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Peripodisma tymphii (Willemse, 1972) (Orthoptera, Acrididae, Catantopinae), status and threats in Greece and Albania

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Abstract

Different mountains of Albania and Greece were surveyed to investigate the range of *Peripodisma tymphii*. For each of the localities surveyed, we estimated the population status and possible risks. At medium term, the Albanian populations do not seem threatened. However in Greece, the relatively recent introduction of non-native cows and cattle derived from crosses with native cows, unsuited to the mediterranean mountains, is a major threat to this species.

Zusammenfassung

Zur besseren Kenntnis über die Vorkommen von *Peripodisma tymphii* wurden mehrere Gebirge von Albanien und Griechenland kartiert. In jedem der Bereiche wurden die Bestände aufgenommen und auf mögliche Risiken analysierten. Mittelfristig scheinen die albanischen Vorkommen nicht gefährdet zu sein. In Griechenland stellt dagegen die relativ neu eingeführte Beweidung durch Rinderrassen aus Kreuzungen mit einheimischen Kühen, die eher ungeeignet für mediterrane Gebirgsregionen sind, eine große Bedrohung für die Bestände von *P. tymphii* dar.

Introduction

The genus *Peripodisma*, endemic of the calcarous mountain range of Pindos (KENEYRES et al. 2009) is considered very close to the Italian genus *Italopodisma* (WILLEMSE 1972, CHINTAUAN-MARQUIER et al. 2014).

Peripodisma tymphii is distributed mainly in Greece, in the north of the massif of Pindos (WILLEMSE 1972, 1984, WILLEMSE & WILLEMSE 2008) to Albania on the nearby mountains (Fig. 1) (LEMONNIER-DARCEMONT al. 2015). During this field study our aim was to assess the extent of its range. In our surveys, a few new sites have been discovered in Albania and on the Greek-Albanian border. We made a first estimate of the population status and quality of the habitats, comparing the Greek and Albanian populations, so as to have a more comprehensive view of the conservation status of this species. In addition, we studied its distribution in relation to other species within this genus, and more generally of other members of the tribe *Podismini*, whose habitats are quite similar.

