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NEW FINDS OF BAGWORM *PTILOCEPHALA BIROI* (REBEL, 1909) FROM VELEBIT IN CROATIA (LEPIDOPTERA: PSYCHIDAE)

Željko PREDOVNIK[1], Jurij REKELJ[2]

[1] Ob železnici 82, 3313 Polzela, Slovenia. e-mail: predovnik1@gmail.com
[2] Struževo 35, 4000 Kranj, Slovenia. e-mail: jurij.rekelj@gmail.com

Abstract – We discuss findings of the species *Ptilocephala biroi* (Rebel, 1909) on Visočica mountain in the central part of the Velebit mountain range. These are the first observations of a rare and hitherto little-known species, described in the early 20th century on the basis of only one male specimen. During our field work, we succeeded in rediscovering the species in nature, where in addition to males we were successful in observing females, caterpillars and pupae of both sexes. Pupae, female and caterpillars have not so far been known. Data on the biology and the rearing of larvae are also presented in the paper.

KEY WORDS: Lepidoptera, Psychidae, *Ptilocephala biroi*, new records, fauna, Croatia

Izvleček – NOVE NAJDBE VREČKARJA *PTILOCEPHALA BIROI* (REBEL, 1909) NA VELEBITU NA HRVAŠKEM (LEPIDOPTERA: PSYCHIDAE)

V prispevku obravnavamo najdbe vrste *Ptilocephala biroi* (Rebel, 1909) na gori Visočica v osrednjem delu Velebita. To so prva opazovanja redke in do sedaj malo znane vrste, opisane na začetku 20. stoletja po samo enem primerku samca. Med terenskim delom smo uspeli ponovno najti vrsto v naravi, kjer smo poleg samcev uspešno opazovali še samice in gosenice, ter bube z vrečkami obeh spolov. Bube, samice in gosenice do sedaj niso bile poznane. V prispevku so predstavljeni tudi podatke o biologiji in gojenju gosenic.

KLJUČNE BESEDE: Lepidoptera, Psychidae, *Ptilocephala biroi*, nove najdbe, favna, Hrvaška

Introduction

The genus *Ptilocephala* Rambur, 1858, has about 24 named species in the Palaearctic region, especially diverse in the Iberian Peninsula and Italy (Arnscheid & Weidlich, 2017). With their winged males and apterous females, they belong to

the medium-large to large psychids (Arnscheid & Weidlich, 2017). So far, three species: *P. biroi* (Rebel, 1909), *P. muscella* (Denis & Schiffermüller, 1775) and *P. plumifera* (Ochsenheimer, 1810), have been reliably confirmed in Croatia (Gumhalter, 2020; Predovnik & Kranjčev, unpublished data), while Arnscheid & Weidlich (2017) mention only *P. biroi* and *P. plumifera*.

On July 28th 1893, the Hungarian entomologist Lajos Biró found the first and so far the only confirmed male specimen of *P. biroi* in the Velebit mountains near Raduc [Raduč], about 23 km southeast of Gospić (Rebel, 1909). The specimen, now stored in the National Museum in Budapest, was described as a new species *Oreopsyche biroi* by Rebel and named after the finder. For now, the species is reliably known only from Velebit (Sobczyk, 2011; Arnscheid & Weidlich, 2017).

In the paper we present additional information on the biology and morphology of *P. biroi* as observed in the natural environment in Croatia.

Material and methods

Field observations. In the field, we mainly used the method of observing and photographing larvae and adults in order to obtain data on the behavour of this species in its natural habitat. Freshly attached female larval cases collected in the larval habitat were successfully used as pheromone baits for active males. In addition to observing, larvae, adults, and eggs were collected for rearing and for more detailed examination.

We used ESRI ArcGIS Pro 2.9 software to map all known records from different localities (Figure 1). For the base map, ESRI topographic map layers from the ArcGIS online version were used (ArcGIS 2021).

