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FIRST RECORD OF *LUFFIA LAPIDELLA* (GOEZE, 1783) IN SLOVENIA (LEPIDOPTERA: PSYCHIDAE)

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Abstract – Recent studies of Psychidae in Slovenia have resulted in the finding of *Luffia lapidella* (Goeze, 1783), which is new to Slovenian fauna. Two seasons observation of life cycle at different localities confirmed that the colonies above Dragonja, Socerb and Goriška Brda belong to the parthenogenetic form *ferchaultella* (Stephens, 1850). Some information about biology and ecology of the species are given.

KEYWORDS: Lepidoptera, Psychidae, *Luffia lapidella*, new record, Slovenia, fauna

Izvleček – PRVA NAJDBA VRSTE *LUFFIA LAPIDELLA* (GOEZE, 1783) V SLOVENIJI (LEPIDOPTERA: PSYCHIDAE)

Preučevanja vrečkarjev v zadnjih letih so botrovala najdbi vrste *Luffia lapidella* (Goeze, 1783), ki je nova za slovensko favno. Celoletno spremljanje življenjskega kroga na več lokacijah je potrdilo, da pripadajo kolonije nad Dragonjo, Socerbom in v Goriških Brdih nespolni obliki vrste - formi *ferchaultella* (Stephens, 1850). Podane so informacije o biologiji in ekologiji vrste.

KLJUČNE BESEDE: Lepidoptera, Psychidae, *Luffia lapidella*, nova najdba, Slovenija, favna

Introduction

Intensive studies of Slovenian Lepidoptera fauna in the last ten years began to yield results. With publication of the Rdeči seznam metuljev Slovenije (Carnelutti, 1992a, 1992b) we got the basic reference list which was complemented by the Check list of Slovenian Microlepidoptera (Lesar and Govedič, 2010). Recent intensive studies of Psychidae provided some new and interesting findings in Slovenia (Štanta, 2008; Predovnik, 2009; Predovnik, 2010). The finding of *Luffia lapidella f. ferchaultella*

(Stephens, 1850) is also a result of systematic search, based on good knowledge of biology of the species.

In the genus *Luffia* Tutt, 1899, four species have been described until now. Three species are endemic to the Canary Islands: *Luffia rebeli* Walsingham, 1908, is known from Tenerife, *L. gomerensis* Henderickx, 1996, from La Gomera and *L. palmensis* Sobczyk, 2001 from La Palma (Sobczyk, 2001).

Within the species *Luffia lapidella* (Goeze, 1783) we can distinguish three different ecological forms:

- *Luffia lapidella f. lapidella* (Goeze, 1783).

The ratio between female and male is about 1:1. This type of bisexual form is widespread in Europe from Greece, along the Adriatic coast, Corsica, Sardinia, Sicily, Italy, Madeira, Portugal, Spain, the Maltese Islands and France to the Channel Islands and Great Britain.

- *Luffia lapidella f. maggiella* Chapman, 1901.

In this form, male ratio is quite small, only 1 to 5 % of the population. It is only known in Switzerland.

- *Luffia lapidella f. ferchaultella* (Stephens, 1850)

This is a parthenogenetic form, in which only female population exists. In Europe it is known from the Canary Islands, the Azores, Italy, France, Belgium, Germany, Luxemburg, the Netherlands, Channel Islands, Great Britain and Ireland.

Material and methods

First observation of larvae in the field was carried out from 28th of March 2010 to 15th of Nov. 2010 at three locations on the shore in Western Slovenia. Second observation lasted from 17th of May 2011 to 20th of July 2011 at two new locations, one at the Karst edge and another in Goriška Brda. Some larvae of different instars were taken for observation in captivity. In order to imitate natural conditions of their habitat, they were kept outdoors on the balcony, in insectariums which were protected from direct sunlight. All material was sprinkled with rainwater daily, usually in early morning. The larvae were held on stones overgrown with lichens, brought from the observation locations.