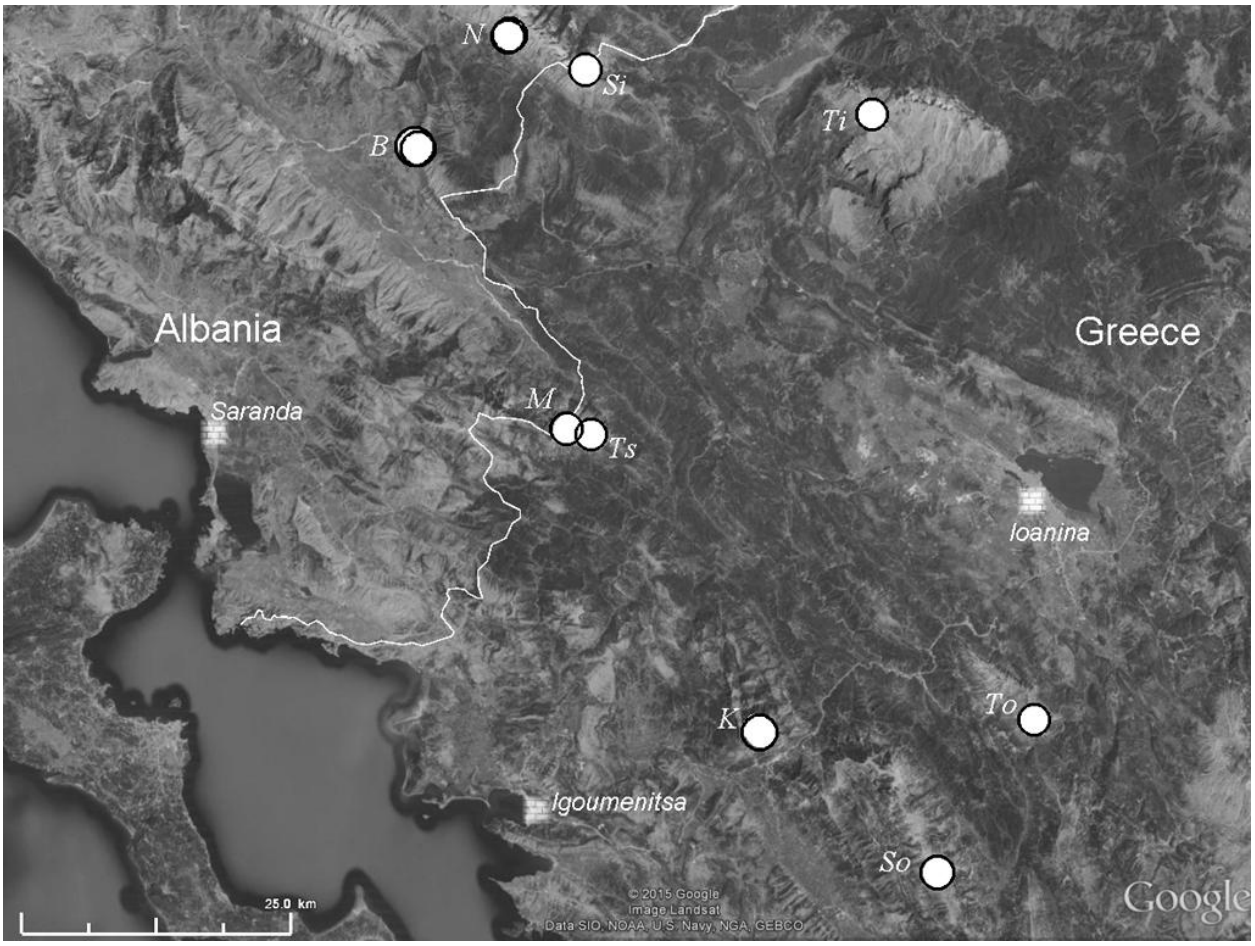

Figure 1: Map of *Peripodisma tymphii* localities. Mounts: B = Buretos, N = Nemërçkës, Si = Silvit, Ti = Timfi, M = Murganës, Ts =Tsamada, K = Khionistra, To = Tomaros, So = Souli.

Materials and methods

The locations for the survey were selected by looking at suitable habitats in the surrounding of the known populations. To do so, satellite data have been used extensively (Google Earth). We included the locality found in Albania in 2014, near the Greek border (LEMONNIER-DARCEMONT et al. 2015). For comparison and also in order to assess a possible trend, one of the known localities (WILLEMSE & WILLEMSE 2008), was surveyed this year.

For each of these stations, we identified the key ecological features of the habitat. We evaluated the overall diversity and richness of Orthoptera and Lepidoptera (Rhopalocera) populations, some of these insects being excellent indicators of environmental quality.

Abundance classes have been assigned to the different sampled populations of *P. tymphii*:

A: abundant, more than 20 individuals per are

M: medium density, between 10 to 20 individuals per are

P: poor density, less than 10 individuals per are

R: rare, less than 5 individuals per are

Our field campaign in 2015 took place between late July and early August, when the occurrence of adult populations of *Peripodisma* seems optimal. Surveys have been conducted during good weather, avoiding too cold and too hot temperatures. Under these circumstances, they often remain hidden in the very low vegetation or sheltered between the blocks of stones.

Results

With this field campaign we found a new locality of *P. tymphii* in Greece (5) with a wide extension on the Albanian side (4). In Albania, the range of the species is now extended towards the northwest on the western slope of the chain of Nemërckës and on Mount Buretos.

Albania[1]

(1) Mount Buretos - District of Gjirokastër; 40°01'53.05"-11.57" / 020°18'09.71"-49.29". 1450-1700 m a.s.l. 28 July 2015. (Fig. 2).

Dry and rocky mountain grasslands with a few isolated groups of deciduous trees, up to about 1550 m a.s.l. Extensive sheep grazing (several small herds). The lack of water, the rocky nature of the site at higher altitude seems to reduce the presence of herds. Some overgrazed areas but localized and not extensive.

