

Description and biogeographical implications of a new species of the genus *Podisma* Berthold 1827 from Mont Ventoux in South France (Orthoptera: Acrididae)

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Summary. The status of the genus *Podisma* Berthold 1827 is discussed and all its taxa are listed. Endemic taxa within montane orthopteroid insects in southern Europe are considered and new genera recently revised are recorded. In this context *Podisma amedegnatoae* n. sp. from Mount Ventoux in the South Alps (France) is defined and described. The main distinctive characters of the new species are the relative length of prozona and metazona, the presence of the dotted dorsal pattern (FDDP) in almost 100% of the females, the broadly incised male furcula, the subquadrate dorsal valvae of the penis and the peculiar v-shaped middle incision dividing them. The presence of a distinct species on Mount Ventoux allows to suppose the presence of a refuge area in this region during the ice ages. The analysis of the distribution of the FDDP character, distributed from southern France to southeastern Italy, shows a clear interruption in the genetic flow between the western and eastern slopes (French and Italian slopes) in the western Alps. This interruption fits well with the presence of a hybrid zone, recorded in literature for the genus *Podisma* on the basis of the distribution in this area of two male sex-chromosome forms. On the other hand data concerning the distribution of FDDP suggest a genetic flow coming from Northwest to South-east. After that the description of *P. amedegnatoae* is not only a new contribution to the knowledge of the biodiversity in the southern European mountains but adds new data to the study of the colonisation of Europe after the ice ages, by species which have survived in refuge areas.

Résumé. Description et implications géographiques d'une nouvelle espèce du genre *Podisma* Berthold 1827 du Mont Ventoux dans le Sud de la France (Orthoptera : Acrididae). Cet article discute du statut du genre *Podisma* et dresse une liste de tous les taxons qui y sont inclus. *Podisma amedegnatoae* n. sp. est décrit du Mont Ventoux dans les Alpes méridionales (France). Les principaux caractères distinctifs de cette nouvelle espèce sont les longueurs relatives de la prozone et de la métazone, la présence chez presque 100 % des femelles du pattern dorsal tacheté (FDDP), la furcula du mâle largement incisée, les valves dorsales du pénis subquadrangulaires et une incision médiane en forme de V qui divise ces dernières. La présence d'une espèce particulière sur le Mont Ventoux permet de supposer la persistance d'une zone-refuge dans cette région pendant les glaciations. L'analyse de la distribution du FDDP, que l'on rencontre du sud de la France vers l'est et le sud-est en Italie, met en évidence une nette interruption dans le flux génique entre les pentes ouest et est des Alpes occidentales, soit entre la France et l'Italie. Cette interruption correspond à la présence d'une zone d'hybridation, déjà mentionnée dans la littérature pour le genre *Podisma* dans cette région sur la base de la distribution de deux formules de chromosomes sexuels mâles. D'autre part, les données sur la distribution du FDDP suggèrent la présence d'un flux génique dirigé du nord-ouest au sud-est. La description de *P. amedegnatoae* n'est ainsi pas seulement une contribution à la connaissance de la biodiversité en Europe du sud, mais ajoute de nouvelles données sur la colonisation de l'Europe après les glaciations par les espèces qui ont subsisté dans les zones refuges.

Keywords: *Podisma amedegnatoae* n. sp., morphology, ecology, biogeography, ice age, refuge, hybrid zone

The mountains of southern Europe contain many endemic Orthoptera, especially of the tribe Podismini. The explanation lies in the effects of the ice ages on the Pleistocene fauna and in the interglacial migrations from refuge areas. The study of Orthoptera provided basic data for biogeographical research, due to their peculiar ecological requirements and their

species richness. Although the Alpine Orthoptera fauna was believed to be well known, several new taxa have recently been described from this region. This concerns mostly orophilous species, like the genus *Anonconotus* Camerano 1878 (Carron *et al.* 2002; Galvagni 2002, 2003; Galvagni & Fontana 2003, 2004), Blattaria of the genus *Ectobius* Stephens 1835 (Bohn 2004) and Dermaptera of the genus *Chelidurella* Verhoeff 1902 (Capra 1982; Vigna Taglianti 1993; Galvagni 1994, 1995, 1996, 1997). The description of a new species of *Podisma* Berthold 1827 living in a

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region well investigated as the Alpine area (including the Mount Ventoux), is not only the result of a lucky entomological excursion. It is the result of the new impulse to the study of the Alpine fauna, initiated by the renewed interest in the effects of the ice ages on the origin and dispersion of the European fauna.

An ancient *file rouge* between Italy and France guided the first author to visit the top of the Mount Ventoux, as well the deep impression printed in his mind after reading, as a young entomologist, J. H. Fabre's description of his ascension of this surprising mountain (Appendix 1).

In Summer 2003 the first author spent a 3-week holiday with his family in southern France, Andorra and north-western Spain. During this lovely journey, he made interesting entomological observations and intensively collected orthopteroid insects in several localities. On August 7, The Mount Ventoux was visited and just under the top, some *Podisma* specimens were collected. The first impression included their stout body, peculiar colour pattern and not angulose pronotum. It seemed that they were somewhat different from all the Alpine taxa of the genus but resembling more some taxa endemic in the Apennine Mountains in Italy. The subsequent examination of the material collected on M. Ventoux during summer 2003 and of the specimens preserved in the collection of the first author, as well in the Muséum National d'Histoire Naturelle in Paris and in the La Greca collection in the Museo Civico di Storia Naturale in Milan, confirmed the first impression. Comparison of the *Podisma* from Mont Ventoux and surrounding mountains with the other European taxa showed clear differences and it was concluded it must be assigned to a new species, as described here. Furthermore some peculiar characters of this new species allowed us to outline more general consideration with biogeographical implications.

Material and methods

The morphology of the *Podisma* specimens from M. Ventoux and from other localities in the South Alps was compared to that of specimens of most of European *Podisma* species (Tab. 1) and with all described taxa on the basis of concerning literature. The taxonomic study has been based on the relevant morphological characters used in the tribe Podismini like shape of the pronotum, tegmina, furcula, supra anal plate and phallic complex. General colour and the colour of the postfemora and posttibia were studied in dried specimens and on photos of living specimens.

Examined material

The examined material (Appendix 2) belongs to the following

collections: coll. FP = collection Fontana, Paolo, Isola Vicentina (Italy); coll. BFM = collection Buzzetti, Filippo Maria, Arzignano (Italy); coll. LG = collection La Greca, Museo Civico di Storia Naturale, Milan (Italy); coll. ZSM = Zoologische Staatssammlung, München; coll. MNHNP = Muséum National d'Histoire Naturelle, Paris; coll. GA = collection Galvagni, Antonio, Rovereto (Italy); coll. WF = collection Fer Willemse (Eygelshoven, The Netherlands).

The female dotted dorsal pattern were checked on all material available in our collection as well in the Muséum National d'Histoire Naturelle of Paris, in Marcello La Greca's Collection at the Museo Civico di Storia Naturale of Milan, in the Museo Nacional de Ciencias Naturales of Madrid and in the private collections of Fer Willemse (Eygelshoven, The Netherlands) and Antonio Galvagni (Rovereto, Italy).

Conventional coordinates (Barbier et al. 2000) are given between brackets.

Morphometric analysis

General morphometric analysis was conducted on 148 ♂♂ (28 *P. amedeagnatoae* n. sp., 51 *P. d. dechambrei*, 2 *P. d. melisi*, 62 *P. p. pedestris*, 3 *P. p. caprai* and 2 *P. p. nadigi*) and 111 ♀♀ (21 *P. amedeagnatoae* n. sp., 42 *P. d. dechambrei*, 2 *P. d. melisi*, 41 *P. p. pedestris*, 3 *P. p. caprai* and 2 *P. p. nadigi*). Main measures were taken using a stereomicroscope Leica (Wild M3B) and a micrometric ocular (Wild 10X) on the following anatomical traits: pronotum length, prozona length, metazona length, visible right and left tegmina maximum length, right postfemora.

The datasets concerning *P. pedestris*, *P. dechambrei* and *Podisma* n. sp. were analyzed using the discriminant analysis module of Statistica (StatSoft Italia srl) applying discriminant function analysis followed by canonical analysis. On the metazona length and the prozona length the Kruskal-Wallis analysis of ranks have been run.

Results and discussion

The genus *Podisma* Berthold 1827 in Europe

According to Otte (1995), the genus *Podisma* Berthold 1827 belongs to the family Acrididae MacLeay 1819, subfamily Podisminae, tribe Podismini, *Podisma*-group. Sergeev (1999) assigns it to the family Acrididae, subfamily Catantopinae, tribe Melanoplinae, subtribe Podismina. Otte (1995) numbers 33 taxa [*Podisma goidanichi* Baccetti 1958 and *P. silvestrii* Salfi 1935 are erroneously recorded under the genus *Podismopsis* Zubovski 1900 (subfamily Gomphocerinae), but they are listed here under *Podisma*] for the genus (Tab. 1) and after that catalogue only *P. tyatiensis* Bugrov & Sergeev 1997 from Kuril Islands has been described. The generic or specific identity of some *Podisma* taxa are not definitely ascertained. In particular the generic identity of *P. hesperus* (Hebard 1936) from North America and *P. syriaca* (Brunner von Wattenwyl 1861) from Lebanon is doubtful. The group of taxa from Caucasus probably needs a general revision and

some subspecies are not listed under the correct species according last revisions. In Europe the identity of some alpine taxa needs to be better defined, in particular the status and the distribution of *Podisma dechambrei* Leproux in Chopard 1951 as well other populations in the western Alps hitherto considered to belong to *Podisma pedestris*.

The genus *Podisma* is quite well known in Europe: Heller *et al.* (1998) place it in the subfamily Catantopinae and list 13 species (subspecies are omitted from the European Checklist). In south-western Europe the genus *Podisma* is represented by several

endemic taxa, mostly distributed in Spain and Italy: La Greca & Messina (1982) consider all these taxa as derived from *Podisma pedestris pedestris* L. 1758.

In France only *Podisma pedestris pedestris* (L. 1758) and *Podisma dechambrei dechambrei* Leproux in Chopard 1951 until now were known. The last taxon is cited in different ways by the most important French authors (Chopard 1951; Luquet 1992; Defaut 1999; Voisin 2003) but most of them consider *P. dechambrei* a subspecies of *P. pedestris* or even a local short-winged form. *Podisma dechambrei dechambrei* Leproux in Chopard 1951, was reported as a new wing form by

Table 1. The species of the genus *Podisma* Berthold 1827 listed by Otte (1995) and their type localities with the addition of the recently described *P. tyatiensis*.

