danger to the natural ecosystems of Hungary or Central Europe.

### Bionomics

Observations on individuals in captivity indicate that *Fulvius oxycarenoides* prefers warm and humid conditions. It might be relatively abundant on rotting wood lying on the ground (Fig. 3); it is found not only in subcorticolous microhabitats, but it readily colonises surface of cut wood boards concealed inside of wood piles. Adults are hiding in the daytime, but leave their shelters in the evening. They readily feed from pieces of rotten bark, presumably sucking hyphae. No predatory behaviour on invertebrates normally present in their native habitats (e.g. pseudoscorpions, collembolans and mites) could have been observed, but this does not necessarily indicate that the species does not have at

least partly or facultatively predacious habits, because preys reportedly attacked by other species of *Fulvius* (larvae of Coleoptera and Diptera developing in dead wood) (CHINA 1935, ZIMMERMAN 1948, KELTON 1985) were not present in their enclosure. Similarly to other congeners, the species is readily attracted to artificial light. Its life cycle in Hungary deserves further study.

#### Hungarian name

Proposed Hungarian name of *Fulvius oxycarenoides*: vörösló alkonypoloska, in allusion to the fact that the species becomes active after sunset and also of the two conspicuous reddish brown spots on its body.

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