The population of Orthoptera is quite diverse and dominated by xero-thermophilic species. Some endemic Balkan species with more or less wide distribution are observed: *Modestana ebneri*, *Vichetia oblongicollis* and also a very common species in the country, *Poecilimon jonicus jonicus*. *Celes variabilis*, a heliophilous and xerophytic species with affinities with steppe is also common. *Celes* seems to be sensitive to overgrazing and tends to disappear quickly in overexploited areas. This is probably due to its extremely sedentary behavior and to the limited mobility of females (competition for food, trampling etc.). The population of Lepidoptera is diverse, and also dominated by xero-thermophilic species including *Melanargia russiae*, *Hyponephele lycaon, Arethusana arethusa, Satyrus ferula, Polyommatus daphnis,* etc.

P. tymphii: observed from 1450 m a.s.l. on the NW side and up the summit at 1700 m a.s.l. The abundance of its populations varies between A and M (in it's lower altitudinal limit). Currently, in the area where the species is present, the populations of Orthoptera and Lepidoptera are rather rich and diverse. Obviously, the rather light sheep grazing, does not present a threat to the species.

(2) Mount Silvit in southeast of the Nemërçkës chain - District of Gjirokastër: 40°03'51.2" / 020°29'23.0". 1800-1850 m a.s.l. 9 August 2014.

This locality, discovered in 2014, was not revisited in 2015. It consists of subalpine meadows located at the shady side of the mountain and on the crest. It is more alpine than the other studied localities, as can be seen by the presence of *Gomphocerus sibiricus*, boreo-alpine and clearly thermophobic species, mainly found above 1700 m altitude in the south of Europe.

[1] The names of the mountains are those from the regional map Vektor 1/200.000 "Southern Albania"

The population of Orthoptera is diverse. Especially the presence of *Pholidoptera macedonicus,* endemic to the southern Balkans, and of *Poecilimon zimmeri* and *Poecilimon gracilioides*, two Greek species reaching the northern limit of their range, is noteworthy. *Celes variabilis* is common on the ridge, which is drier. Several flocks of sheep graze these mountains on both the Albanian and Greek side. The grazing pressure doesn't seem to be excessive, as a dense cover of herbs and grasses is present as late as early August, even along the ridge, together with the associated rich Orthoptera fauna. The Lepidoptera fauna is also rich, including *Parnassius apollo, Melanargia larissa, Melanargia russiae, Pieris mannii, Colias libanotica, Hipparchia syriaca, Argynnis niobe*, etc.

P. tymphii: The species is quite abundant (A) on the northern slopes between 1800 and 1850 m up on the ridge that makes the border with Greece. Currently, the population does not seem threatened.

(3) West of the Nemërçkës, north of Sopik - District of Gjirokastër: 40°06' 16.00"- 21.00" / 020°25'04.00"- 22.00". 1600-1800 m a.s.l. 30 July 2015.

This station is located on the west side of the mountain, at less than 8 km of the previous locality. The suitable environment for *P. tymphii* starts with rocky meadows of the mediterranean montane stage with *Juniperus* sp. and some *Colutea arborescens.* It continues at least up to 1800 m a.s.l. where a meadow with *Arctostaphylos uva-ursi* is present. Due to lack of time, we have not been able to establish the upper altitudinal limit of the species here. The slope is hot and dry, as it is oriented southwest and relatively steep. Even at 1800 m a.s.l., mediterranean influences are still strong, as indicated by the presence of *Pholidoptera femorata*. On the whole site, we note a great richness of species of Orthoptera with the presence of *P. zimmeri* and a nice population of a new representative of the tribe of *Platycleidini*, under description (G. Puskás, pers. comm.). The population of Lepidoptera is divers and includes *Parnassius apollo, Melanargia russiae, Satyrus ferula*, etc. The grazing pressure, on an extensive way, relatively low, mainly sheep (with a few goats, located further downstream). It seems mostly limited in time, probably in the spring and possibly autumn, because of the warm character of this mountain, the steep slope with rare ledges and especially because of the lack of water points.

P. tymphii: abundant above 1700 m a.s.l. (M to A), more scarce below (P). Currently, the species does not seem threatened here.