Taxa	Type locality
<i>P. aberrans</i> Ikannokov 1911	Eurasia: Maritime Territory
<i>P. cantabricae</i> Morales Agacino 1950	Eurasia: Spain: Lago de la Cueva
<i>P. carpetana carpetana</i> Bolivar 1898	Eurasia: Spain: Madrid, Cercedilla
<i>P. carpetana ignatii</i> Morales Agacino 1950	Eurasia: Spain: Asturias, Picos de Europa
<i>P. eitschbergeri</i> Harz 1973	Eurasia: Italy: Valdieri, Capella San Giovanni
<i>P. emiliae</i> Ramme 1926	Eurasia: Italy: Emilia, Val Gorgo, Etrusk. Apennin
<i>P. goidanichi</i> Baccetti 1958*	Eurasia: Italy: Gran Sasso, Apennin
<i>P. hesperus</i> (Hebard 1936)	North America: USA: Oregon, Lane Co., McKenzie Pass
<i>P. kanoi</i> Storozhenko 1994	Asia-Temperate, Eastern Asia, Japan
<i>P. kawakamii</i> Shiraki 1910	Eurasia: Formosa
<i>P. lezgina</i> Uvarov, B. P. 1917	Eurasia: Caucasus: Russia: Dagestan; Georgia
<i>P. lofaoshana</i> Tinkham 1936	Eurasia: China: Kwangtung [Guangdong], Loh Fau Shan
<i>P. magdalena</i> Galvagni 1971	Eurasia: Italy: Monte Catria, Apennin
<i>P. miramae</i> Savenko 1941	Eurasia: Caucasus: Georgia, Svanetia, Lagilda
<i>P. pedestris pedestris</i> (L. 1758)	Eurasia: Europe [Sweden according to Baccetti 1954]
<i>P. pedestris caprai</i> Salfi 1935	Eurasia: Italy: Alpi finestre, Biella
<i>P. pedestris dechambrei</i> Leproux in Chopard 1951	Eurasia: France: Col de Larche
<i>P. pedestris melisi</i> Baccetti 1954	Eurasia: Italy: Alpe Tre Potenze, Apennin
<i>P. pedestris nadigi</i> Harz 1975	Eurasia: Italy: Passo Croce Domini-Gio, Bala
<i>P. pedestris sviridenkoi</i> Dovnar-Zapolskii 1927	Eurasia: Krasnodar Territory; Georgia, Teberda.
<i>P. ruffoi</i> Baccetti 1971	Eurasia: Italy, M. Terminillo, Apennine
<i>P. sapporensis sapporensis</i> Shiraki 1910	Eurasia: Japan: Sapporo
<i>P. sapporensis ashibetsuensis</i> Storozhenko 1994	Eurasia: Japan: Hokkaido, Ashibetsu
<i>P. sapporensis krylonensis</i> Storozhenko 1983	Eurasia: Russian SFSR
<i>P. sapporensis kurilensis</i> Bei-Bienko 1949	Eurasia: Kurile Islands: Kunashir Island, Shimanobori
<i>P. sapporensis longipenne</i> Shiraki 1910	Eurasia: Formosa
<i>P. satunini satunini</i> Uvarov 1916	Eurasia: Georgia: Abkhazia, Sanchara
<i>P. satunini coerulipes</i> Mishchenko 1950	Eurasia: Russia: Krasnodarsky Distr., Krasnaya Polyana
<i>P. satunini fuscipes</i> Mishchenko 1950	Eurasia: Russia: Krasnodarsky Distr., Arkhyz River
<i>P. satunini pallipes</i> Mishchenko 1950	Eurasia: Russia: Krasnodarsky Distr., Zagdanskaia dolina
<i>P. silvestrii</i> Salfi 1935*	Eurasia: Italy: M. Sibillini, Bolognola, Apennin
<i>P. syriaca</i> (Brunner von Wattenwyl 1861)	Eurasia: Lebanon: Beirut
<i>P. teberdina</i> Ramme 1951	Eurasia: Caucasus: Teberda, Khatipara mountain
<i>P. tyatiensis</i> Bugrov & Sergeev 1997	Eurasia: Russia: Kurili Islands, Kunashir Island
<i>P. uvarovi</i> Ramme 1926	Eurasia: Caucasus, Oschten

* Taxa listed under the genus *Podismopsis* Zubovski 1900 by Otte (1995).



Figures 1–2
Podisma amedegnatoae n. sp. 1, female (top); 2, male (bottom). M. Ventoux, top, 1900 m, 7.08.2003. Photos by P. Fontana.

Chopard (1951) who referred it to Leproux as author. The identity of this taxon was first clarified by Baccetti (1954, 1955, 1957, 1958). Dreux (1962) did not consider this taxon and also Kruseman (1982) did not correctly distinguish all its French populations. The specific status of *Podisma dechambrei* was recognized by La Greca (1985) on morphological characters and on chromosomal data after Hewitt & John (1972). Recently *Podisma dechambrei melisi* Baccetti 1954 (Fontana *et al.* 2005) from the northern Apennines was assigned to this species. On the other hand Hewitt & John (1972), Hewitt (1975) and Barton & Hewitt (1985 and 1989) consider the *Podisma* populations referred to *dechambrei* by La Greca (1985) to a group of local sex-chromosome races (XO and XY) of *P. pedestris*. The standard acridid karyotype is $2n\♂ = 22+X$ with an XO/XX sex chromosome mechanism (Hewitt 1975). In southern France and in particular in the Alpes-de-Haute-Provence as well in the Alpes-Maritimes there is a *Podisma* sex-chromosome form XY/XX. In contrast, on the Italian slope of the Alpes-Maritimes as well as in other western French and Italian Alps the normal sex-



Figure 3
Podisma amedegnatoae n. sp., mating female and male. M. Ventoux, top, 1900 m, 7.08.2003. Photo by P. Fontana.

chromosome XO/XX is present. The sex-chromosome races are well divided on the eastern and the western slopes of Alpes-Maritimes but along the main ridge of these mountains there is a remarkable hybrid zone (Hewitt 1975). A similar distribution pattern of XO/XX and XY/XX chromosomal races was observed in the island of Hokkaido (Japan) for *Podisma sapporensis* too. In Hokkaido there are two subspecies of *P. sapporensis*, *P. sapporensis sapporensis* Shiraki 1910 in the west and *P. sapporensis ashibetsuensis* Storozhenko 1994 in the East, but in this case hybridisation between the two chromosomal races was not detected and it may have been hampered by geographical barriers (Perepelov & Akimoto 2001). The origin of these chromosomal changes most probably occurred in small peripheral isolates or internal refugia, which were created by the cool conditions of the ice ages or the warm conditions of the post glacial climatic optimum (Hewitt 1975). The mechanisms of isolation and speciation of European montane Orthoptera during late Pliocene to Pleistocene ice ages, based on the ecological niche conservation, were outlined by La Greca (1965, 1995, 1996) on the basis of morphological and biogeographical researches on the genera *Italopodisma* Harz 1975, *Cophopodisma* Dvornar-Zapolskii 1933, *Oropodisma* Uvarov 1942 and *Podisma*. Wiens (2004) confirms that ecology is an important factor in speciation, after the tendency of lineages to maintain their ancestral ecological niche. In the case of European Podismini the structure of the genus *Podisma* needs to be accurately investigated, in order to obtain a synthesis

between the wide biogeographical vision of La Greca (1965, 1995, 1996) and the chromosomal approach of Hewitt (1975) based up to date on a dense but localised group of populations. La Greca's (1985) concept of *P. dechambrei*, distributed across France and Italy from the southwestern Alps to the northern Apennines and the presence of sex-chromosome races could not be in conflict; in fact the XO/XX and XY/XX races belongs to the same species according to Hewitt (1975) and Barton & Hewitt (1985, 1989) but this species could be *P. dechambrei* sensu La Greca rather than *P. pedestris*.

According to La Greca (1985) *P. p. pedestris* and *P. d. dechambrei* never get in contact in the Alps but the morphological features of the last species are not yet well defined. The identity of *P. eitschbergeri* Harz 1973 and its relationship with *P. d. dechambrei* and *P. p. pedestris* are not yet known. Morphological studies carried out for the current research on populations of *Podisma* on the M. Ventoux and surrounding mountains, demonstrated that the female dotted dorsal pattern (Fig. 1) is never present in *P. pedestris* and in its strictly related taxa, but it is common in many *P. dechambrei* (sensu La Greca) populations and

in the new species described here as well as in some Italian endemic taxa from the Apennines. Litzenberger & Chapco (2001) demonstrated a divergence between Russian and French *Podisma*, on the basis of molecular phylogeny data.

After these considerations, a list of the species of the genus *Podisma* Berthold 1827 for Europe and Caucasus is proposed (Tab. 2).

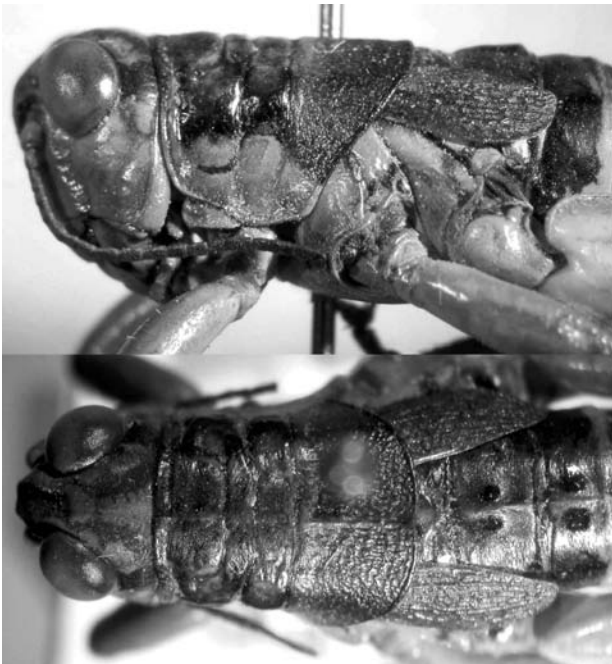
The *Podisma* of the Mount Ventoux

P. d. dechambrei is recorded in France only from Alpes-Maritimes while all other French *Podisma*, from the Alps, the southern range of the Massif Central to the Pyrenees Mountains, have been assigned to *P. p. pedestris* (Chopard 1951; Dreux 1962; Kruseman 1982; Defaut 1999; Luquet 1992; Voisin 2003).

Fabre (1899) records "*le Criquet pédestre (Pezotettix pedestris Lin.), compagnon de l'Analote des Alpes sur les cimes du Ventoux*". Later many authors (Chopard 1951; Dreux 1962; Kruseman 1982; Luquet 1977, 1992) recorded *Podisma pedestris* as living in many localities on the M. Ventoux but no morphological research on the Ventoux *Podisma* population was carried out; only Luquet (1992) outlined that on the

Table 2. Species of the genus *Podisma* Berthold 1827 from Europe and Caucasus.

Species	Type locality
<i>P. amedegnatoae</i> n. sp.	France: M. Ventoux, South Alps
<i>P. cantabricae</i> Morales Agacino 1950	Spain: Lago de la Cueva, Cantabria
<i>P. carpetana carpetana</i> Bolivar 1898	Spain: Madrid, Cercedilla, Sierra de Guadarrama
<i>P. carpetana ignatii</i> Morales Agacino 1950	Spain: Asturias, Picos de Europa
<i>P. dechambrei dechambrei</i> Leproux in Chopard 1951	France: Col de Larche, Apes Maritimes
<i>P. dechambrei melisi</i> Baccetti 1954	Italy: Alpe Tre Potenze, Apennine
<i>P. eitschbergeri</i> Harz 1973	Italy: Valdieri, Capella San Giovanni
<i>P. emiliae</i> Ramme 1926	Italy: Val Gorgo, Apennine
<i>P. goidanichi</i> Baccetti 1958	Italy: Gran Sasso, Apennine
<i>P. magdalenae</i> Galvagni 1971	Italy: Monte Catria, Apennine
<i>P. miramae</i> Savenko 1941	Georgia: Caucasus, Svanetia, Lagilda
<i>P. pedestris pedestris</i> (L. 1758)	Sweden
<i>P. pedestris caprai</i> Salfi 1935	Italy: Alpi Finestre, Biella, Alps
<i>P. pedestris nadigi</i> Harz 1975	Italy: Passo Croce Domini-Gio, Bala, Alps
<i>P. pedestris sviridenkoi</i> Dovnar-Zapolskii 1927	Russia: Caucasus, Krasnodar Territory, Teberda.
<i>P. ruffoi</i> Baccetti 1971	Italy: M. Terminillo, Apennine
<i>P. satunini satunini</i> Uvarov 1916	Georgia: Caucasus. Abkhazia, Sanchara
<i>P. satunini coerulipes</i> Mishchenko 1950	Russia: Krasnodar Territory, Krasnaya Polyana
<i>P. satunini fuscipes</i> Mishchenko 1950	Russia: Krasnodarsky Distr., Arkhyz River
<i>P. satunini pallipes</i> Mishchenko 1950	Russia: Krasnodarsky Distr., Zagdanskaia dolina
<i>P. silvestrii</i> Salfi 1935	Italy: M. Sibillini, Bolognola, Apennine
<i>P. teberdina</i> Ramme 1951	Russia: Caucasus, Teberda, Khatipara mountain
<i>P. uvarovi</i> Ramme 1926	Russia: Caucasus, Krasnodar Territory, Oschten

**Figures 4-5**

Podisma amedegnatoae n. sp., male head, pronotum and tegmina in dorsal and lateral view. M. Ventoux, top, 1900 m, 7.08.2003, leg. P. Fontana. Photo by P. Fontana.