After examination, the females were set and stored in the entomological collection. Specimens from Padna and Socerb are stored in the author's collection, those from Golo Brdo in the collection of Željko Predovnik in Polzela.

Results

Specimens examined: Slovenia (Dates according to the following format: day.month.year):

- Primorska, Padna, 80 m: 10.7.2010 (e.l.), 9 ♀; 11.7.2010 (e.l.), 7 ♀; 12.7.2010 (e.l.), 3 ♀; 13.7.2010 (e.l.), 4 ♀ (larvae collected on 25.4.2010); 13.7.2010 (e.p.), 10 ♀; 14.7.2010 (e.p.), 6 ♀; 15.7.2010 (e.p.), 4 ♀ (larval cases collected on 25.4.2011).

- Primorska, Socerb, 360 m: 19.7.2011 (e.l.), 4 ♀; 20.7.2011 (e.l.), 2 ♀; 21.7.2011 (e.l.), 7 ♀; 22.7.2011 (e.l.), 2 ♀ (larvae collected on 15.5.2011); 22.7.2011 (e.p.), 12 ♀ (larval cases collected on 17.7.2011).
- Goriška Brda, Golo Brdo, 178 m: larva collected on 25.6.2011 emerged on 5.7.2011, 1♀.

Habitat:

In Slovenia *Luffia lapidella* prefers warm south-facing slopes. It is found on retaining walls of terraces and natural rock faces consisting of Eocene flysch sandstone. The larval cases are localized and in some micro-localities quite common. Larvae are likely to avoid places with high light intensity; that is why walls shadowed by vegetation are more populated (Fig. 1). Very important for the occurrence of larvae is the presence of lichens and green algae on the stones. They prefer to feed on lichens of the genus *Lecanora* (McDonogh, 1939). In Slovenia we noticed that the most colonized areas are those overgrown with *Lecanora polytropa* or *L. dispersa* (Fig. 2). Despite intensive search of larval cases on the bark of different trees, no presence of them was confirmed.

Observations:

We started observing the population in Padna at the end of March 2010. At that time a lot of small overwintered larvae were found; larval cases were almost uniform, constructed of small particles of algae, lichens and sand (Fig.3). Their length was between 2 and 2.8 mm. The larval period in captivity ended on 23rd of June. The size of the grown larval cases was from 5.3 to 6.8 mm in length and 1.8 to 2.0 mm in width. In nature there was no difference in size or pupation time, except in the structure of larval cases - a lot of them carried larger parts of plant remains. The fully grown larvae fix larval cases on the sheltered parts of stones or in crevices. Another group of specimens from the same location in the pupal stage was taken from nature for comparison to the bred ones.

Only females hatched after 10 to 15 days (in captivity, hatching time was between July 10th-15th) in the afternoon between 14:30 and 18:00. Exuviae of the female stay completely inside the larval case. After 10-20 minutes (in laboratory conditions) the female starts to lay eggs in the exuviae inside the larval case (Fig. 4). Caterpillars hatch from their eggs after 10 to 14 days. Larval cases of young larvae are made from light silk with remains of the mother larval case (Fig. 5). The length of the initial larval case is 0.8-1.0 mm. Larvae progress quickly until autumn, when conditions involve winter hibernation. At the last visit to the locality on November 13th, the larval cases were between 2.0 and 2.5 mm long.

Intensity of illumination and humidity (McDonogh, 1939) is very important for the larval activity. Our observations in laboratory conditions show more activity in the morning and afternoon, especially after sprinkling with water. During hot sunny hours larvae rest hidden under or between rocks.

We visited the Karst edge at Socerb two times and searched for the presence of species on the whole south-facing slope on 17th of May 2011 near the village. The larval cases were found on the same micro-habitats like those in Padna. A lot of larval cases were taken for further observations. They fixed and pupated on the first week

of July. Only females hatched between 19th and 22th of July and they immediately started to lay eggs inside the larval cases. On 17th of July we visited Socerb again and found many larval cases, some of them with eggs laying females. Very interesting was the finding of 15 active caterpillars, which pupated only 10 days later in captivity. And again from those pupae only females hatched.

