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Paracaloptenus cristatus Willemse, 1973 (Orthoptera: Acrididae) recently rediscovered in Slovenia

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Abstract

After extensive search, we finally succeeded, in September 2011, to confirm the current presence of *Paracaloptenus cristatus* in Slovenia. The species inhabits remnants of xerothermic meadows surrounded by southerly exposed sub Mediterranean to sparse montane forest habitats on Slavnik Mountain. Further observations in 2012 showed that the species has reproduced well, although only a small population was located. Adult individuals were observed at the site from mid-July to the end of September. As only a limited number of individuals were present at the site, the species is highly endangered in Slovenia and should receive immediate protection.

Zusammenfassung

Nach langer Suche ist es endlich gelungen, einen rezenten Nachweis von *Paracaloptenus cristatus* in Slowenien im September 2011 zu erbringen. Die Art lebt auf den Resten xerothermer Rasen an den südexponierten Hängen des Slavnik, umgeben von submediterranem bis lückigem montanem Wald. Weitere Beobachtungen im Jahr 2012 zeigten, dass die Art sich erfolgreich fortpflanzt, obwohl es sich nur um eine kleine Population handelt. Adulte Tiere wurden von Mitte Juli bis Ende September beobachtet. Da es sich um eine kleine Population handelt, ist die Art in Slowenien als stark gefährdet einzustufen und sollte sofort geschützt werden.

Introduction

The genus *Paracaloptenus* is closely related to *Calliptamus* but is not so polymorphic and wide spread as the latter. Three species of *Paracaloptenus* are present in Europe. *Paracaloptenus caloptenoides* was first described by Brunner von Wattenwyl (1861). The species is known from isolated populations in Eastern Europe and the Balkans, and was also recently found in Slovakia (GAVLAS 2004, 2005) and discovered in Austria (PANROK 2008). It is also listed as Natura 2000 species in the Habitat Directive of the European Union (Annex II & IV) and therefore protected at the European level. Special conservation areas are designated in the countries where this species is present.

Almost one hundred years after Brunner von Wattenwyl described *P. caloptenoides*, two additional species were observed in Europe. First, UVAROV (1942) described *Paracaloptenus bolivari,* which is endemic to the Pyrenees in Spain and France (PONIATOWSKI et al. 2012).

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In 1973 Willemse described the third species *Paracaloptenus cristatus*, which is closely related to *P. caloptenoides* and can be considered as its sibling species. These two species can only be differentiated on the apex of the males' phallus, which is slightly different between the two species, whereas females are inseparable (illustrations in WILLEMSE 1973 and HARZ 1975). *P. cristatus* was described from material from Učka Mountain, Istria (Croatia), and a locality near Mostar (Bosnia-Herzegovina. The species is generally rare and lives in isolated locations.

In Slovenia US (1992) mention only the species *P. caloptenoides* in his key of Orthopteroidea insects, where he did not stated any exact location. As he mentioned in his text: "Willemse (1973) found and described the species *P. cristatus* from Učka Mt. (Istria), which differentiate from our known *P. caloptenoides* mainly on the shape of male copulating organ and the more tightened elytra. Females of both species cannot be separated. According to Willemse opinion, this species lives in South West of former Yugoslavia, and should also be present in Slovenia, as *P. caloptenoides* is spread across Eastern and Southern Europe. In my collection there are only females from Monte Negro and Slovenia, therefore, I could not confirm the statements of Willemse, thus I only gave a description of *P. caloptenoides*".

According to this information, the third author searched for a very long time in order to confirm the presence of the species in Slovenia and to verify their systematic status (GOMBOC & ŠEGULA 2006). As he is familiar with the habitat of *P. cristatus* from Učka and *P. caloptenoides* from Austria, he searched in the most suitable habitats for the presence of *Paracaloptenus* sp., in the area of Podgorski Kras, on south exposed slopes at the Karst edge and in other suitable habitats with flysch rocks in the direction of the coast.