Rearing. The observation colony was established by collecting young larvae in their habitat. They were kept in mesh breeding boxes in which we made an approximate copy of the natural habitat with soil, sand, moss and plant particles from the locality. For food we planted several species of plants, such as: *Trifolium pratense* L., *Taraxacum officinale* Web., *Plantago lanceolata* L., *P. major* L. and various sharp grasses: *Brachypodium* sp., *Sesleria* sp., and *Festuca pratensis* Huds., etc. We occasionally added fresh leaves of *Rumex* sp. and *Taraxacum* flowers, which have proven to be a favourite food. The breeding boxes were slightly moistened with water once a day and twice a day on warm summer days: in the morning and in the evening. We watered moderately once a week and once every two weeks in winter. All rearing procedures were carried out in external conditions.

The nomenclature is taken from Arnscheid & Weidlich (2017), the evidence specimens are preserved in the author's collection, the photographs are the work of both authors.

Results

Material. Croatia, Srednji Velebit, Visočica, 1500–1550 m: 1♂ with larval case, leg. D. Šešok, 20.6.2019, (e.1.–e.p.), coll. Ž. Predovnik. 7♂♂, 9♀♀ with larval

Fig. 1: Distribution map of *P. biroi* with confirmed and doubtful findings.

cases, 3 empty old larval cases, leg. Ž. Predovnik, 13.6.2020 (e.l. 14.6.–12.7.2021), coll. Ž. Predovnik; 19♂♂, 16♀♀ with larval cases, leg. J. Rekelj, 13.6.2020 (e.l. 14.6.–12.7.2021), coll. J. Rekelj. 13♂♂, leg. Ž. Predovnik, 6.7.2021, coll. Ž. Predovnik; 4♂♂, 16♀♀ empty larval cases, leg. Ž. Predovnik, 6.7.2021, coll. Ž. Predovnik; 1♂ with larval case, leg. Ž. Predovnik, 6.7.2021, coll. Ž. Predovnik; 6♂♂, 3♀♀ with larval cases, leg. J. Rekelj, 6.7.2021, coll. J. Rekelj; 5♂♂ pupa with larval cases, 9 empty larval cases, leg. J. Rekelj, 6.7.2021, coll. J. Rekelj.

Observations. On June 20th in 2019, on one of his mountain trips, Croatian entomologist Damir Šešok found a freshly attached larval case of an indeterminate bagworm species, below the top of the Mount Visočica at an altitude of 1550 m. He gave the larval case to his friend Dr. Radovan Kranjčev, and a single male hatched a few days later. Dr. Kranjčev identified the butterfly as *Phalacropterix graslinella* (Boisduval, 1852) and then donated it, together with the larval case to the first author. Redetermination with comparison of the external morphology of the male corresponds to the description of the species *Ptilocephala biroi*.

In the following year, on 14th June 2020, we visited the locality on Visočica mountain again. Along the trail just below the ridge, at an altitude of about 1500–1550 m we found many active young larvae of the genus *Ptilocephala* sp. The species inhabits rocky calcareous grasslands (association of *Seslerietum juncifoliae*)

Fig. 2: Habitat of *P. biroi* on Visočica, Srednji Velebit, 1500 m, 6.7.2021. Photo: J. Rekelj.

on SW and W exposed slopes. Larvae were observed mainly on high grass stems, individually or in scattered groups along the entire grassy slope. The larval cases were between 5 and 8 mm long. After a few hours of searching, we found three old cases in the herb layer, hidden among the stones and grasses. Despite the sunny weather, no active adults were observed.

We visited the locality again the following year on 6th July 2021, on the first warm and sunny day after a short period of rain. The main goal was to find the last instar larvae and adults. We found many empty as well as several freshly attached larval cases before pupation, while young larval cases were not present in this year. We observed that the larvae look for hidden, dry and warm stones for attaching their cases and are not interested in substrates of vegetation or bare soil. Female cases were more often attached on exposed sites, attached mostly to the south side of rocks or larger stones up to half a meter above the ground, as well as under smaller flat stones. Larval cases of males (some already with exuvium) were attached to the

Fig. 3: Immature specimens of *P. biroi*. **a.** Young larva from rearing, 13.5.2021. Photo: J. Rekelj; **b.** Last instar larva from rearing, 20.5.2021. Photo: Ž. Predovnik.

underside of smaller, mostly flat stones and only exceptionally to the base of larger rocks. All cases were spun and attached with dense white-silver silk.