M. Ventoux *Podisma* lives at low altitude, in very hot and dry habitats.

Chinery (1997) illustrated a *Podisma* female identified as *Podisma pedestris* but without any locality remark. As this female shows a remarkable dotted dorsal pattern, we wrote to Michael Chinery asking for locality information. He kindly replied: “the photograph was taken on Mount Ventoux, in September 1977. The insect was then very common among the prostrate junipers in the vicinity of Chalet Reynard, which I think is just over half-way up the mountain.”

The specimens collected on M. Ventoux in August 2003 (Fig. 1–3) as well as those preserved in the Muséum National d’Histoire Naturelle in Paris, in the Zoologische Staatssammlung in München, in Fer

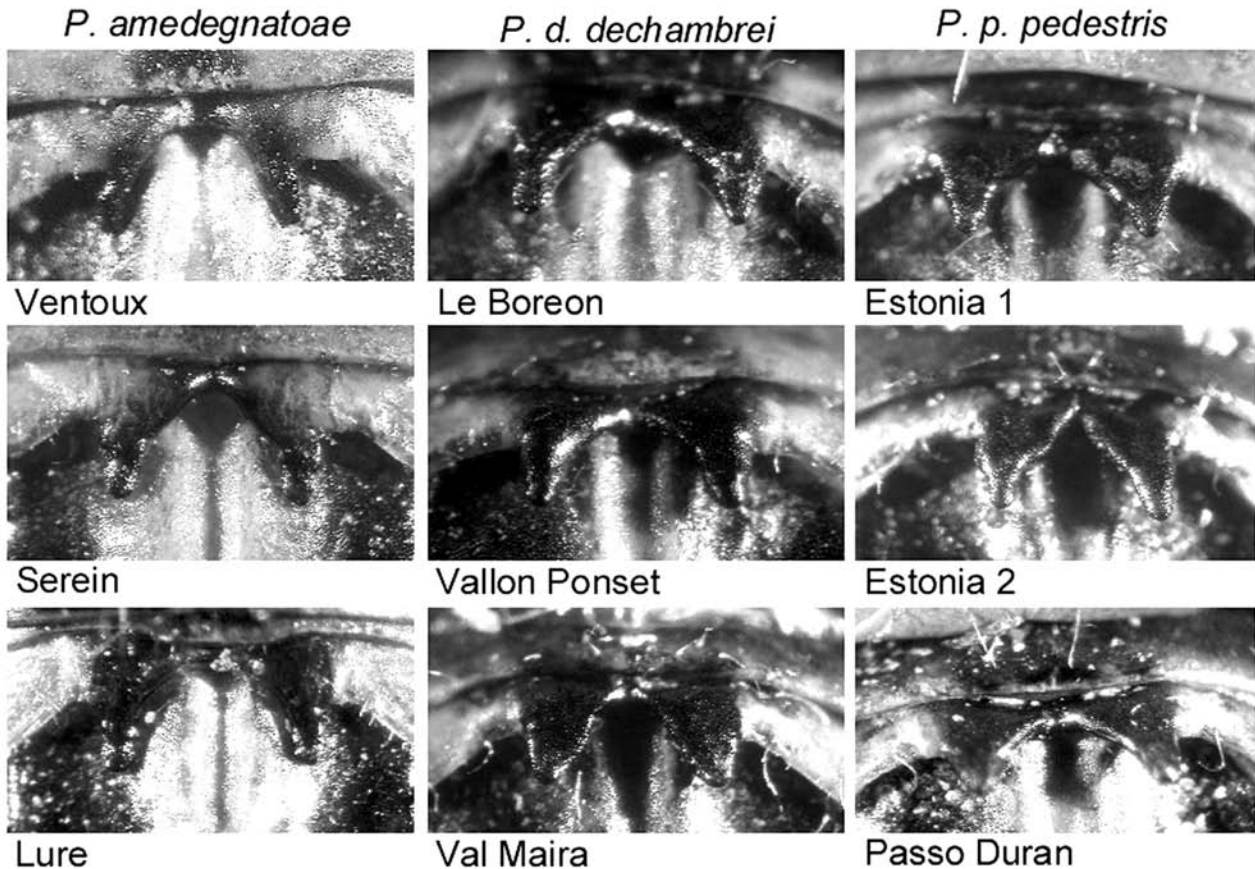


Figure 6
Male furcula in *Podisma amedegnatoae* n. sp., *P. d.dechambrei* and *P. p. pedestris*.

Willemse's collection and those received by Michael Chinery (now preserved in Paolo Fontana's collection) from the same and surroundings mountains, show distinctive morphological characters: large size, pronotum with rounded transversal section and rugose metazona, tegmina elliptical and usually reaching the beginning of the second urotergum, peculiar dorsal pattern on the female abdomen, male furcula with elongated digitiform branches and peculiar dorsal valvae of penis. The assemblage of these characters well define the M. Ventoux population as well those present in the southern range of the Alps, in comparison to all other European taxa and makes them more related to *P. dechambrei dechambrei* and to some Italian Apennine taxa than to *Podisma pedestris pedestris*.

Podisma amedegnatoae n. sp.

Type material. FRANCE, **Vaucluse:** Mont Ventoux [44°10'N 5°17'E], top, 1900 m, 7.08.2003, 6 ♂♂ (*holotype* and *paratypes*) and 3 ♀♀ (*allotype* and *paratypes*), leg. FP, coll. FP; M. Ventoux, 9.08.1974, 1 ♂ and 2 ♀♀ (*paratypes*), leg. F. Willemse, coll. WF; Mont Ventoux, 800 m, 4.08.1967, 2 ♂♂ and 4 ♀♀ (*paratypes*), leg. M. Descamps, coll. MNHNP; Mont Ventoux, 800 m, 4.08.1967, 2 ♂♂ and 4 ♀♀ (*paratypes*), leg. M. Descamps, coll. MNHNP; Mont Ventoux sud, 1700 m, 4.08.1967, 1 ♂ (*paratype*), leg. M. Descamps, coll. MNHNP; Mont Ventoux sud, 1500 m, 19.07.1967, 1 ♂ (*paratype*), leg. M. Descamps, coll. MNHNP; M. Ventoux sud, Fontaine de la Grave (44°09'N 5°19'E), 17.08.1963, 1 ♂ (*paratype*), leg. M. Donskof, coll. MNHNP; Mont Ventoux, 1500–1800 m, IX.1971, 2 ♂♂ and 2 ♀♀ (*paratypes*), leg. M. Chinery, coll. FP; Mont Ventoux, entre Sault (44° 09'N 5°21'E) & le Chalet Reynard, 1300 m, 22.07.1967, 1 ♂ and 6 ♀♀ (*paratypes*), leg. M. Descamps, coll. MNHNP; Mt. Serein [44°11'N 5°15'E],

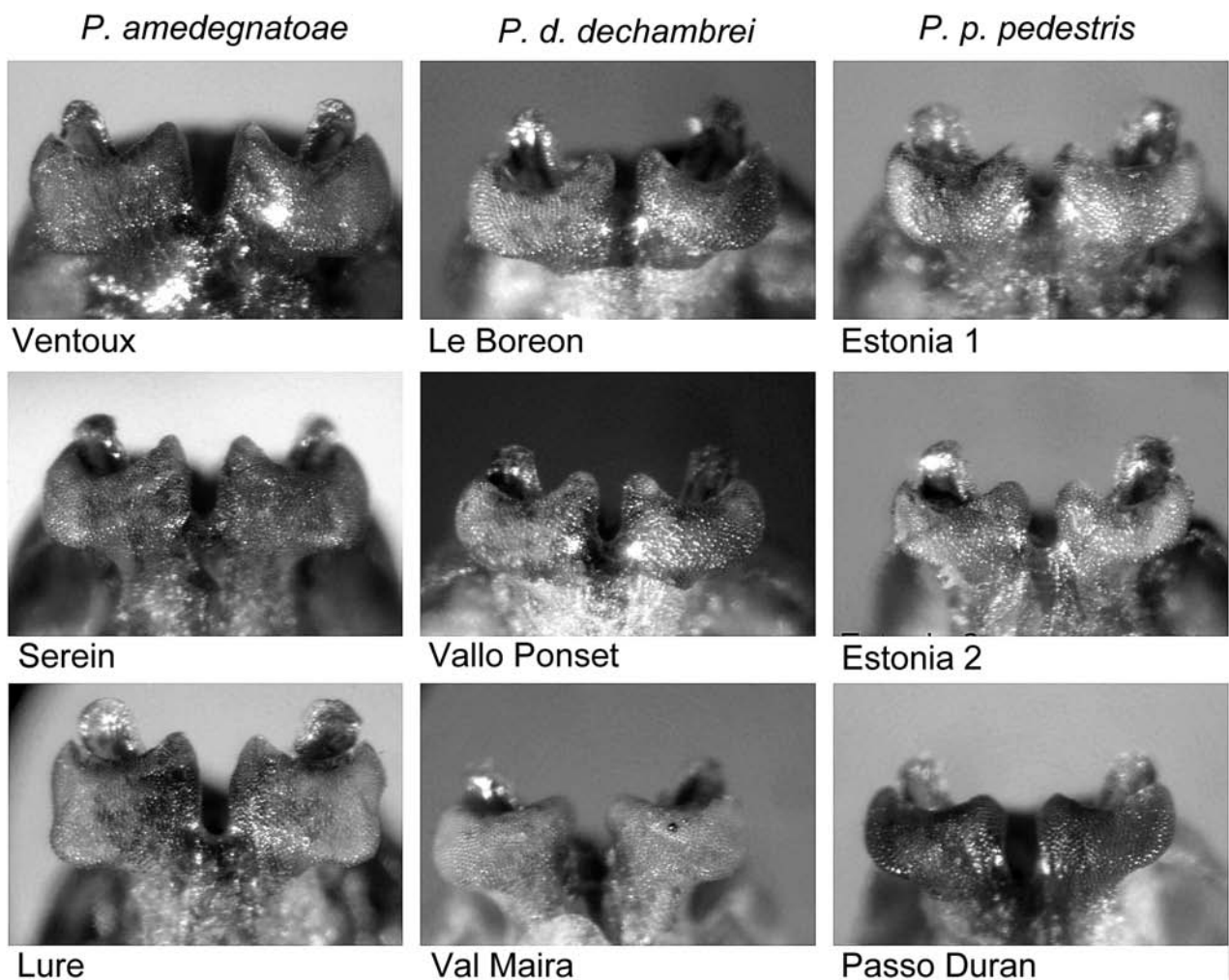


Figure 7
Male dorsal and ventral valvae of penis (in a dorsal view) in *Podisma amedegnatoae* n. sp., *P. d. dechambrei* and *P. p. pedestris*.

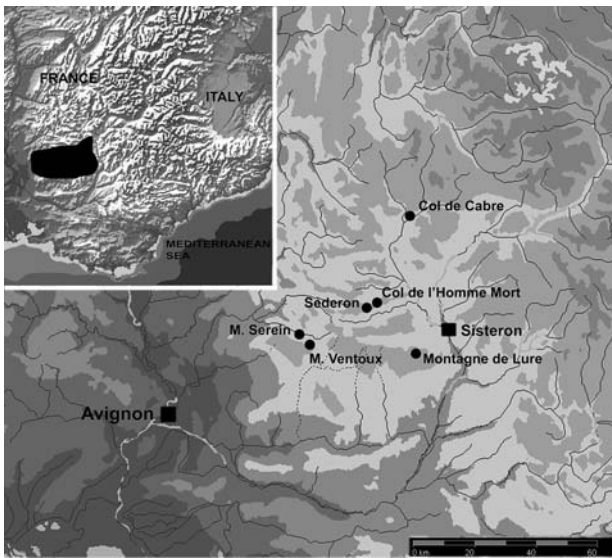


Figure 8
Distribution of *Podisma amedegnatoae* n. sp.



Figure 9
Habitat of *Podisma amedegnatoae* n. sp. on the top of M. Ventoux, 1900 m, 7.08.2003. Photo by P. Fontana.