Results and discussion

Location and habitat

After several years of intensive search for *Paracaloptenus* sp. we finally succeeded to find several individuals of *P. cristatus* in the area of Slavnik Mountain. During an orthopterological excursion by the first two authors on 2 September 2011, a small population of the species with approximately 30 individuals was located in two small clearings at 670 m and 746 m asl, respectively (fig. 1, 2). The following material was collected and examined: 4 ♂♂ & 3 ♀♀ leg., det. and coll. E. Sardet -/9/2011, 2 ♂♂ & 1 ♀ leg., det. and coll. S. Gomboc, 2/9/2011. For positive identification the phallus of 5 ♂♂ were dissected by the authors.

The species lives on the patches of xerothermic grassland, which are remnants of former pastures within the southern exposed sub Mediterranean to montane sparse forest on Slavnik Mountain (fig. 3).

Further observations in 2012 showed, that the species had reproduced well, although only small populations were found. On 14 July 2012 all together 60 individuals, mainly nymphs and a few adults (mainly males), were observed at a few locations from the altitude of 670 m to 900 m. Adult individuals were observed at the site from mid-July to the end of September, although 2012 was a very hot

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and dry summer, which was the reason for the earlier disappearance of the most other Orthoptera species. On the dry meadows on the Karst Plateau most Orthoptera had already vanished by the end of July. On 9 September 2012, ten individuals were still observed at five localities; on 29 September, only four individuals were present.

In the habitat of *P. cristatus* the following Orthoptera species were observed during excursions in 2011 and 2012: *Arcyptera fusca*, *Barbitistes yersini*, *Barbitistes ockayi*, *Barbitistes serricauda*, *Calliptamus italicus*, *Ephippiger discoidalis*, *Euchorthippus declivus*, *Euthystira brachyptera*, *Eupholidoptera* cf. *chabrieri* (♀), *Euthystira brachyptera*, *Gomphocerippus rufus*, *Gryllus campestris* (nymph), *Leptophyes laticauda*, *Metrioptera kuntzeni*, *Miramella irena*, *Pezotettix giornae*, *Pholidoptera a. aptera*, *Pholidoptera fallax*, *Pholidoptera griseoaptera*, *Pholidoptera l. littoralis*, *Psophus stridulus*, *Sepiana sepium*, *Stenobothrus l. lineatus*, *Stenobothrus n. nigromaculatus*, *Stenobothrus rubicundulus*, *Troglophilus neglectus* and *Mantis religiosa*.

According to WILLEMSE (1973) *P. cristatus* is distributed in Croatia (Istria) and in the Dinarian area of Bosnia and Herzegovina. Other specimens, which we checked in the collection of Giuseppe Müller in Triest Museum and which also belong to the *P. cristatus,* are from Croatia (Učka Mt.) and Slovenia (Slavnik and Predmeja) (Table 1). Müller did not manage to publish his contribution on Orthoptera although he was preparing the publication on Orthoptera fauna during his lifetime. Recent findings are within the geographical continuation of the Istria peninsula. This shows once more the specific faunistical position of Mt. Slavnik, where we have located several other Orthoptera species reaching their northern most distribution point, for example, *Psorodonotus fieberi illyricus*. Altogether, 60 Orthoptera species are known from the Mt. Slavnik until now. This ranks Mt. Slavnik among the locations with the highest diversity of grasshoppers in Slovenia.

Table 1: Specimens of *P. cristatus* present in the collection of Giuseppe Müller in the Civico Museo di Storia Naturale, Trieste.

Label locality	**Today valid loc. name**	**Species label**	**Sex**	**Specimens**	**Date**	**Legit**
Predmeja, S. Tarnova, prati sotto	meadows under Predmeja at Trnovski gozd	*Caloptenus brunneri*	female	1	28/10/1925	Zirnich
Monte Taiano, Istr.	Slavnik near Kozina	*Caloptenus brunneri*	female	1	?/09/1926	Müller
Monte Taiano	Slavnik near Kozina	*Caloptenus brunneri*	female	3	28/09/1930	Müller
Monte Taiano	Slavnik near Kozina	*Caloptenus brunneri*	male	1	09/09/1932	Müller
M. Maggiore, Draga, M. Ucka	Učka, Draga near Rijeka	*Caloptenus brunneri*	female	1	16/08/1952	Müller

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Fig. 1: Male of *P. cristatus*, 2 September 2011, Slavnik (Foto: L. Zechner).