At 9:46 am, we observed the first adult male in fast and strong flight low above the ground vegetation. They are hard to catch because of difficult footing on the rocky slopes and because males tend to move along rapidly in the wind, so we used freshly collected female larval cases for pheromone attraction, which proved to be the most successful way for attracting males. Males appeared at short intervals throughout the day occasionally saw them fly two or three at a time. A few individual males flew close to the set females during the day, but none of them tried to mate with them, from which we concluded that they were probably already fertilized. A

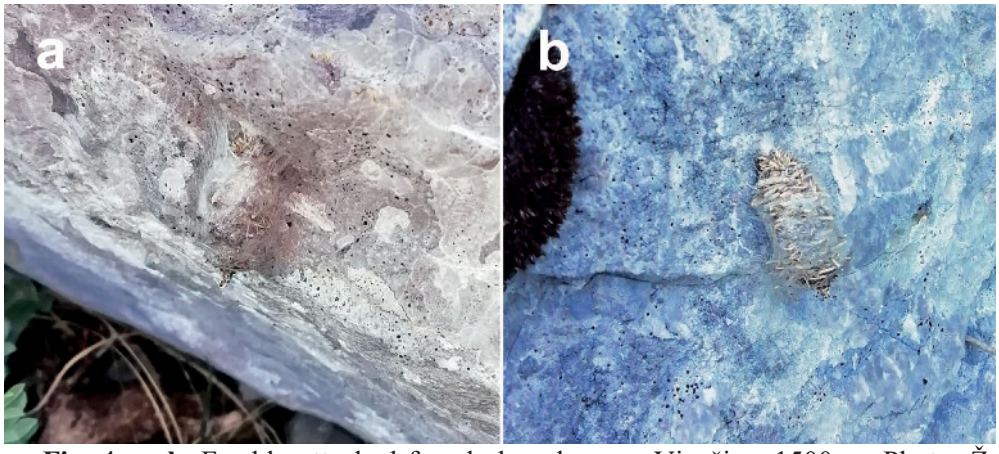


Fig. 4: a, b. Freshly attached female larval cases, Visočica, 1500 m, Photo: Ž. Predovnik.

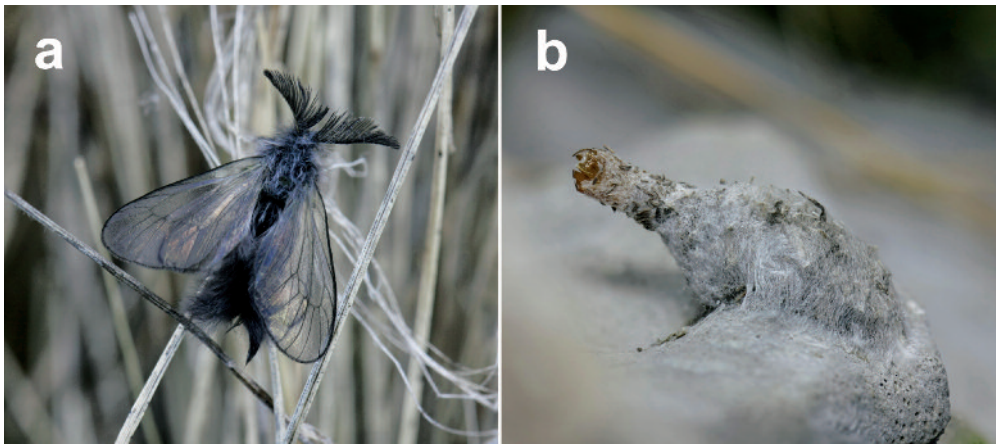


Fig. 5: *P. biroi*: **a.** Freshly hatched reared male, 16.6.2020. **b.** Attached male larval case with exuvium, Visočica, 1500 m, 6.7.2021. Photo: J. Rekelj.