1500 m, 4.08.1967, 6 ♂♂ and 5 ♀♀ (*paratypes*), leg. Me. Descamps, coll. MNHNP; Montagne de Lure [44°07'N 5°47'E], 1700–1800 m, 30.07.1967, 5 ♂♂ (*paratypes*), leg. M. Descamps, coll. MNHNP; Südost Frankreich, Mgne. De Lure, 1700 m, 5-7.09.1996, 10 ♂♂ and 11 ♀♀ (*paratypes*), leg. W. Schacht, coll. ZSM (8 ♂♂ and 9 ♀♀) and coll. FP (2 ♂♂ and 2 ♀♀); **Drôme**: Col de la Croix de l'Homme Mort [44°17'N 5°33'E], 6.08.1967, 4 ♂♂ and 3 ♀♀ (*paratypes*), leg. M. Descamps, coll. MNHNP; Sédéron [44°12'N 5°32'E], 1040 m, 6.08.1967, 1 ♂ (*paratype*), leg. M. Descamps, coll. MNHNP; Col de Cabre [44°33'N 5°36'E], 1180 m, VII.1971, 1 ♀ (*paratype*), leg. M. Chinery, coll. FP.

Type locality. FRANCE, Vaucluse: Mont Ventoux, on the top, m 1900.

Male description. Living specimens (Fig. 2) brown-olive green, yellow, black and whitish in colour; postfemora with pale orange outer surface and reddish lower portion; posttibia bluish. Large in size; measures as shown in table 3. Head with wide post ocular space, eyes well projecting, vertex with a wide and quite deep longitudinal impression. Pronotum rounded in transversal section, with largely rounded posterior margin and well defined longitudinal median carina. Prozona smooth, longer than metazona; metazona rugose (Figs. 4–5). Tegmina elliptic, usually surpassing the first abdominal tergite, with dorsal convex margin, apical tip scarcely and rarely detectable.

Tympanum oval in shape, usually covered by tegmina. Furcula broadly incised, with elongated digitiform lateral processes (Fig. 6). Supra anal plate black with a whitish longitudinal median stripe; elongated, with posteriorly converging lateral sides and well-elevated sub-apical tubercles.

Cerci subconical and laterally flattened. Epiphallus hardly sclerotized with elevated, crest-like posterior processes, rounded lateral lobes and digitiform anterior processes; posterior processes scarcely sinuous in lateral view. Dorsal valvae of penis subquadrate, divided by a deep v-shaped middle incision, well concave anterior margin and long lateral side and external-posterior corner subrecte; ventral valvae of penis thin, scarcely projecting in dorsal view (Fig. 7).

Subgenital plate, in dorsal view, with rounded, pointed apex.

Female description. Living specimens (1) olive green and only partially black and whitish in colour; tegmina reddish-brown, abdomen with a peculiar dorsal pattern, resulting from two oblique elongate small black dots on the median anterior portion of each tergite. Postfemora with reddish lower portion, posttibia bluish. Large in size; measures as shown in table 4.

Table 3. Main measures (in mm) and ratios of *P. amedegnatoae* n. sp. males (based on 28 specimens).

Measures	Range	Average	Standard Deviation
Pronotum length	4.59–5.967	5.212	0.305
Prozona length	2.448–3.519	2.770	0.217
Metazona length	1.989–3.213	2.491	0.231
Prozona/metazona	1–1.307	1.115	-
Pronotum/metazona	1.619–2.307	2.100	-
Maximum length of visible part of the right tegmina	2.295–3.978	3.371	0.457
Right postfemora	9.639–11.322	10.759	0.428
Pronotum/right tegmina	1.28–2.33	1.5776	-
Right postfemora/pronotum	1.897–2.366	2.068	-

Head with wide postocular space, eyes scarcely projecting and vertex with a wide and shallow longitudinal impression. Pronotum markedly rounded in transversal section, with rounded posterior margin and defined longitudinal median carina. Prozona smooth, longer than metazona; metazona rugose. Tegmina wide, elliptic, usually surpassing the first abdominal tergite, with dorsal convex margin, apical tip absent or rarely detectable. Tympanum oval in shape, usually covered by tegmina.

Dorsal pattern of abdomen (Fig. 10) well recognizable in dried specimens too and present in 87 of the 88 studied ♀♀. Supra anal plate subtriangular with a longitudinal median depression.

Cerci short, conical. Dorsal valvae of ovipositor with large and decidedly concave dorsal surface; ventral valvae of ovipositor with basal tooth evident in lateral view and decidedly concave ventral surface. Subgenital plate subtriangular, with sinuous oblique lateral sides.

Derivatio nominis. the new species is named after the well-known orthopterist Christiane Amedegnato (responsible for the service des Orthoptères at the Laboratoire d'Entomologie of the Muséum National d'Histoire Naturelle in Paris) for her kind help in our studies on this topic.

Distribution. *P. amedeagnatoae* n. sp. is confined to the southern ranges of the Alps in the Vaucluse and Drôme départements (Fig. 8); in particular, it is known to date from Mont Ventoux, Mt. Serein, Montagne de Lure (Vaucluse), Col de la Croix de l'Homme Mort (The locality of Col de la Croix de l'Homme Mort must be referred to Drôme: Descamp, pers. comm.), and Séderon (Drôme).

Ecology *P. amedeagnatoae* n. sp. lives at a lower altitude than other *Podisma* species. It is common near the top but it is also frequent at lower altitudes especially on M. Ventoux. In this mountain Luquet (1992, sub *P. pedestris*) found it in all climatic belts, from mesomediterranean to subalpine, and from about 300 m to the top (1912 m). On M. Ventoux *P. amedeagnatoae* n. sp. lives both on the dried and stony slopes (Fig. 9) and in dense meadows where it is more common (Luquet 1992).

Relations to other taxa. *P. amedeagnatoae* n. sp. is related to the populations of *Podisma* of the western Alps, here considered as *P. d. dechambrei* sensu La Greca. The main distinctive characters are the relative length of prozona and metazona and the female dotted dorsal pattern (FDDP) (Fig. 10). Another very



Figure 10
FDDP (female Dotted Dorsal Pattern) as present in *Podisma amedeagnatoae* n. sp. (M. Ventoux) and *P. d. dechambrei* (Alpes-Maritimes, Vallon du Ponssetand, and absent in *P. p. pedestris* (Eastern Alps, M. Baldo). Photos by P. Fontana.

relevant distinctive character is the male furcula (Fig. 6) that in *P. amedeagnatoae* n. sp. is broadly incised, with elongated digitiform lateral processes. In *P. pedestris pedestris* the male furcula is acutely incised and with large subtriangular processes. In *P. dechambrei* it is more variable but usually more broadly incised and

Table 4. Main measures (mm) and ratios of *P. amedeagnatoae* n. sp. females (based on 28 specimens).

Measures	Range	Average	Standard Deviation
Pronotum length	5.508–7.344	6.608	0.420
Prozona length	2.907–3.672	3.311	0.192
Metazona length	2.601–3.825	3.296	0.309
Prozona/metazona	0.875–1.210	1.011	-
Pronotum/metazona	1.875–2.210	2.011	-
Maximum length of the visible part of the right tegmina	2.754–5.814	4.524	0.626
Right postfemora	9.639–14.229	13.085	1.052
Pronotum/right tegmina	1.171–2.444	1.491	-
Right postfemora/pronotum	1.465–2.162	1.982	-

with subtriangular lateral processes. Dorsal valvae of penis are subquadrate and divided by a deep v-shaped middle incision in *P. amedeagnatoae* n. sp., while in *P. p. pedestris* and *P. d. dechambrei* these are transversal and divided by a u-shaped middle incision. The external-posterior corner of the dorsal valvae of penis is subrecte in *P. amedeagnatoae* n. sp. while is decisely rounded in *P. d. dechambrei* and *P. p. pedestris* (Fig. 7).

A comparison based on some measurements within the alpine *Podisma* species is presented in Tab. 5.

The FDDP character is very peculiar and it is present, according to the material we could study (Tab. 6), only in a small part of the wide range of the genus and in particular from the southeastern French Alps to the central Apennines in Italy. This character

seems to be present in a considerable percentage only in *P. amedeagnatoae* n. sp. as well in French *Podisma dechambrei* populations. The scarce manifestation of this character in the Italian populations of *P. dechambrei* could fit very well with the presence of a hybrid zone along the southern range of western Alps (Hewitt 1975). On the other hand, the reduction of the expression of the FDDP character from west to east and south-east, could suggest a migration of this character from France to Italy, but this aspect, related to the presence of refuge areas in the western Alps, needs to be investigated more profoundly. Another interesting aspect of the distribution of the FDDP character is its absence from the Pyrenees and other European mountains.

Table 5. Main measures of males (M) and females (F) of *Podisma amedeagnatoae* n. sp., *P. p. pedestris*, *P. p. caprai*, *P. p. nadigi*, *P. d. dechambrei* and *P. d. melisi*.

Species		<i>P. amedeagnatoae</i> n. sp.		<i>P. p. pedestris</i>		<i>P. p. caprai</i>		<i>P. p. nadigi</i>		<i>P. d. dechambrei</i>		<i>P. d. melisi</i>	
		(28)	(21)	(62)	(41)	(3)	(3)	(2)	(2)	(51)	(42)	(2)	(2)
(measured specimens)	SEX	M	F	M	F	M	F	M	F	M	F	M	F
Pronotum length (mm)	mean	5.212	6.608	4.747	6.000	4.998	6.298	4.590	5.967	4.695	5.874	4.743	6.12
	St. dev.	0.305	0.420	0.273	0.38	0.491	0.289	0	0	0.276	0.34	0.216	0
Prozona length (mm)	mean	2.770	3.311	2.392	2.845	2.346	2.958	2.524	2.983	2.46	2.983	2.371	3.06
	St. dev.	0.217	0.192	0.142	0.216	0.176	0.176	0	0.108	0.162	0.182	0.108	0
Metazona length (mm)	mean	2.491	3.296	2.355	3.102	2.652	3.340	2.065	2.983	2.238	2.89	2.371	3.06
	St. dev.	0.231	0.309	0.182	0.238	0.318	0.116	0	0.108	0.169	0.201	0.108	0
Ratio prozona/metazona	mean	1.115	1.011	1.019	0.929	0.888	0.885	1.222	1.001	1.103	1.034	1.000	1.000
	St. dev.	0.078	0.093	0.08	0.088	0.045	0.026	0	0.072	0.091	0.064	0	0
Ratio pronotum/metazona	mean	2.100	2.011	2.019	1.937	1.888	1.885	2.222	2.001	2.102	2.034	2.000	2.000
	St. dev.	0.123	0.093	0.08	0.097	0.045	0.026	0	0.072	0.091	0.064	0	0
Maximum length of the visible part of the right tegmina (mm)	mean	3.371	4.524	3.282	3.686	3.774	4.437	1.836	1.606	2.259	2.699	1.989	2.065
	St. dev.	0.457	0.626	0.705	0.782	0.176	1.003	0.216	0.54	0.725	0.917	0.432	0.324
Maximum length of the visible part of the left tegmina (mm)	mean	3.294	4.458	3.175	3.582	3.468	4.335	1.759	1.912	2.196	2.579	1.759	1.989
	St. dev.	0.503	0.517	0.722	0.817	0.353	0.995	0.108	0.324	0.667	0.965	0.757	0.432
Right postfemora (mm)	mean	10.759	13.085	10.26	12.400	10.404	12.597	10.251	12.546	10.137	12.258	10.327	13.387
	St. dev.	0.428	1.052	0.534	0.768	0.265	0.385	0.649	0.216	0.426	0.637	0.108	0.757
Ratio pronotum/right tegmina	mean	1.5776	1.491	1.517	1.690	1.323	1.463	2.517	3.9375	2.197	2.095	2.454	3.000
	St. dev.	0.260	0.268	0.356	0.325	0.105	0.289	0.296	1.325	0.884	0.739	0.642	0.471
Ratio right postfemora/pronotum	mean	2.068	1.982	2.163	2.068	2.092	2.001	2.233	2.102	2.163	2.089	2.179	2.187
	St. dev.	0.113	0.142	0.098	0.088	0.161	0.049	0.141	0.0362	0.101	0.092	0.076	0.123

Morphometric analysis

The discriminant function analysis of morphological data measured on female individuals indicates a significant discrimination between the three species ($\Lambda = 0.27545$; d.f.:12,192; $F = 14.486$; $p < 0.001$). According to the discriminant analysis the classification of 84 (80.76%) individuals is correct while 20 (19.23%) are misclassified.