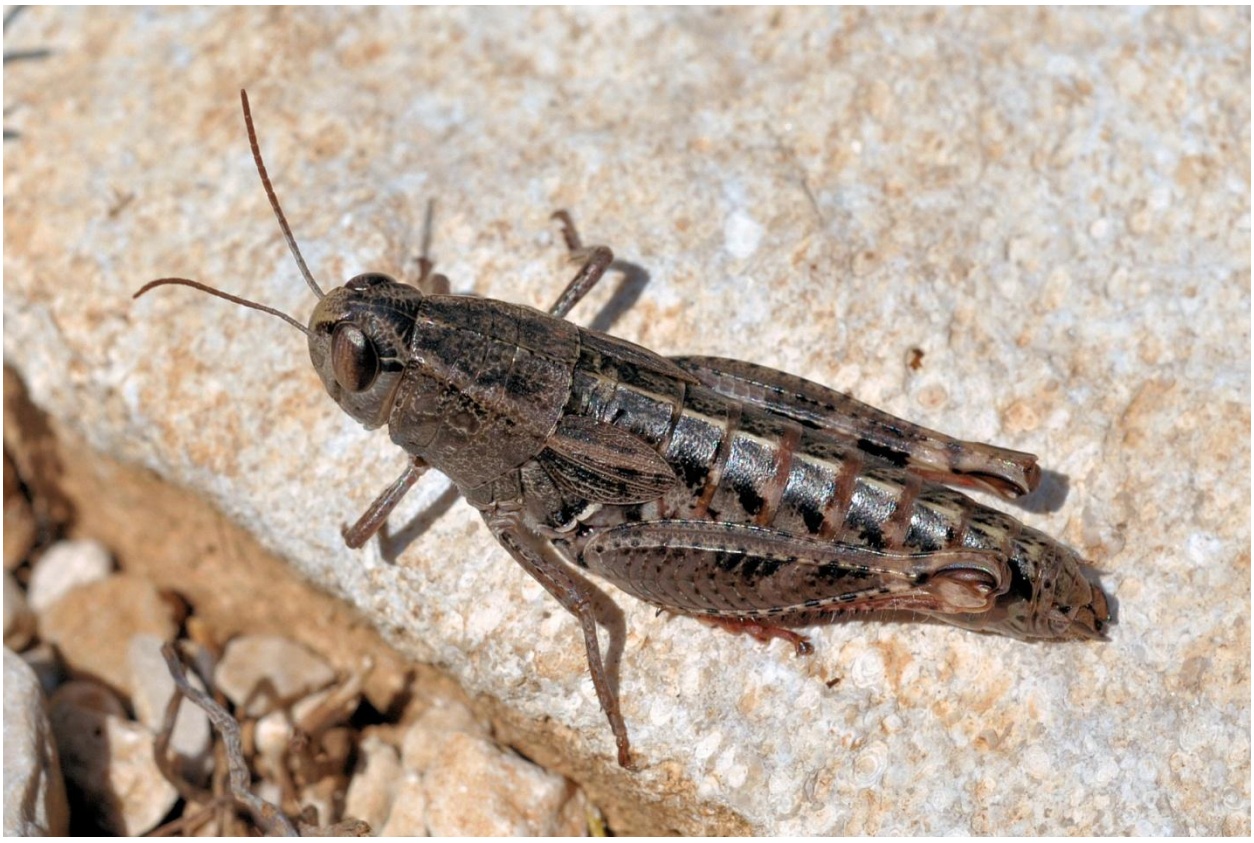

Fig. 2: Female of *P. cristatus*, 2 September 2011, Slavnik (Foto: E. Sardet).

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Fig. 3: Habitat of *P. cristatus*, 2 September 2011, Slavnik (Foto: L. Zechner).