The data from Goriška Brda were contributed by Željko Predovnik, who visited this location on 12th and 25th of June 2011. He found on the retaining walls a small number of active caterpillars and some fixed larval cases. At the beginning of July only one female hatched, which immediately started laying eggs.

After two years of observations we can confirm that all examined colonies belong to the form *ferchaultella* (Stephens, 1850). From all localities only females emerged from reared larvae and also from larval cases which were collected later with pupae. The parthenogenetic way of reproduction was clearly shown by the hatching of caterpillars from unfertilized eggs in controlled laboratory conditions. Presence of parthenogenetic population was also confirmed by later verification of larval female exuviae in the field.

Luffia lapidella in their natural habitat in Slovenia cohabits with other bagworm moths, first of all *Eumasia parietariella* (Heydenreich, 1851), another common one is *Psyche crassiorella* (Bruand, 1850), and *Taleporia tubulosa* (Retzius, 1783).

Discussion

Asexual reproduction in the family Psychidae is a secondary reproductive strategy (Soumalainen, 1962; Bell, 1982). Among Naryciinae this way of reproduction is quite common, but for now few theories exist on this phenomenon.

Observations of *L. lapidella* took two seasons because of one interesting reason. In the first year (2010) the observation at first location showed that in reared material only females were found. Just a few days before submitting the article the author received interesting information that Mojmir Lasan discovered one male of this species (Fig. 6). Specimen was collected on 22nd of July 1993 near the village Socerb during the day time, by net. This remarkable information certainly delayed the publication of the article and involved further studies in the year 2011. Despite intensive searching and rearing numerous larvae, no single male was found.

For now *Luffia lapidella* have been found in Slovenia on hillsides above Dragonja, Socerb and in Goriška Brda, but similar biotopes are widespread, and the species is probably widely distributed. Some ecological, physiological or environmental factors can involve parthenogenesis (Grapputo, Kumpulainen, 2005). In our case we can just presume that the changes in the environment (overgrowing habitats) in recent years affects this way of reproduction. In the parthenogenetic form the appearance of males happens extremely rarely. The possibility of finding bisexual forms of *lapidella f. lapidella* can't be excluded, as findings in other countries show both forms living separately in different micro-climate conditions in the same area.

The existence of the species depends on preservation of natural rock walls or retaining walls of local stone. These habitats are menaced because old walls are overgrown or destroyed by intensive agriculture.

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References

Bell, G., 1982: The masterpiece of nature: the evolution and genetics of sexuality. University of California Press, Berkeley.

Carnelutti, J., 1992a: Rdeči seznam ogroženih metuljev (Macrolepidoptera) v Sloveniji. *Varstvo narave*, Ljubljana, 17: 61–104.

Carnelutti, J., 1992b: Popravki / errata. *Varstvo narave*, Ljubljana, 18: 189–190.

Fauna Europaea Web Service, 2004: *Fauna Europaea* version 2.5 (last update 23. July 2012), http://www.faunaeur.org.

Forster, W., Wohlfahrt, T. A., 1960: Die Schmetterlinge Mitteleuropas. Band. III: Spinner und Schwärmer (Bombyces und Sphinges). 239 p.: 189–190.

Grapputo, A., Kumpulainen, T., Mappes, J., 2005: Phylogeny and evolution of parthenogenesis in Finnish bagworm moth species (Lepidoptera: Psychidae: Naryciinae) based on mtDNA-markers. *Ann. Zool. Fennici,* 42: 141–160.

Hättenschwiler, P., 1997: Pro Natura – Schmetterlinge und ihre Lebensräume, Band 2, Psychidae: 165 – 308, *Luffia lapidella*: 231–233.