In order to understand the contribution of each morphometric character to the discrimination, the canonical analysis was run. Two canonical varieties (CV) were generated by the canonical analysis, explaining 100% of the variation (Tab. 7). The variation captured by CV1 is 59% and the remaining is captured by CV2.

Podisma amedeagnatoae n. sp. is separated from *P. pedestris* and *P. dechambrei* on the first CV (Fig. 11). *P. pedestris* is primarily separated on CV2 (Fig. 11). The absolute values of the standardized canonical coefficients (Tab. 7) indicate the contribution of each morphological character in CV1 and CV2.

The average Mahalanobis' distances between the female individuals indicated as *Podisma amedeagnatoae* n. sp. and the two others *Podisma* spp. ranged from 3.7467 to 7.7182 (Tab. 8).

The discriminant function analysis of the male data indicates a significant discrimination between the three species ($\Lambda = 0.32605$; d.f.: 12,266; $F = 16.65$; $p < 0.001$).

Table 6. Occurrence of female dotted dorsal pattern (FDDP) in the examined material from western Alps and Apennines (Italy and France). In the checked material of the genus *Podisma* from all other region, the occurrence of this character is 0%.

Species	origin	females	Dotted	Undotted	% Dotted
<i>dechambrei dechambrei</i>	France	68	59	9	86.76%
<i>dechambrei dechambrei</i>	Italy	164	28	136	17.07%
<i>dechambrei melisi</i>	Italy	53	0	53	0.00%
<i>emiliae</i>	Italy	46	0	46	0.00%
<i>goidanichi</i>	Italy	43	0	43	0.00%
<i>magdalenae</i>	Italy	7	0	7	0.00%
<i>amedeagnatoae</i> n. sp.	France	101	100	1	99.00%
<i>pedestris pedestris</i>	France	41	0	41	0.00%
<i>pedestris pedestris</i>	Italy	65	0	65	0.00%
<i>ruffoi</i>	Italy	55	1	51	1.82%
<i>silvestrii</i>	Italy	78	11	67	14.10%

Table 7. Standardized canonical coefficient and cumulative percentage of variation explained per canonical variate for morphometric data.

CHARACTERS	Females		Males	
	CV1	CV2	CV1	CV2
Pronotum length	-0.2716	-0.1544	0.4212	0.2369
Prozona length	-0.4888	-0.9898	0.8653	0.0399
Metazona length	-0.0350	0.8466	-0.5520	0.2691
Maximum length of the visible part of the right tegmina	-0.3792	0.3674	-0.3449	0.5546
Maximum length of the visible part of the left tegmina	-0.3252	0.0073	0.0282	0.3722
Right postfemora	0.2174	0.0258	0.1073	-0.2787
Cumulative variance (%)	59.05	100.00	53.10	100.00

Two canonical varieties (CV) were generated by the canonical analysis, explaining 100% of the variation. The variation captured by CV1 result in 53% and the remaining variation is captured by CV2 (Tab. 7).

Podisma amedeagnatoae n. sp. is separated from *P. pedestris* and *P. d. dechambrei* on the CV1 (Fig. 12). The average Mahalanobis' distances between the male individuals indicated as *Podisma amedeagnatoae* n. sp. and the two others *Podisma* spp. ranged from 3.6337 to 5.6769 (Tab. 8).

Significant differences for the prozona length were found between the females of the three species. The values of prozona length measured on *P. amedeagnatoae* females are higher than those measured on females of *P. dechambrei*. The lowest values of prozona lengths were measured on females of *P. pedestris* (Fig. 13). Additional differences were found among the metazona lengths of

Table 8. Generalized Mahalanobis' distances (D^2) between the species for females and males.

Females			
Species	<i>P. amedeagnatoae</i>	<i>P. dechambrei</i>	<i>P. pedestris</i>
<i>P. amedeagnatoae</i>	0.000	7.7182	6.8653
<i>P. dechambrei</i>		0.000	3.7467
<i>P. pedestris</i>			0.000
Males			
Species	<i>P. amedeagnatoae</i>	<i>P. dechambrei</i>	<i>P. pedestris</i>
<i>P. amedeagnatoae</i>	0.000	5.5438	5.6769
<i>P. dechambrei</i>		0.000	3.6337
<i>P. pedestris</i>			0.000

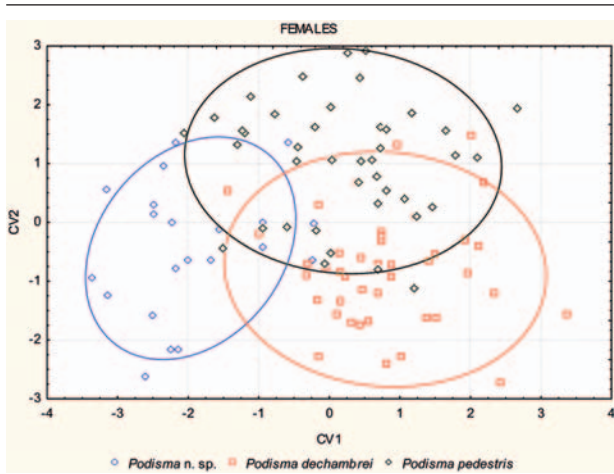


Figure 11
Plot of the two canonical variates for females individuals.

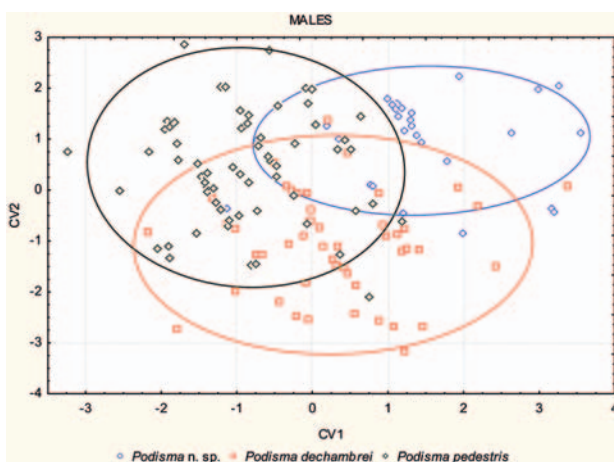


Figure 12
Plot of the two canonical variates for males individuals.

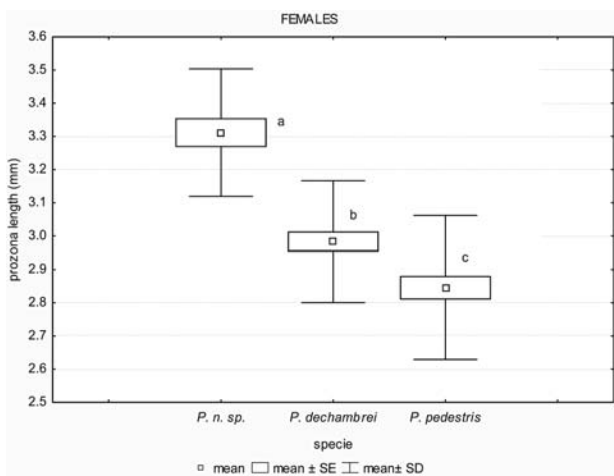


Figure 13
Prozona length measured on females individuals (mean, standard error, standard deviations). Different letters indicate significant difference (Kruskal-Wallis analysis of ranks; $p < 0.05$).

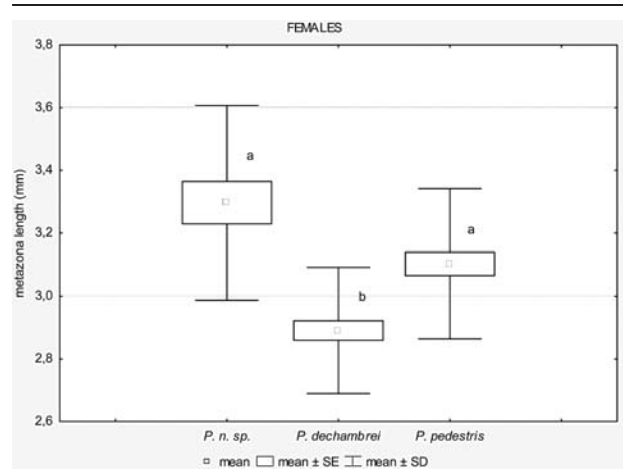


Figure 14
Metazona length measured on female individuals (mean, standard error, standard deviations). Different letters indicate significant difference (Kruskal-Wallis analysis of ranks; $p < 0.05$).

the three species. On *P. amedegnatoae* females and *P. pedestris* females metazona lengths resulted longer than in *P. dechambrei* females (Fig. 14). Moreover, prozona and metazona lengths resulted significantly different among males of the three species. The longest prozona length is found in *P. amedegnatoae* males compare to the two other species (Fig. 15). The metazona lengths of *P. amedegnatoae* males resulted higher than those measured in *P. pedestris*. The lowest metazona lengths were measured in *P. dechambrei* (Fig. 16).

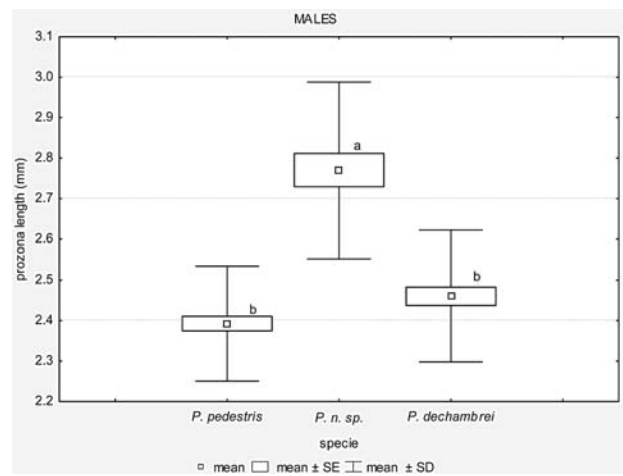


Figure 15
Prozona length measured on male individuals (mean, standard error, standard deviations). Different letters indicate significant difference (Kruskal-Wallis analysis of ranks; $p < 0.05$).

Conclusion

Morphological characters, colour pattern, morphometric analysis as well some ecological peculiarities, show that the *Podisma* populations living on southern ridges of Petites Alpes du Dauphiné, in the Vaucluse and Drôme départements, must be considered a separated species, here described as *P. amedegnatoae* n. sp. The new species differs from its congeners in many characters, like the shape and the measurements of pronotum, the length of the tegmina, the shape of male furcula and dorsal valvae of penis, the size and the colour of living specimens. In particular, as result in the morphometric analysis, *P. amedegnatoae* n. sp. differs from those of *P. pedestris* and *P. dechambrei*.

The peculiarity of this species is also shown by the fact that it can live in very hot and dry localities even at low altitudes, while all the other *Podisma* species in central and southern Europe live only at highest altitude.

But the most interesting data can be obtained by a comparison of the new species of *Podisma* with those living in southern Europe. In particular the presence of this species on Mount Ventoux and other low ranges of southern France suggest that these mountains could have performed as refuge areas during the last ice ages, as suggested also by G. Hewitt (pers. com.): “*The genetic work done on Alpine Podisma suggests that it survived ice ages in several pockets, certainly a French Maritime one and an Italian Piedmont one. The chromosomal evidence is quite clear.*”

The analysis of the distribution of the FDDP (female dorsal dotted pattern) character, apparently

flowing from southern France to the east and south-east in Italy, adds new data to the study of the colonisation of Europe after the ice ages, by species which have survived in refuge areas. This colour pattern apparently confirms also the presence of a clear interruption in the genetic flow between the western and eastern slopes (French and Italian slopes) of the southwestern Alps. This fact fits well with the presence of a *Podisma* hybrid zone based on the presence of the two male sex-chromosome forms: the XY/XX form is present in France while in the Italian slope of Alpes-Maritimes as well in other western French and Italian Alps the normal sex-chromosome XO/XX is present (Hewitt 1975). The similarity of the results offered by a male chromosomal character and a female chromatic character represents a singular coincidence and offers new arguments for the investigation of the phenomena related to the ice age effects on the survival, evolution of new species and distribution of the animals in southern Alps.