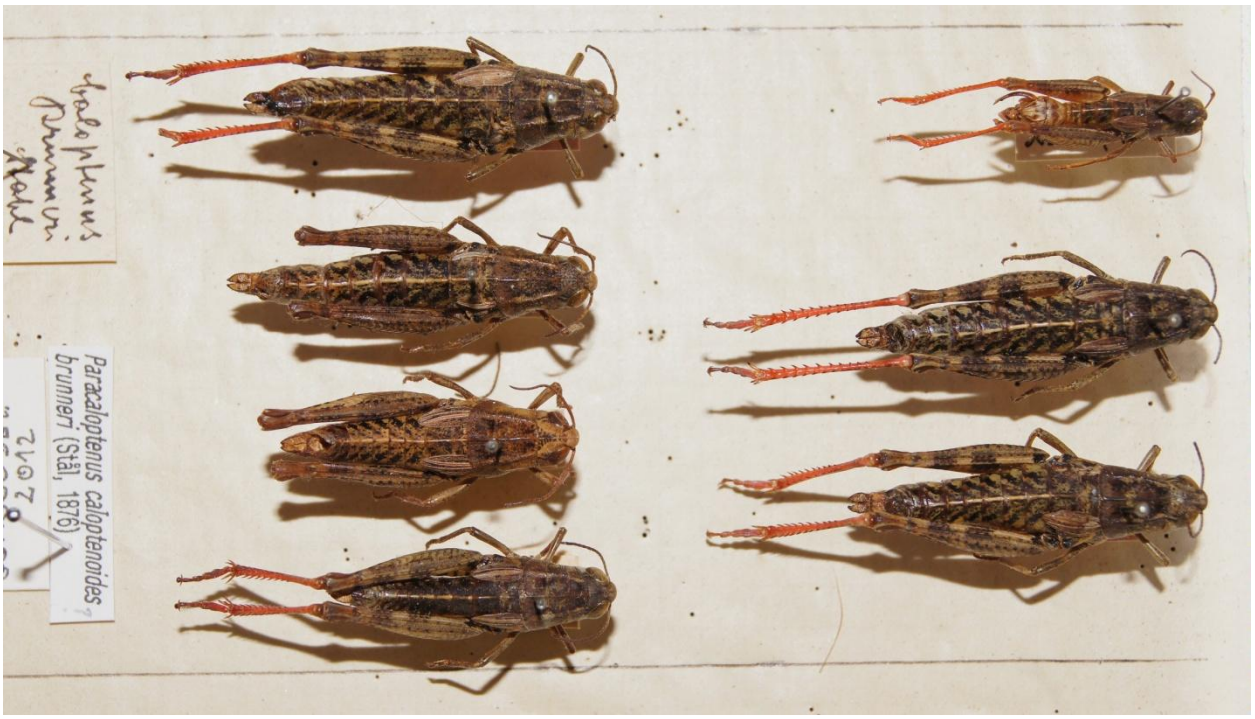

Fig. 4: Specimens of *P. cristatus* in Giuseppe Müller collection in the Civico Museo di Storia Naturale, Trieste (Foto: S. Gomboc).