(4) Mount Murganës - District of Gjirokastër: 39°47'17.89" / 020°23'22.79". 1796 m a.s.l. 8 August 2015. Located on the border with Greece (Fig. 3).

Mediterranean mountain meadow located on the ridge and on the north slope. Some fresh tracks of cattle on the crest, suggest the presence of the cows seen lower on the Greek sunny side. While the shady side is marked by numerous traces of livestock, it is clearly not used for summer pastures, maybe due to water supply problems. The population of Orthoptera is quite divers and includes some common Balkan endemic species as *P. jonicus jonicus* and *V. oblongicollis.* The mediterranean influences allow thermophilic species to occur at higher altitudes: *Ph. femorata, Saga hellenica* and *Platycleis intermedia intermedia.*

Figure 2: Mount Buretos **-** Albania.

Figure 3: Mount Murganës **-** Albania.

The population of Lepidoptera has unfortunately been undersampled due to weather conditions. *Melanargia russiae* and *Hesperia comma* were dominant.

P. tymphii: the species is well distributed over the area and does not seem to be currently threatened (M). On the shady side only few scorched meadows, which indicate overgrazing, were observed.

Greece

(5) Mount Tsamada, north of Lias village - Epirus: 39°46'47.96" - 39°47'14.79" / 020°24'49.14" - 020°23'33.31". 1527-1779 m a.s.l. 8 August 2015.

Mediterranean mountain meadows located in sunny side with *Juniperus* sp. and thorny cushion-shaped xerophytes (*Astragalus* sp.). The site is overgrazed over large areas by large cattle (non-native breed). This overexploitation of the environment is marked by alternating grazed meadows and bare soil or screes and rest areas for the livestock.

In less affected areas where the grass cover remains adequate, there is quite a rich Orthoptera fauna, dominated by different xero-thermophilic species such as *Paracaloptenus caloptenoides caloptenoides, Celes variabilis, Saga hellenica* and *Tessellana orina,* the last two being endemic to the southern Balkans.

P. tymphii: the species is relatively well represented on the site from 1500 m a.s.l. and up to the ridge, that forms the border with Albania (M). We noted a negative correlation between grazing density and the abundance of *P. tymphii*. Even if considering its current density here, it does not seem threatened on the site. However this type of pastoralism, obviously not suitable in this habitat, is a potential threat to the sustainability of its populations.

(6) Mount Khionistra = Mount Spata (North Paramithia) - Epirus: 39°31'10.00" / 020°30'58.31". 1450-1571 m a.s.l. 9 August 2015 (Fig. 4).

Mediterranean karstic mountain meadow with *Juniperus* sp. and grazed by cattle. The habitat bears the traces of an excessive and inappropriate bovine grazing pressure. The herbaceous cover is irregular, visibly poor in diversity, the rock is outcropping and limestone chips are predominant everywhere. In the footsteps of cattle on the steepest slopes, we see strong erosion that renders the soil unstable and leaves large sections of bare soil. The population of Orthoptera has only a few ubiquitous taxa and a majority of them are still in the juvenile state despite the late survey date, indicating a highly disturbed environment. No important Lepidoptera species were observed, occasionally only some very ubiquitous butterflies.

P. tymphii: very few individuals observed (R). The sustainability of the population on this locality seems unlikely.

We found a small residual area, located below, at 1400 m a.s.l., in the south of the areas already referenced (39°31'23.24"/ 020°30'45.50"). Three males observed on a steep rocky slope, mainly covered by *Juniperus ocycedrus*, with a very scarce herbaceous cover (≤10%).

Figure 4: Mount Khionistra (North Paramithia) **–** Greece.

Discussion

P. tymphii extends its distribution from Mount Soulion in the south to the Nemercka (Nemërçkës) mountains in the north. It is then replaced in the north by two other species of the genus discovered in 2014, *P. llofizii* and *P. ceraunii* (LEMONNIER-DARCEMONT & DARCEMONT 2015a, 2015b).