Lesar, T., Govedič, M., 2010: Check list of Slovenian Microlepidoptera. *Natura Sloveniae*, 12 (1): 35–125.

McDonogh, R.S., 1939: The habitat, distribution and dispersal of the Psychid moth, *Luffia ferchaultella*, in England and Wales. *Journal of Animal Ecology*, 8: 10–28.

Predovnik, Ž., 2009: *Ptilocephala muscella* ([Denis & Schiffermüller], 1775) prvič najdena v Sloveniji (Lepidoptera: Psychidae). *Acta entomologica slovenica*, 17 (2): 130–132.

Predovnik, Ž., 2010: *Phalacropteryx graslinella* (Boisduval, 1852) in Slovenia (Lepidoptera: Psychidae). *Acta entomologica slovenica*, 18 (2): 151–158.

Sobczyk, T., 2001: *Luffia palmensis* sp. n. eine neue Psychide von den Kanarischen Inseln (Psychidae). *Nota lepidopterologica*, 24 (4): 11–16.

Suomalainen, E., 1962: Significance of parthenogenesis in the evolution of insects. *Annu. Rev. Entomol.,* 7: 349–365.

Štanta, R., 2008: Novi najdbi v slovenski favni metuljev (Lepidoptera). *Acta entomologica slovenica*, 16 (1): 63–66.

Zerafa, M., Sammut, P., Hättenschwiler P., 2008: *Luffia lapidella* (Goeze, 1783), a new bagworm moth for the Maltese Islands (Lepidoptera: Psychidae). *Bulletin of the Entomological society of Malta*, 1: 51–54.

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Fig. 1: Habitat in the village Padna on 25th of April 2010: retaining wall of flysch sandstone. Small plants are lightly shadowing rocks, overgrown with lichens.

Fig. 2: Stone lichen - *Lecanora dispersa.*

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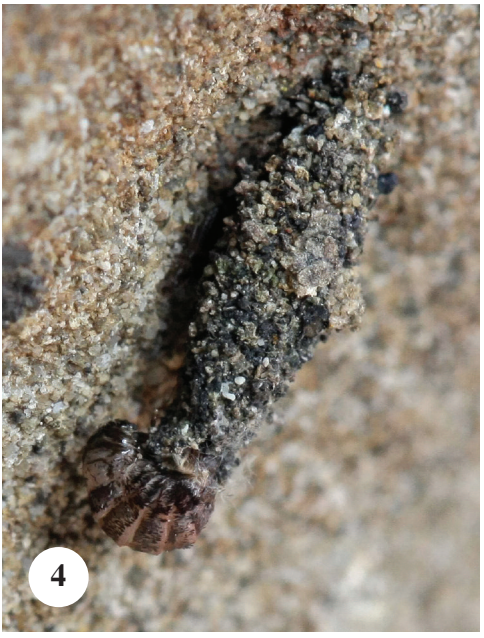

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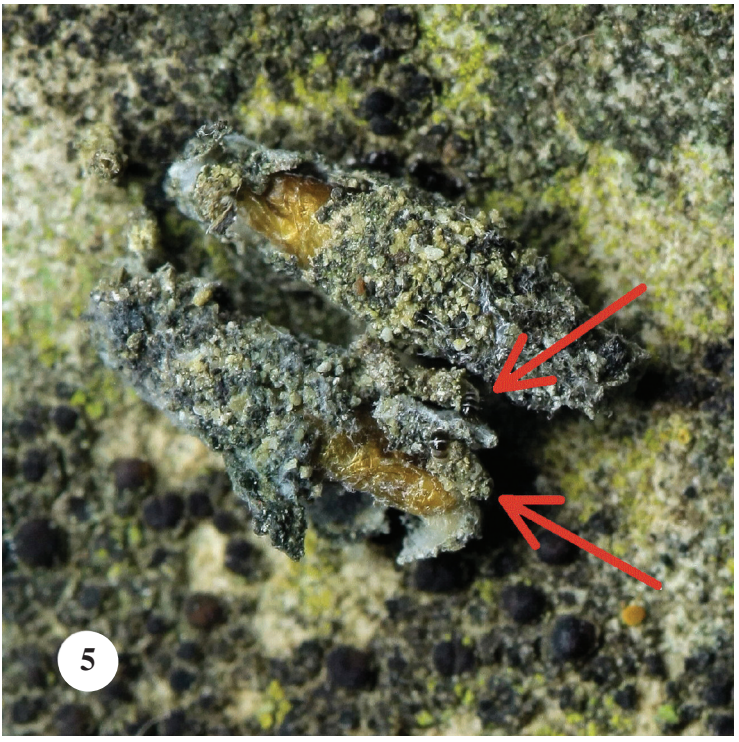