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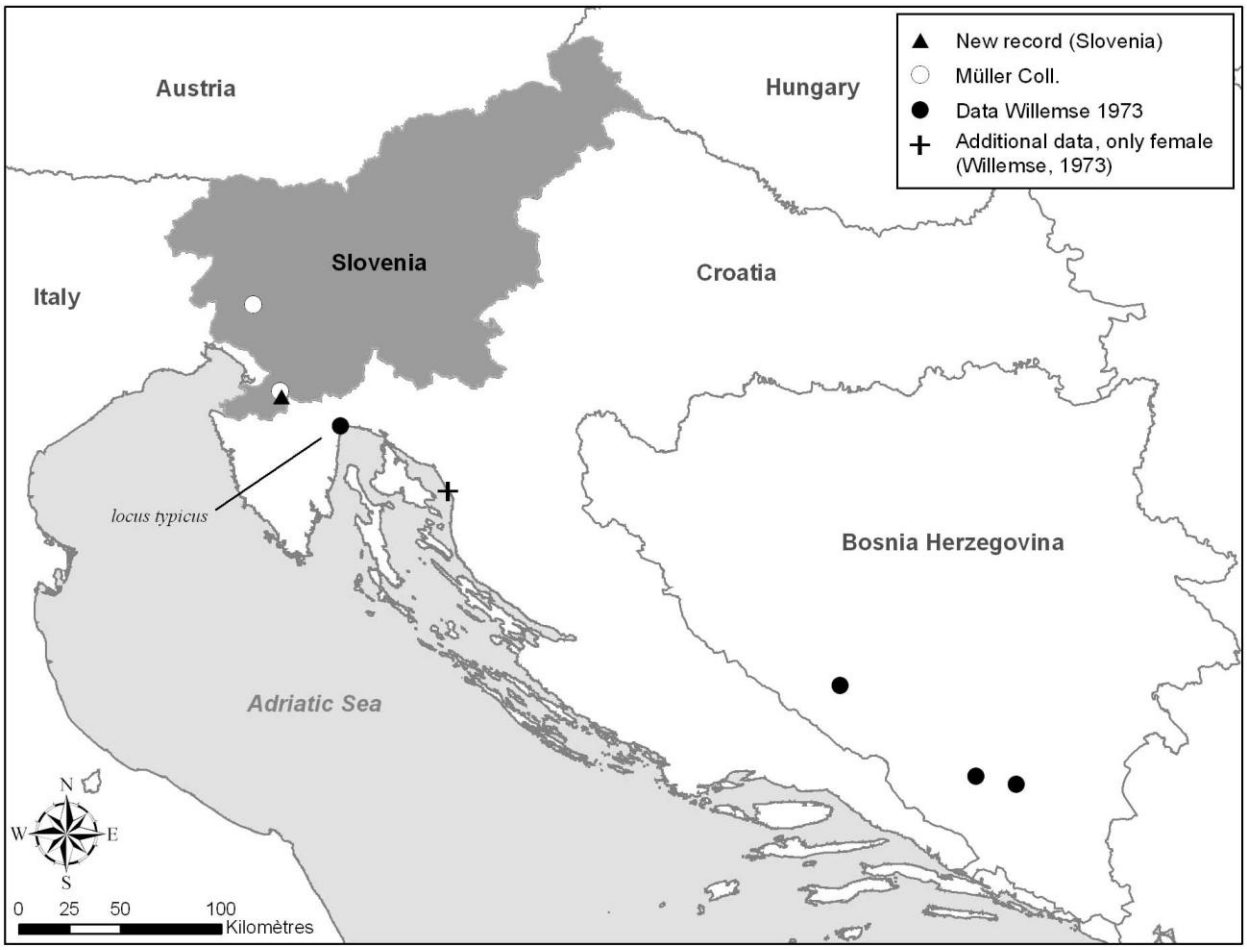

Fig. 5: The known distribution of *P. cristatus* in the Balkans, former observations and new record (E. Sardet).

Remarks on the behaviour

Both sexes of *P. cristatus* are cryptic, and since males are considerably smaller and more active as well as more agile than females, it is difficult to observe and to catch them. When at risk they jump very fast into the nearest hiding-place inside the dense vegetation. Nymphs and to a lesser extent adults are similar to the related species *Caliptamus italicus* that is also present at these localities. It is a slightly earlier species than *P. cristatus*, usually present on more bare soil. Because both species are similar from distance, *P. cristatus* can easily be overlooked.

For behavioural observations, the third author reared one pair of *P. cristatus* in a terrarium for more than one month during September 2011 although it was very late in the season when we found the specimens. In captivity the pair of *P. cristatus* consumed mostly herbs from the garden (*Taraxacum*, *Plantago*, *Trifolium repens*, *Buphthalmum*) and a small amount veterinarian cat food. Even if specimens live on very dry southern exposed slopes they also take water when it is available. During the rearing the female copulated a few times with the male, but we did not find any ootheks in the sand afterwards. It could be that the sand was not suitable for laying eggs or it was already at the end of the season.

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Status in Slovenia

P. cristatus is a very rare and highly endangered species in Slovenia, where it can be found only in a very small refugia consisting of a few patches of xerothermic grassland surrounded by forest, therefore, it should be as strongly protected as its sibling species *P. caloptenoides*. Also, according to the IUCN (2013) Red List Criteria the species could be classified as Endangered (EN B2ab (i,ii, iii,v)) at global scale, because of very local, scarce distribution and habitat decline.

The habitats of the species are already threatened by scrub encroachment. Therefore, immediate protection and management measures should be implemented in order to preserve the species in the known clearings.

With the current knowledge on the behavior and ecological requirements of the species, we assume that it could be also present in other similar locations in Slovenia. According to our findings, at least the southern slopes of the Trnovski forest at the foothills in the Vipava valley could harbour further populations of *P. cristatus*. Currently, this area of former pastures are significantly overgrown by trees. Further possibilities are the slopes of Lipnik above Rakitovec and other similar habitats such as clearings within sunny forests.

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