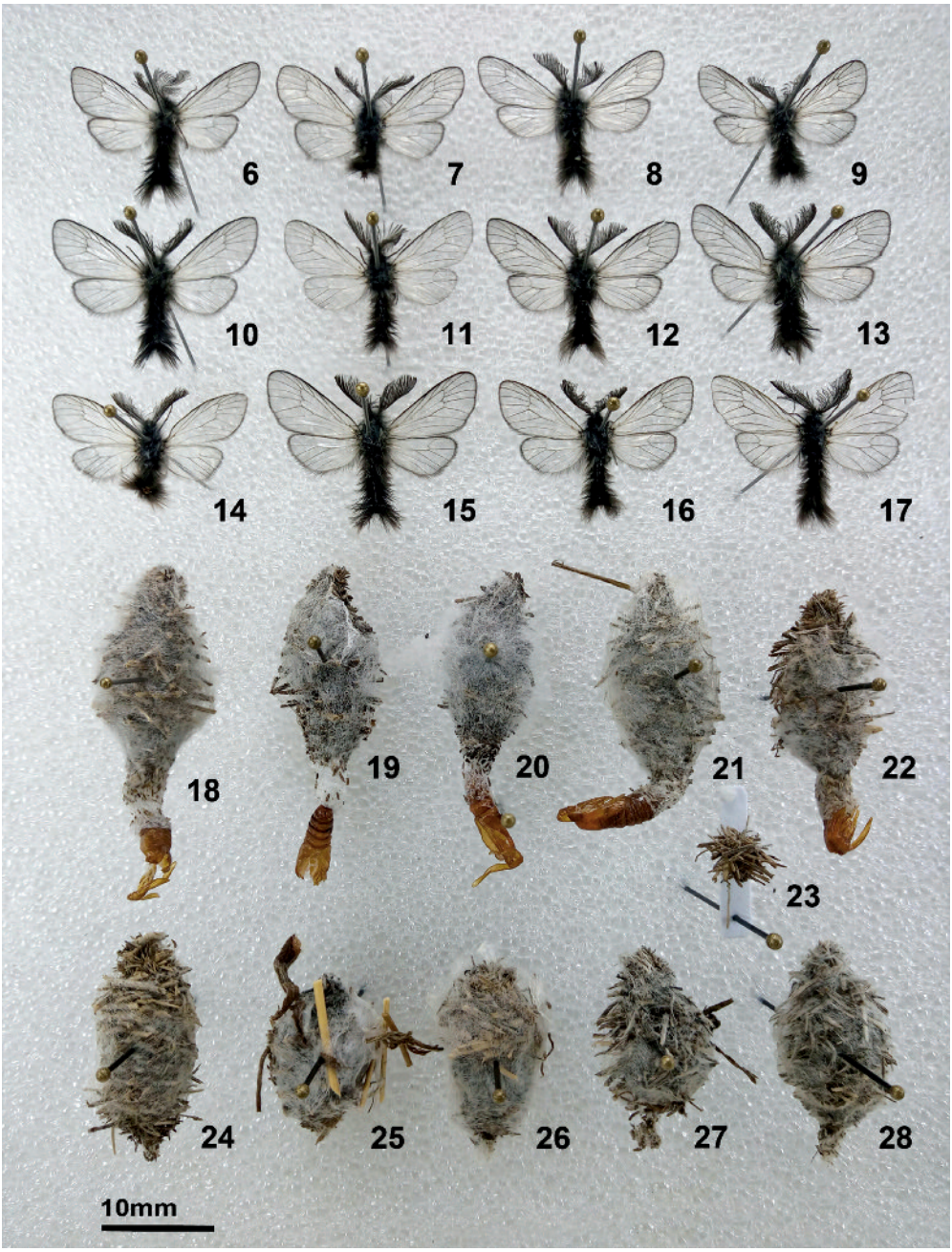
crowd of young larvae later in fact hatched from a few of these bags. By 6pm, when we left the locality, we had counted a total of about 35 active males.