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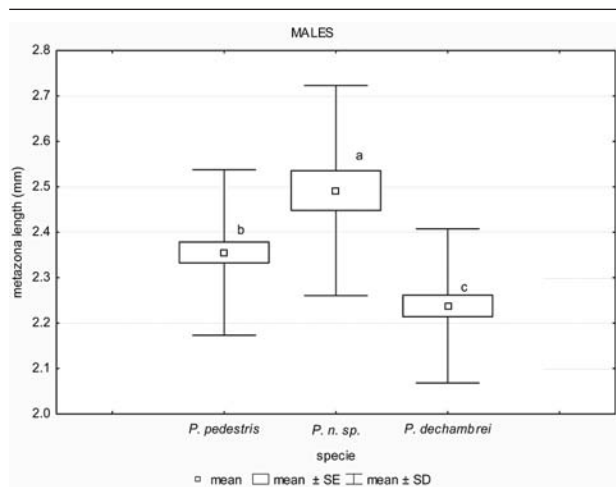


Figure 16

Metazona length measured on males individuals (mean, standard error, standard deviations). Different letters indicate significant difference (Kruskal-Wallis analysis of ranks; $p < 0.05$).

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Appendix 1

“Altissimum regionis huius montem, quem non immerito Ventosum vocant, hodierno die, sola videndi insignem loci altitudinem cupiditate ductus, ascendi. Multis iter hoc annis in animo fuerat; ab infantia enim his in locis, ut nosti, fato res hominum versante, versatus sum; mons autem hic late undique conspectus, fere semper in oculis est.” [Francesco Petrarca 1364, Epistolarum familiarum liber IV, ep. 1: Epistola ad Dionysium De Burgio Sancti Sepulcri. (De ascensu Montis Ventosis)].

“Par un isolement, qui lui laisse, sur toutes les faces, exposition libre à l’influence des agents atmosphériques ; par son élévation, qui en fait le point culminant de la France en deçà des frontières soit des Alpes, soit des Pyrénées, le mont pelé de la Provence, le mont Ventoux, se prête, avec une remarquable netteté, aux études de la distribution des espèces végétales suivant le climat” (J. H. Fabre 1899, Souvenirs entomologiques, 6^{ème} Série, Chapitre 15).

Appendix 2

***Podisma* examined material** (the localities are reported as written in original labels)

Coll. FP = collection Fontana Paolo, Isola Vicentina (Italy); coll. BFM = collection Buzzetti Filippo Maria, Arzignano (Italy); coll. LG = collection La Greca, Museo Civico di Storia Naturale, Milan (Italy); coll. ZSM = Zoologische Staatssammlung, München; coll. MNHNP = Muséum National d’Histoire Naturelle, Paris; coll. GA = collection Antonio Galvagni, Rovereto (Italy); coll. WF = collection Fer Willemse (Eygelshoven, The Netherlands).

***Podisma amedegnatoae* n. sp.**

FRANCE: **Vaucluse:** Mont Ventoux, top, m 1900, 7.08.2003, 6 ♂♂ and 3 ♀♀, leg. FP, coll. FP; M. Ventoux, 9.08.1974, 1 ♂ and 2 ♀♀, leg. F. Willemse, coll. WF; Mont Ventoux, 800 m, 4.08.1967, 2 ♂♂ and 4 ♀♀, leg. M. Descamps, coll. MNHNP; Mont Ventoux, 800 m, 4.08.1967, 2 ♂♂ and 4 ♀♀, leg. M. Descamps, coll. MNHNP; Mont Ventoux sud, 1700 m, 4.08.1967, 1 ♂, leg. M. Descamps, coll. MNHNP; Mont Ventoux sud, 1500 m, 19.07.1967, 1 ♂, leg. M. Descamps, coll. MNHNP; M. Ventoux sud, Fontane de la Grave, 17.08.1963, 1 ♂, leg. M. Donskof, coll. MNHNP; Mont Ventoux, entre Sault & le Chalet Reynard, 1300 m, 22.07.1967, 1 ♂ and 6 ♀♀, leg. M. Descamps, coll. MNHNP; Mt. Serein, 1500 m, 4.08.1967, 6 ♂♂ and 5 ♀♀, leg. Me. Descamps, coll. MNHNP; Montagne de Lure, 1700-1800 m, 30.07.1967, 5 ♂♂, leg. M. Descamps, coll. MNHNP; Sudostafankreich, Mgne. De Lure, 1700 m, 5-7.09.1996, 10 ♂♂ and 11 ♀♀ (*paratypes*), leg. W. Schacht, coll. ZSM (8 ♂♂ and 9 ♀♀) and coll. FP (2 ♂♂ and 2 ♀♀); **Drôme:** Col de la Croix de l’Homme Mort, 6.08.1967, 4 ♂♂ and 3 ♀♀, leg. M. Descamps, coll. MNHNP; Sederon, 1040 m, 6.08.1967, 1 ♂. Leg. M. Descamps, coll. MNHNP.

Podisma cantabricae

SPAIN: Asturias, Valle del Lago, Samiedo, 06.08.1949, 1 ♂ and 1 ♀ (Topotypes), leg. Morales Agacino E., coll. FP.

Podisma carpetana carpetana

SPAIN: Sierra de Guadarrama B. Cercedilla, Kastilien, 18-24.07.1924, 1 ♀ (Topotype), leg. Ebner R., coll. FP; Cercedilla, 1 ♂ (Topotype), leg. Bolivar I., coll. FP.

Podisma carpetana ignatii

SPAIN : Santander, Station Teleferique Boven Parador Fuente de Boven Pido, 1800 m, 3.08.1968, 1 ♀, leg. M. C. & G. Kruseman, coll. LG ; Santander, Puerto de San Glorio, 1600 m, 4-10.08.1968, 1 ♂, leg. M. C. & G. Kruseman, coll. LG.

Podisma dechambrei dechambrei

FRANCE: **Alpes-Maritimes:** P. N. de L’Arpette, m 1800, 26.08.1992, 7 ♂♂ and 5 ♀♀, leg. FP, coll. FP (1 ♂ coll. LG); P. N. Mercantour, Pas des Ladres, m 2400, 28.08.1992, 1 ♂ and 1 ♀, leg. FP, coll. FP; P. N. Mercantour, Vallée des Merveilles, m 2200, 26.08.1992, 1 ♀, leg. FP, coll. FP; P. N. Mercantour, Vallon de Prals, m 1900-2300, 27.08.1992, 10 ♂♂ and 16 ♀♀, leg. FP, coll. FP (1 ♀ coll. LG); P. N. Mercantour, Le Boreon - Val du Cavalet, m 2200, 25.08.1992, 13 ♂♂ and 12 ♀♀, leg. FP, coll. FP; Rive du Boreon, 1200-1300 m, 6.09.1965, 3 ♂♂ and 3 ♀♀, leg. R. Roy, coll. MNHNP; P. N. Mercantour, M. Caval, St. Martin Vesubie, Lacs de Prals, m 2284, 24.08.2003, 5 ♂♂ and 2 ♀♀, leg. FP, coll. FP; P. N. Mercantour, M. Caval, St. Martin Vesubie, Plan de Prals, m 2068, 24.08.2003, 3 ♂♂ and 3 ♀♀, leg. FP, coll. FP; P. N. Mercantour, M. Caval, St. Martin Vesubie, Vallon de Prals, m 2068, 24.08.2003, 1 ♂ and 1 ♀, leg. FP, coll. FP; P. N. Mercantour, M. Caval, St. Martin Vesubie, Vacherie de la Madone, m 1800, 23.08.2003, 3 ♂♂ and 2 ♀♀, leg. FP, coll. FP; P. N. Mercantour, M. Caval, St. Martin Vesubie, Vallon du Ponset, m 2020-2100, 23.08.2003, 5 ♂♂ and 2 ♀♀, leg. FP, coll. FP; S. Martin Vesubie, m 1650, 5.08.1981, 4 ♀♀, leg. F. Lombardo, coll. LG; Madonna de Finestre, m 2000, 05.08.1981, 14 ♂♂ and 6 ♀♀, leg. F. Lombardo, coll. LG; Colle Turini, Sospel, 6.08.1981, 4 ♂♂ and 4 ♀♀, leg. F. Lombardo, coll. LG; La Colmiane, 1400-1500 m, 8.09.1965, 1 ♂, leg. R. Roy, coll. MNHNP; **Alpes-de-Haute-Provence:** Plan du Peiron, 11.09.1950, 1 ♂ and 2 ♀♀, leg. C. & F. Willemse, coll. WF; Col de Cayolle, som. Des Garrets, 20.08.1975, 1 ♂ and 1 ♀, leg. Nadig, coll. WF; Le Cheval Blanc, 14.08.1905, 1 ♂, leg. Rey, coll. MNHNP; **Hautes-Alpes:** Col Du Noyar, 1500 m, 27.07.1981, 1 ♂ and 1 ♀, leg. Willemse & Faassen, coll. WF;

ITALY: **Piemonte:** Torino, Colle Bercia, Cesana Torinese, m 2250, 11.08.1967, 3 ♂♂ and 3 ♀♀, leg. La Greca, coll. LG; Cuneo, Colle della Lombarda, m 2200, 28.08.1992, 1 ♀, leg. FP, coll. FP; Cuneo, Colle della Lombarda, m 2260, 26.08.2003, 4 ♂♂ and 3 ♀♀, leg. FP, coll. FP; Cuneo, Colle Lombarda, Vinadio, m 2100, 3.08.1967, leg. La Greca, 1 Male and 3 ♀♀, coll. LG; Cuneo, Colle della Lombarda, m 2351, 18.08.2001, 4 ♂♂, leg. Fontana, Buzzetti, Kleukers, coll. FP (3 ♂♂ coll. BFM); Cuneo, Colle della Lombarda, Lakes, m 2200, 18.08.2001, 5 ♂♂ and 8 ♀♀, leg. Fontana, Buzzetti, Kleukers, coll. FP (2 ♂♂ and 5 ♀♀ coll. BFM); Cuneo, Val Maira, Colle Valcavera (Val Arma) Demonte, m 2800, 4.08.1967, 2 ♂♂ and 4 ♀♀, leg. La Greca, coll. LG; Vallone dell’Armà (Demonte),