In our different surveys we never noticed cohabitation between different species of *Peripodisma* or other *Podismini* except on Mount Tymfi in Greece, where *P. tymphii* lives together with *Oropodisma macedonica.* It is likely that the latter species reaches its southwestern limit of distribution here, because it is more widespread on the colder mountains to the east and north. Other species of the genus *Oropodisma* have a more southern distribution (Thessaly, Central Greece). Mediterranean mountains, where most of the populations of *Peripodisma* are located, are unlikely to be colonised by *Podisma pedestris*, which is only observed in north Albania and further north and east in Greece (Fig. 5).

The habitats occupied by *P. tymphii*, consist of karstic meadows, more or less rocky, of mediterranean montane stage, subalpine grasslands, some of which having thermophobic affinities, but also, open plant formations of supra mediterranean stage such as clear heathlands with *Juniperus oxycedrus* on dry and rocky slopes.

The species is found from 1100 m a.s.l. on Mount Soulion (WILLEMSE 2008), up to 2100 m on the Mount Tymphi (WILLEMSE 1972), as well in ubac or adret (sunny or shady side). Our observations *in natura* and also during breeding experiments have shown that even though the graminaceous plants were sometimes eaten, *Peripodisma* are mainly forbivores and particularly fond of flowers of *Verbascum* sp. and leaves of *Astragalus* sp.