According to Kozhanchikov (1956), relatively large larval cases of *P. biroi* are very similar to cases of *P. vesubiella* (Millière, 1872), which was also confirmed by our findings and they belong to the "viciella" type in terms of shape (Arnscheid & Weidlich, 2017). They are rounded, covered transversely with distinctly protruding, short grass stems, in the final instar larva also covered with dense silk thread. In the final instars, a pronounced sexual dimorphism is expressed. Male cases are more pear-shaped, with a distinctive silken tube at the rear-end. The length of male cases is between 16 and 21 mm and the width is 8 to 11 mm, with a silk tube 4 to 6 mm long and 3 to 4 mm in diameter (n=19). Female larval cases are cylindrical to roundish, with a poorly visible thin silken tube and are therefore shorter. The length is between 9 and 11 mm and the diameter is 12 to 19 mm, with a thin silk tube 2 to 3 mm long (n=11). All measurements apply to larval cases found in the natural environment. The cases of larvae grown under laboratory conditions are generally smaller in size, with almost no characteristic dense silk threads.

The wingspan of adult males obtained in nature or hatched from reared material does not show differences in size and is from 17 to 20 mm (n=21).

Discussion

According to our observation, the last instar larvae and adults *P. biroi* were found on Visočica every other (odd) year, which indicates a biennial life cycle, with the appearance of adults in July. The length of daily activity of males that were active on the day of observation from the morning until late afternoon is surprising. Most activity is likely to be weather dependent and confined to bright, sunny periods, which will be clarified by future research.



Figs. 6–28: Adults and larval cases of *P. biroi*, collected in natural habitat. **6–17.** Male specimens; **18–22.** Male larval cases; **23.** Young larval case; **24–28.** Female larval cases; Coll. Ž. Predovnik, photo: J. Rekelj.

Kozhanchikov (1956) states *P. biroi* also for Bosnia and Herzegovina: »Dinaric Alps, Bosnia, Mt. Travnik«, where in all probability he means the mountainous area from the settlement of Galica to the mountain peak Paljenik (Vlašić) 1933 m above the town of Travnik. The author does not specify the exact location for the locality »Herzegovina, Mt. Prenj-Planina«: Prenj is a mountain massif in the south of Bosnia and Herzegovina, with more than eleven peaks higher than 2000 m. Arnscheid & Weidlich (2017) mention the unproven finds of Schawerda (1916) from the Orjen mountain range in Herzegovina. These indications suggest that the species may be more widespread on the tops of the Balkan mountains, since the possible finds coincide with the distribution of plant communities of high mountain vegetation of the Dinarides.

The rediscovery of the species for the first time in all its developmental stages allows us thorough morphological and genetic research in the future, a final comparison of *P. biroi* with the closely related species *P. vesubiella*, which is very similar in external morphology (Rebel, 1909; Kozhanchikov, 1956; Arnscheid & Weidlich, 2017).

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References

Arnscheid R. W., Weidlich M. 2017: Psychidae. - In: Karsholt, O, Mutanen, M. & M. Nuss [edit.]: Microlepidoptera of Europe. Leiden & Boston (Brill), 8: 1–423.

Gumhalter D. 2020: Biodiversity, ecological and biogeographical features of Pyralidae and Crambidae (Insecta, Lepidoptera) in three Croatian climate regions. PhD Dissertation, University of Zagreb, Zagreb, 369 pp. (in Croatian). [Prilog 1 – Prvi sistematski popis utvrđenih vrsta iz skupine mikrolepidoptera].

Kozhanchikov I.V. 1956: Fauna of the U.S.S.R. Lepidoptera. Psychidae. *Zoologicheskii Akademii Nauk SSSR*, *N.S.*, 62, 3(2): 1–517.

Rebel H. 1909: Eine neue Psychiden-Art aus Croatien. *Ann. Mus. Nat. Hungar.*, 7: 344–346.

Schawerda K. 1916: Neunter Nachtrag zur Lepidopterofauna Bosniens und der Herzegovina. *Vehr. tool. bot.Ges. Wien*, 66: 228.

Sobczyk T. 2011: Psychidae (Lepidoptera). In: Nuss, M. (ed.), World Catalogue of Insects, *Apollo books*, Stenstrup, 10: 1–467.

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