m 2200, 4.08.1967, 8 ♂♂ and 14 ♀♀, leg. La Greca, coll. LG; Demonte, V. ne dell'Arma, Colle sale, 2400-2500 m, 2 ♂♂ and 2 ♀♀, leg. A. Galvagni, coll. WF; Cuneo, Colle di Perla (Limone), m 2080, 2.08.1967, 22 ♂♂ and 25 ♀♀, leg. La Greca, coll. LG; Cuneo, Chiappera di Acceglio, m 1800, 05.08.1996, 1 ♂, leg. Osella B., coll. FP; Cuneo, Vinadio, Santuario S. Anna, m 2064, 21 ♂♂ and 18 ♀♀, leg. Fontana, Buzzetti, Kleukers, coll. FP (8 ♂♂ and 6 ♀♀ coll. BFM); Cuneo, S. Anna di Vinadio, m 2025, 8.08.1967, 26 ♂♂ and 28 ♀♀, leg. La Greca, coll. LG; Cuneo, Bagni di Vinadio, m 1200, 3.08.1981, 1 ♂ and 10 ♀♀, leg. F. Lombardo, coll. LG; Cuneo, Col di Tenda, 1870-1900 m, 12.08.1973, 7 ♂♂ and 5 ♀♀, leg. A. Galvagni, coll. GA; Cuneo, Col di Tenda, 2000-2200, 31.08.1958, 6 ♂♂ and 8 ♀♀, leg. Ferrais, coll. GA; Cuneo, Col di Tenda (F.te Margherita), m 1900, 2.08.1967, 1 ♂ and 1 ♀, leg. La Greca, coll. LG; Cuneo, Punta Bussaia (W. Col di Tenda), 2.08.1967, 1 ♂, leg. La Greca, coll. LG; Cuneo, M. Mondolè, Rifugio Balma, 1900 m, 11.08.1973, 11 ♂♂ and 10 ♀♀, leg. A. Galvagni, coll. GA; Cuneo, M. Mondolè, 2000-2300, 07.1950, 6 ♂♂ and 1 ♀ nymph, coll. LG; Cuneo, Terme Valdieri, m 1700, 30.07.1981, 2 ♂♂ and 10 ♀♀, coll. LG; Cuneo, C.le di Caccia, Terme Valdieri, m 1500, 30.07.1981, 2 ♂♂, coll. LG; Cuneo, M. Maladecia, Vinadio, m 1500, 1.08.1981, 2 ♂♂ and 4 ♀♀, leg. F. Lombardo, coll. LG; Monte Murdino, Val cassetto, Cuneo, m 1200, 3.08.1981, 4 ♂♂ and 9 ♀♀, leg. F. Lombardo, coll. LG; Cuneo, Monte Marguareis, Rif. Cervino, 2000 m, 30.07.1955, 12 ♂♂ and 3 ♀♀, leg. A. Galvagni, coll. GA; Cuneo, Monte Marguareis, 2000-2500 m, 30.07.1955, 7 ♂♂ and 5 ♀♀, leg. C. Conci, coll. GA; Cuneo, Monte Moro, Frabosa Soprana, 1700 m, 8.08.1973, 11 ♂♂ and 10 ♀♀, leg. A. Galvagni, coll. GA; **Liguria:** Imperia, Alpi Marittime, Saccarello, m 2000, 08.1982, 7 ♂♂ and 1 ♀, leg. Osella B., coll. FP; Imperia, C.le S. Bernardo (Mendatica), m 1500, 8.08.1981, 1 ♀, leg. F. Lombardo, coll. LG; Imperia, Certosa di Pesio, m 1500, 1.08.1981, 1 ♂, leg. F. Lombardo, coll. LG; Genova, Passo della Bocchetta, 25.07.1962, 1 ♂, leg. B. Baccetti, coll. LG; La Spezia, M. Penna, m 1400, 28.08.1962, 1 ♀, leg. B. Baccetti, coll. LG.

Podisma dechambrei melisi

ITALY: **Emilia Romagna:** Modena, Appennino Modenese, Alpe tre Potenze, m 1800, 14.08.1979, 1 ♂ and 1 ♀, leg. Osella B., coll. FP; Modena, Appennino Modenese, Alpe tre Potenze, m 1900, 31.08.1954, 2 ♂♂ and 2 ♀♀, leg. B. Baccetti, coll. LG; Modena, Appennino Modenese, Alpe tre Potenze, Valle Pozza, 1350-1750 m, 10.08.1972, 55 ♂♂ and 49 ♀♀, leg. A. Galvagni, coll. GA; Modena, Appennino Modenese, M. Giovo, 20.09.1955, 1 ♀, leg. B. Baccetti, coll. LG; **Toscana:** Pistoia, Alpe Tre Potenze, m 1940, 31.08.1954, 1 ♂ and 1 ♀, leg. Baccetti B., coll. FP.

Podisma emiliae

ITALY: **Emilia Romagna:** Modena, Lago Scaffaiolo, 11.09.1956, 1 ♂ and 3 ♀, leg. Baccetti B., coll. FP (3 ♂♂ coll. LG); Modena, Scaffaiolo, 6.09.1954, 2 ♂♂ and 2 ♀♀, coll. LG; Modena, M. Cimone, 20.09.1955, 1 ♀, leg. B. Baccetti, coll. LG; Modena, M. Cimone, 10.09.1960, 2 ♂♂, leg. B. Baccetti, coll. LG; Modena, M. Cimone, S slope, 1680 m, 5.08.1972, 42 ♂♂ and 31 ♀♀, leg. A. Galvagni, coll. GA; Modena, Pian del Falco, m 1300, 26.07.1963, 1 ♀, leg. B. Baccetti, coll. LG; Modena, M. Calvanella, 1400-1550, 27.07.1963, 1 ♀, leg. B. Baccetti, coll. LG; Bologna, Corno Alle Scale, 19.09.1965, 1 ♀,

leg. B. Baccetti, coll. LG; **Toscana:** Pistoia, Passo Croce Arcana, Doganaccia, m 1700, 29.09.2000, 1 ♂, leg. FP, coll. FP;

Podisma goidanichi

ITALY: **Abruzzo:** Teramo, Gran sasso, La Madonna, Prati di Tivo, 2250 m, 26.08.1971, 10 ♂♂ and 5 ♀♀, leg. A. Galvagni, coll. GA; Teramo, Laga, Monti di Mezzo, 2000-2100 m, 6.09.1971, 15 ♂♂ and 7 ♀♀, leg. A. Galvagni, coll. GA; Teramo, Laga, Monti di Mezzo - La Montagnola, m 2000, 12.09.1996, 1 ♀, leg. FP, coll. FP; **Lazio:** Rieti, Monti della Laga, M. delle Vene, m 1900-2020, 30.09.1997, 1 ♂ and 1 ♀, leg. Osella B., coll. FP; Rieti, Monti della Laga, M. Gorzano, m 2200-2458, 09.1968, 1 ♂, coll. FP; Rieti, Monti della Laga, M. Gorzano - Stazzo del Gorzano, m 1900, 30.07.1997, 1 ♂ and 1 ♀, leg. Andreotti & Mancinelli, coll. FP; Rieti, Monti della Laga, M. Pizzitello cima, m 2150-2220, 14.08.1997, 1 ♂ and 1 ♀, leg. Andreotti, coll. FP; Rieti, Monti della Laga, M. Pizzitello: Costa Solagne, m 1900-2000, 14.08.1997, 1 ♂ and 1 ♀, leg. Andreotti, coll. FP; Rieti, Monti della Laga, M. Gorzano, m 1800, 17.08.1964, 5 ♂♂ and 2 ♀♀, leg. La Greca M., coll. FP; Rieti, Monti della Laga, Pizzo di Sevo-Tracciolino di Annibale, m 1850-2100, 18.09.1997, 1 ♂ and 1 ♀, leg. Andreotti & Ma rotta, coll. FP; Marche: Ascoli Piceno, Monti della Laga, Macera della Morte lato NE, m 1700-1950, 05.09.1997, 1 ♂ and 1 ♀, leg. Andreotti & Marotta, coll. FP.

Podisma magdalenae

ITALY: **Marche:** Pesaro e Urbino, Cagli, M. Catria, m 1600-1700, 02.09.1970, 11 ♂♂ and 6 ♀ (holotype and paratypes) leg. Galvagni A., coll. GA and coll. FP (1 ♂ and 1 ♀); Pesaro e Urbino, Frontone, M. Catria, 1650 m, 31.08.1975, 1 ♂ and 1 ♀, leg. A. Galvagni, coll. LG.

Podisma miramae

GEORGIA: **Caucasus:** Zagar, 28.08.1957, 1 ♂, coll. FP; Zagar, 18.08.1957, 1 ♂ and 1 ♀, coll. FP; Zescho, 30.07.1957, 1 ♂ and 1 ♀ coll. FP, 1 ♂ and 1 ♀ coll. BFM; Tzana, 19.VII.1957, coll. FP; Svanetia, Lagil'da Tzuldri, 18.VIII.1935, 1 ♂, coll. FP; Mestiya, 29.VIII.1957, coll. FP.

Podisma pedestris pedestris

ANDORRA: Soldeu, Vall d'Incles, Camp Font des Ferrosins, m 1900, 30.07.1995, 1 ♂, leg. Wadde B., coll. FP; Canillo, Riu de Juclà, m 1900, 14.08.2003, 2 ♀♀, leg. FP, coll. FP.

AUSTRIA: Villacher Alpe, m 1500, 15.07.1993, 5 ♂♂ and 3 ♀♀, leg. FP, coll. FP; Villacher Alpe, m 850, 15.07.1993, 1 ♂ and 1 ♀, leg. FP, coll. FP; Villacher Alpenstrabe, m 1300, 15.07.1993, 1 ♀, leg. FP, coll. FP.

BOSNIA-ERZEGOVINA: Titovo, Tara Planina, m 1300, 2.08.1972, 2 ♂♂ and 2 ♀♀, leg. A. Messina, coll. LG; Jasik, Sarajevo, m 1200, 17.08.1975, 2 ♂♂ and 2 ♀♀, leg. Nobile-Messina, coll. LG.

ESTONIA: Kihelkona, Undva, 14.08.1997, 1 ♂, leg. van Steenis J., coll. FP; Saaremaa, Kihelkona, Undava alvar plains, 14.08.1997, 2 ♂♂ and 1 ♀, leg. van Steenis J., coll. FP.

FRANCE: **Hautes-Alpes:** Vallée Etroite, Briançon, m 1790, 2 ♀♀, leg. Meduri, coll. LG; Col du Granon, 2400 m, 08.1965, 3 ♂♂, leg. G. Remaudiere, coll. MNHNP; La Grave, 09.1923, 3 ♂♂, leg. L. Chopard, coll. MNHNP; Ailefroide, 06.1950,

3 ♂♂, leg. L. Chopard, coll. MNHNP; **Haute-Savoie:** Argenitières-Col des Montets, Chamonix, 1500 m, 08.1952, 1 ♂, leg. C. & F. Willemse, coll. WF; Les Bossons, Chamonix, 1914 m, 08.1952, 1 ♀, leg. C. & F. Willemse, coll. WF; Mer de Glace, Chamonix, 1800 m, 08.1952, 1 ♂, leg. C. & F. Willemse, coll. WF; **Savoie:** Col du pt. St. Bernard, 30.07.1981, 1 ♂, leg. Willemse & Faassen, coll. WF; **Hautes-Pyrénées:** L. Oreuoit, 07.1969, 1 ♂, coll. LG; Lac D'Estom, 07.1969, 1 ♂ and 1 ♀, coll. LG.; **Pyrénées Atlantiques:** Prés de Lac de Biou Artigues, 15.08.1964, 1 ♂ and 1 ♀, leg. R. Roy, coll. MNHNP.

GREECE: Akrovouni, Pangeo – Kavala, m 300-1000, 13.07.1983, 6 ♂♂ and 2 ♀, leg. Osella M. & G., coll. FP (3 ♀♀ coll. BFM); Florina, Vernon Ori, 4 km E di Pisoderion, m 1600-1700, 26.07.1972, 1 ♂ and 1 ♀, leg. Willemse F., coll. FP; M. Pieria, Kozani, m 2000, 7.08.1978, 6 ♂♂ and 6 ♀♀, leg. A. Messina, coll. LG; M. Olympus, m 1750-1950, 10.08.1973, 3 ♂♂ and 2 ♀♀, leg. La Greca-Messina, coll. LG;

HUNGARY: Matrahaza, Kékes, 2 ♀♀, leg. Reichart G., coll. FP; Szilvas, Bukk, m 950, 2.10.1971, 2 ♂♂ and 1 ♀, leg. Nagy B., coll. FP; Kozani, M. Pieria, m 2000, 7.08.1973, 6 ♂♂ and 6 ♀♀, leg. A. Messina, coll. LG; M. Olimpo, m 1750-1950, 10.08.1973, 3 ♂♂ and 2 ♀♀, leg. La Greca-Messina, coll. LG.