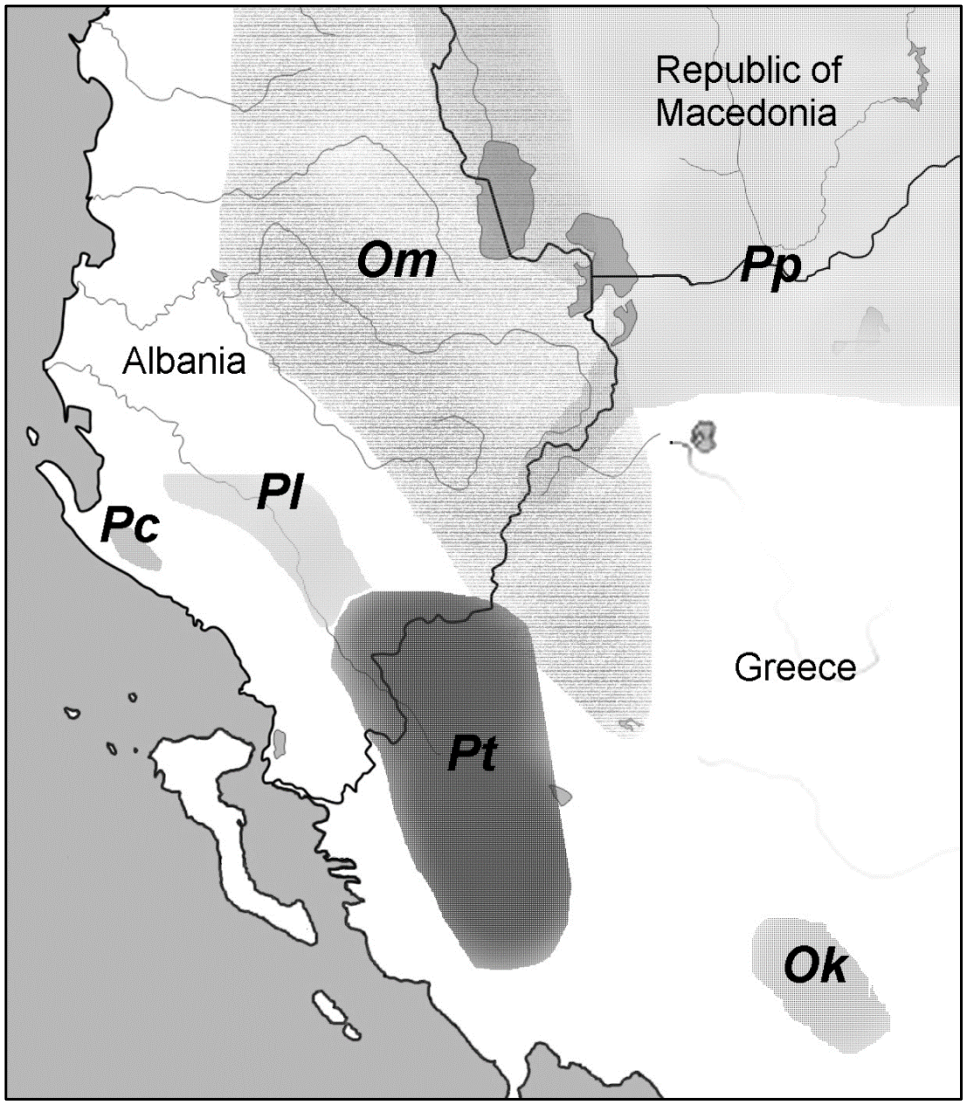

Figure 5: Map of Podismini in the area. Pt = Peripodisma tymphii, Pl = Peripodisma llofizii, Pc = Peripodisma ceraunii, Pp = Podisma pedestris, Om = Oropodisma macedonica, Ok = Oropodisma karavica.

Based on its Greek populations, *P. tymphii* is currently classified by the IUCN as Endangered (EN), according to criteria B1ab(v)+2ab(v), based on the size of the area of occupancy, and extent of occurrence, the few locations and the continuing decline in the number of mature individuals (www.iucnredlist.org). In the area of Paramithia in summer 2015 (Fig. 6), and later in the season on Mount Tomaros, we observed that the biggest threat is cattle grazing, which has increased since the 1970s with the changes in the food consumption of Greek people.

During recent decades we have seen the gradual transformation of a traditional mountain agro-pastoral system to a system that aimed to be more cost effective, with the increase of cattle herds on lands formerly mainly used by sheep. Moreover, small native breeds of cattle such as Shorthorn Illyrian have been crossed with or replaced by imported larger and more productive breeds like the Friesian, Jersey's and especially the Brown Swiss (FRENCH 1967, ZERVAS & BOYAZOGLU 1977).

Livestock pressure is too strong, too continuous or unsuitable for these xeric meadows. The consequence is soil erosion and the degradation of plant formations: dominance of annual species, expansion of none (or hardly) consumed plants like *Eryngium* sp., *Cirsium* sp., etc.

After a few years, the collapse of biodiversity is observed. The species that disappear first are less ubiquitous, those whose tolerance to changes in environmental factors of the environment is the lowest. This is particularly the case of *Peripodisma tymphii*. Moreover, in these habitats with limited resources it is in direct competition with cattle, which leave only little herbs after grazing.

The status seems different in Albania where our 2014-2015 surveys showed good population densities. In these southern mountains, pastoralism remains more traditional, based on herds with moderate numbers of animals, and mainly composed of small ruminants, mainly sheep, aiming at relatively small amounts of wool, meat and milk (KUME 1997, BOURBOUZE & FRANÇOIS 2001).

Figure 6: Overgrazing by cattle on Mount Khionistra (North Paramithia) **–** Greece.

Conclusion

P. tymphii can be used as an indicator of the decline of biodiversity on some Greek mountains.

In order to reverse this phenomenon of homogenization and impoverishment of habitats, we should return to the use of a more traditional livestock, consisting primarily of small ruminants, or, in favorable areas, of native cattle. It is then often necessary to limit grazing pressure but also the duration, by avoiding late spring (in the mountains). Indeed, it is during this period that most plants come out of dormancy and replenish their reserves.

Whether small ruminants or cattle, local breeds are always preferred because they are adapted to the specific conditions and the difficult environment. We can always improve their performance through the selection within the flock, but the crosses with imported breeds pose significant risks for the environment, which are difficult to control, and moreover can quickly become a huge risk of loss for the farmer.

The discovery of new localities of *P. tymphii* in Albania, in the western part of its range, where the species is relatively abundant, allows us to remain optimistic about the global status of the species.

To complement these results and to provide appropriate management measures, further study on the genus *Peripodisma* is underway, including phytosociological and agri-environmental aspects of their habitats. The quality of these environments will be evaluated further and their succession evaluated, in order to contribute to the survival of these populations.

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