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Figs. 3-6: *Luffia lapidella*: **3** - Bag of almost full-grown larva; **4** - Female laying eggs inside the larval case; **5** - Young larvae on the mother larval case; **6** - Male, Slovenia, Primorska, Socerb, 360 m, M. Lasan leg.

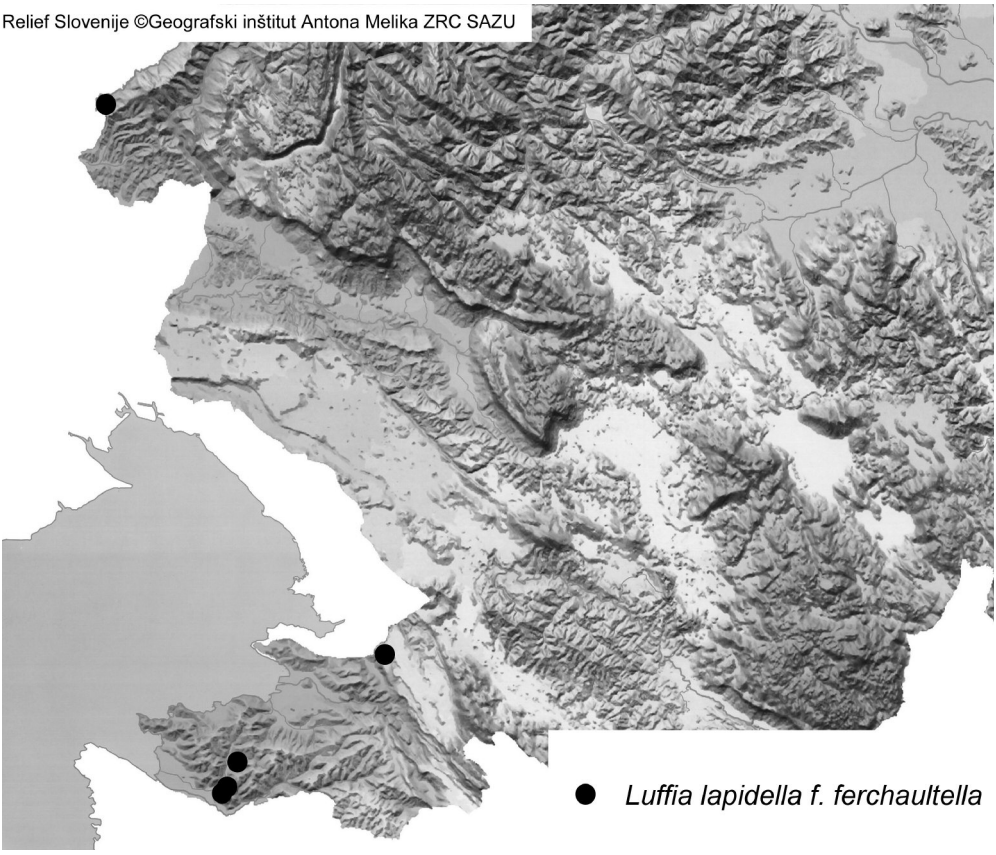

Fig. 7: Distribution of *Luffia lapidella* in western Slovenia.