ITALY: **Valle d'Aosta:** Aosta, Gran Paradiso, Valnontey, m 1600-2600, 08.1970, 1 ♀, leg. Osella B., coll. FP; Aosta, M. Gabiet (Gressoney), m 2300, 23.08.1967, 5 ♂♂ and 5 ♀♀, leg. La Greca, coll. LG; Aosta, Les Suches (La Thuille), m 2200, 21.08.1967, 3 ♂♂ and 2 ♀♀, leg. La Greca, coll. LG; Aosta, Lago Chamolé, m 2300, 22.08.1967, 1 ♀, leg. La Greca, coll. LG; Aosta, Piccolo S. Bernardo, m 1950-2150, 21.08.1967, 3 ♂♂ and 3 ♀♀, leg. La Greca, coll. LG; **Piemonte:** Torino, Val di Susa, M. Calamion, m 2100, 12.08.1966, 1 ♀, leg. La Greca, coll. LG; **Lombardia:** Lecco, Circo di Moncodeno, Grignone, m 2000, 5.09.1982, 1 ♂, leg. Filipazzi, coll. FP; **Trentino Alto Adige:** Bolzano/Bozen, Alpe di Luson, Rodengo, loc. Zunis, m 1757, 25.08.2002, 1 ♂ and 1 ♀, leg. FP, coll. FP; Bolzano/Bozen, Villander Alm, Gasteiger Sattel, m 2036, 28.08.2002, 1 ♂ and 1 ♀, leg. FP, coll. FP; Bolzano/Bozen, Alpe di Villandro, Am Totem, m 2194, 31.08.2002, 1 ♂ and 4 ♀♀, leg. Buzzetti F. M. and Fontana P., coll. BFM; Bolzano/Bozen, Alpe della Muta, Seekopft, m 2200-2400, 1.09.1998, 5 ♂♂ and 4 ♀♀, leg. FP, coll. FP; Bolzano/Bozen, Alta Val Martello, M. Madriate, m 2400, 15.09.1985, 1 ♀, leg. Masutti L., coll. FP; Bolzano/Bozen, P.so dello Stelvio, Trafoi, m 2250, 1.09.1998, 2 ♂♂ and 2 ♀♀, leg. FP, coll. FP; Bolzano/Bozen, Schlernalm, Seiser Alm, Turisteinsteig, m 2250, 11.09.2001, 8 Males and 3 ♀♀, leg. FP, coll. FP; Bolzano/Bozen, Schlernalm, Seiser Alm, Turisteinsteig, m 2025, 11.09.2001, 1 ♀, leg. FP, coll. FP; Bolzano/Bozen, Val Passiria, M.ga Tumolo - Lago Nero, m 2514, 18.08.1992, 1 ♀, leg. Gasparella L., coll. FP; Trento, Monte Spinale, m 2000, 17.09.1997, 2 ♂♂ and 1 ♀, leg. FP, coll. FP; Trento, Pampeago, m 1400, 23.08.1976, 1 ♂, leg. Maseagni A., coll. FP; Trento, M. Pasubio, Alpe Pozze, m 1900, 10.09.2000, 2 ♂♂, leg. FP & Vivian C., coll. FP; Trento, M. Pasubio, Alpe di Cosmagnon - M. Roite W, m 1950, 9.09.2000, 1 ♂, leg. FP & Vivian C., coll. FP; Trento, M. Pasubio, Malga Buse Bisorte W, m 1950, 10.09.2000, 4 ♂♂ and 1 ♀, leg. FP & Vivian C., coll. FP; Trento, M. Pasubio, Sella Campiluzzi, m 2002, 10.09.2000, 1 ♀, leg. FP & Vivian C., coll. FP; Trento, Passo Manghen, m 2050, 28.07.2000, 2 ♀♀, leg. Bianco D., coll. FP; **Veneto:** Belluno, M. Moiazza North, m 2000, 24.09.2000, 1 ♂, leg. Buzzetti F. M., coll.

BFM; Belluno, M. Sorapiss, m 2000, 22.08.1990, 1 ♂ and 1 ♀, leg. FP, coll. FB; Belluno, Cortina d' Ampezzo, Lago di Sorapiss, m 1930, 23.08.1995, 12 ♂♂ and 6 ♀♀, leg. FP, coll. FP; Belluno, Cortina d'Ampezzo, M.ga Padeon, m 1850, 3-25.08.1991, 7 ♂♂ and 8 ♀♀, leg. Guido M., coll. FP; Belluno, Cortina d'Ampezzo, M.ga Gotres, m 2000, 10-20.08.1990, 2 ♂♂ and 3 ♀♀, leg. Guido M., coll. FP; P; Belluno, P.so Duran, m 1600, 11.08.1993, 7 ♂♂ and 7 ♀♀, leg. FP, coll. FP; Belluno, Tre Cime di Lavaredo, m 2400, 6.08.1993, 1 ♂, leg. FP, coll. FP; Verona, Baito delle Pozzette, M. Baldo, m 1930, 13.09.2003, 2 ♀♀, leg. FP, coll. FP (1 ♀ coll. BFM); Verona, Cima delle Pozzette, M. Baldo, m 2125, 13.09.2003, 7 ♂♂ and 2 ♀♀, leg. FP, coll. FP (1 ♂ and 1 ♀ coll. BFM); Verona, M. Baldo, Cima Telegrafo, 19.08.1947, 1 ♀, coll. FP; Verona, M. Baldo, Telegrafo, Val Dritta, 09.1959, 1 ♂, leg. Ruffo S., coll. FP; Vicenza, Arsiero, M.ga Valbona, m 1700, 4.08.1998, 4 ♂♂ and 4 ♀♀, leg. FP, coll. FP; **Friuli Venezia Giulia:** Udine, Pontebba, torbiera di Pramollo, 04.07.2001, 1 ♂ and 1 ♀, leg. Cogo A. and Buzzetti F. M., coll. BFM; Udine, Alpi Giulie, Jof di Sompdogna, m 1900, 27.08.1999, 1 ♂ and 1 ♀, leg. Mazzon L., coll. FP; Udine, Foresta di Tarvisio, M. Biffil, m 1650, 24.08.1982, 2 ♀♀, leg. Battisti A., coll. FP; Udine, Foresta di Tarvisio, V. Romana, m 1000, 19.08.1982, 1 ♂, leg. Battisti A., coll. FP.

ROMANIA: Gyilkosto, m 1300-1400, 14.06.1995, 1 ♂, leg. Nagy B., coll. FP.

RUSSIA: Altaj, Edigan, 3.07.1998, 2 ♂♂ (abdomen apex and genitalia), leg. Bugrov, coll. FP.

SLOVENIA: Kofce (Trzic), 4. 08.1935, 1 ♂ (holopterus), leg. Müller, coll. FP.

SPAIN: **Aragona:** Pyrenees: Balneario de Panticosa, Huesca, m 1650-1750, 2.08.1965, 1 ♂ and 5 ♀♀, leg. La Greca, coll. LG; Pyrenees: Parco Nac. De Ordesa, m1350, 31.08.1970, 1 ♂ and 2 ♀♀, leg. A. Messina, coll. LG; Parco Nac. De Ordesa, Rif. Goriz, m 1700, 1.09.1970, 4 ♂♂ and 3 ♀♀, leg. Nobile-Costa-Messina, coll. LG; Huesca, Ordeba, 07.1934, 1 ♂, leg. E. Morales Agacino, coll. WF; **Navarra:** Pyrenees, Pena S. Martin (Valle Roncal), m 1720, 21.08.1983, 2 ♂♂ and 2 ♀♀, leg. A. Messina, coll. LG.

SWITZERLAND: **Grigioni:** Passo Bernina, vers. Ovest, m 2250, 25.08.1971, 2 ♂♂ and 2 ♀♀, leg. La Greca, coll. LG.

Podisma pedestris caprai

ITALY: **Piemonte:** Biella, Biella, Val Chiobba, 1 ♂ and 1 ♀ Topotypes, leg. F. Capra, coll. FP; Biella, Alpe le Piane, Val Chiobba, 10.08.1950, 1 ♀, leg. F. Capra, coll. LG; Biella, Sotto l'Alpe il Prato, Val Sorba (Val Sesia), m 2000-2150, 19.08.1949, 2 ♀♀, leg. F. Capra, coll. LG; Biella, Bocchetta del Craso, val Chiobba, 17.08.1949, 3 ♂♂ and 2 ♀♀, leg. F. Capra, coll. LG; Biella, Alpe le Piane, Val Chiobba, 11.07.1950, 1 ♂, leg. F. Capra, coll. LG; Biella, Monte Camino (M. Mucrone), m 2300, 27.09.2003, 3 ♂♂ and 3 ♀♀, leg. FP, Buzzetti F. M., Tirello P., coll. FP (1 ♂ and 1 ♀ coll. BFM).

Podisma pedestris nadigi

ITALY: **Trentino Alto Adige:** Trento, A. Giudicarie, Val Daone, m 1900, 08.1971, 3 ♂♂ and 2 ♀♀, leg. B. Osella, coll. FP (1 ♂ coll. BFM).

Podisma ruffoi

ITALY: **Lazio**: Rieti, M. Reatini, Valle della Meta, Leonessa, 1750 m, 27.08.1961, 61 ♂♂ and 40 ♀♀, leg. A. Galvagni, coll. GA; Rieti, M.te Prato, Cittaducale, m 1400-1700, 18.09.1993, 2 ♂♂ and 2 ♀♀, leg. Osella G. & Zuppa A., coll. FP; Rieti, M.te Prato, Cittaducale, m1600-1700, 28.09.1996, 2 ♂♂ and 1 ♀, leg. Osella M. & G., coll. FP; Rieti, M.te Prato (dolina sommitale), Cittaducale, m 1750-1800, 23.09.1997, 1 ♂ and 1 ♀, leg. Andretti & Marotta, coll. FP.

Podisma satunini satunini

GEORGIA: **Caucasus**: Abhasia, Avadhara, 24.08.1958, leg. Seperteladze, 1 ♂ and 21 ♀♀, coll. FP; Abhasia, Avadhara, 11.09.1959, 1 ♂ coll. FP, 1 ♀ coll. BFM; Abhasia, Avadhara, 19.08.1958, 1 ♂, coll. BFM; Gentsvischi, 22.08.1958, 1 ♂, coll. FP; Gentsvischi, 13.09.1938, 1 ♀, coll. FP; Hutna, 13.08.1958, 1 ♀, coll. FP.

Podisma silvestrii

ITALY: **Marche**: Ascoli Piceno, M. Sibillini, Fonte d. Fargno,

2.08.1955, 17 ♂♂ and 16 ♀, leg. Galvagni A., coll. GA (1 ♂ coll. FP and 1 ♂ and 1 ♀ coll. BFM); Ascoli Piceno, M. Sibillini, Valle Bolognola, 26.06.1955, 1 ♀, leg. Galvagni A., coll. FP; Ascoli Piceno, M. Sibillini, Bolognola, Forca di Fargno, 1800-1900, 3 ♂♂ and 3 ♀♀, leg. A. Galvagni, coll. LG; Ascoli Piceno, M. Sibillini, Valle Bolognola, 1200 m, 2.08.1955, 3 ♂♂ and 4 ♀♀, leg. A. Galvagni, coll. GA; Ascoli Piceno, M. Sibillini, Forca Viola, 1900 m, 9.08.1954, 16 ♂♂ and 20 ♀♀, leg. A. Galvagni, coll. GA; Ascoli Piceno, Monte Palazzo Borghese, 4.08.1955, 14 ♂♂ and 7 ♀♀, leg. A. Galvagni, coll. GA; Ascoli Piceno, M. Sibillini, M. Sibilla, Montemonaco, 2000-2100 m, 2.09.1975, 17 ♂♂ and 21 ♀♀, leg. A. Galvagni, coll. GA; Macerata, Monti Sibillini, M. Bove Sud - Val di Bove, m 1900, 29.08.1991, 8 ♂♂ and 3 ♀♀, leg. FP, coll. FP; Macerata, Ussita, Sorgenti di Panico, m 1376, 13.07.2003, 1 ♀, leg. Carotti G., coll. BFM; Macerata, Pizzo Berro, m 1900, 6.08.1999, 2 ♀♀, leg. Carotti G., coll. BFM.

Podisma uvarovi

USSR: **N Caucasus**, Majkop, 30.06.1911, leg. Shaposhnikov, 1 ♂ and 1 ♀, coll. GA.