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Revision of the genus *Prionotropis* Fieber, 1853 (Orthoptera: Pamphagidae: Thrinchinae)

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Abstract

The genus *Prionotropis* Fieber, 1853 is revised. It is distributed in scattered areas of the Mediterranean region from Turkey in the East to Spain in the West. Overall, seven species are listed, namely *P. maculinervis* (Stål, 1878) (Turkey; *P. urfensis* Ramme, 1933 is here considered its synonym), *P. willemsorum* **n. sp.** (Greece, Epirus; previously considered *P. appula*), *P. appula* (O.G. Costa, 1836) (South Italy), *P. hystrix* (Germar, 1817) (Bosnia and Herzegovina, Slovenia, Croatia, North-East Italy; *P. hystrix sontiaca* is here synonymized), *P. rhodanica* Uvarov, 1923 resurrected status (France, Crau, Rhone delta; here considered a valid species), *P. azami* Uvarov, 1923 n. status (France, Var region; here considered a valid species), and *P. flexuosa* (Serville, 1838) (Spain; the ssp. *pereezi* Bolívar, 1921 and *sulphurans* Bolívar, 1921 are here considered its synonyms). A key to species is presented.

Key words: Mediterranean area, female micropterism, sexual dimorphism, isolation, new species

Introduction

Among Thrinchinae, generally widespread in Asia, only *Glyphotmethis* Bei-Bienko, 1951, *Asiotmethis* Uvarov, 1943, *Glyphanus* Fieber, 1853 and *Prionotropis* Fieber, 1853 are present in Europe, but while the first three genera have a restricted distribution in the most eastern parts of Europe (Caucasia, Crimea, European Turkey, Greece and Macedonia: Ünal 2007a, 2007b, Willemse & Willemse 2008), the genus *Prionotropis* covers the entire Mediterranean area including the most western parts (Iberian peninsula). Interestingly, the genus is represented by isolated populations, some of which are recognized as different taxa; their taxonomic status has been debated for over one hundred years. A long series of specimens from different localities and different museums was studied in order to revise the taxonomy of the genus.

Material and methods

Specimens from the following museums were included in this study:

AİBÜEM	Abant İzzet Baysal Üniversitesi Entomoloji Müzesi, Bolu
AÜZM	Ankara Üniversitesi Zooloji Müzesi, Ankara
BMCP	Bruno Massa Collection, University of Palermo
CBGP	Centre de Biologie pour la Gestion des Populations, Montpellier
MfN	Museum für Naturkunde, Berlin
MNCN	Museo Nacional de Ciencias Naturales, Madrid
MNHN	Museum National d’Histoire Naturelle, Paris
MSNG	Museo Civico di Storia Naturale ‘G.Doria’, Genoa

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NBC	Naturalis Biodiversity Center (National Museum of Natural History), Leiden
NHM	Natural History Museum, London
NMW	Naturhistorisches Museum, Vienna
NTM	Nazife Tuatay Müzesi, Ankara

Some specimens were photographed with a Nikon Coolpix 4500 digital camera, mounted on a Wild M5 Stereomicroscope, and photos were integrated using the freeware CombineZP (Hadley 2008). Mounted specimens were measured with a digital calliper (precision 0.01 mm); the following measures were taken (all measurements in mm): Body length (TL=dorsal length from the fastigium of the vertex to the apex of horizontal hind femur); Pronotum length (PL=length of the pronotum along dorsal median line); Pronotum height (PH=maximum height of the pronotum); Hind femur length (HFL= maximum length of hind femur); Hind femur height (HFH=maximum height of hind femur); Tegmina length (TGL=maximum length of exposed tegmina).

Analysis of mean differences of morphometric characters among species was performed with an ANOVA, after data normalisation by means of a Box-Cox transformation. All analyses were concluded with Tukey post hoc tests to compare species for every character. Moreover, morphometric characters of males and females were used in an exploratory analysis (Principal component analysis, PCA) to determine what combinations of characters (if any) delimited groups concordant with the species. Minitab software has been used throughout for all statistical analyses.

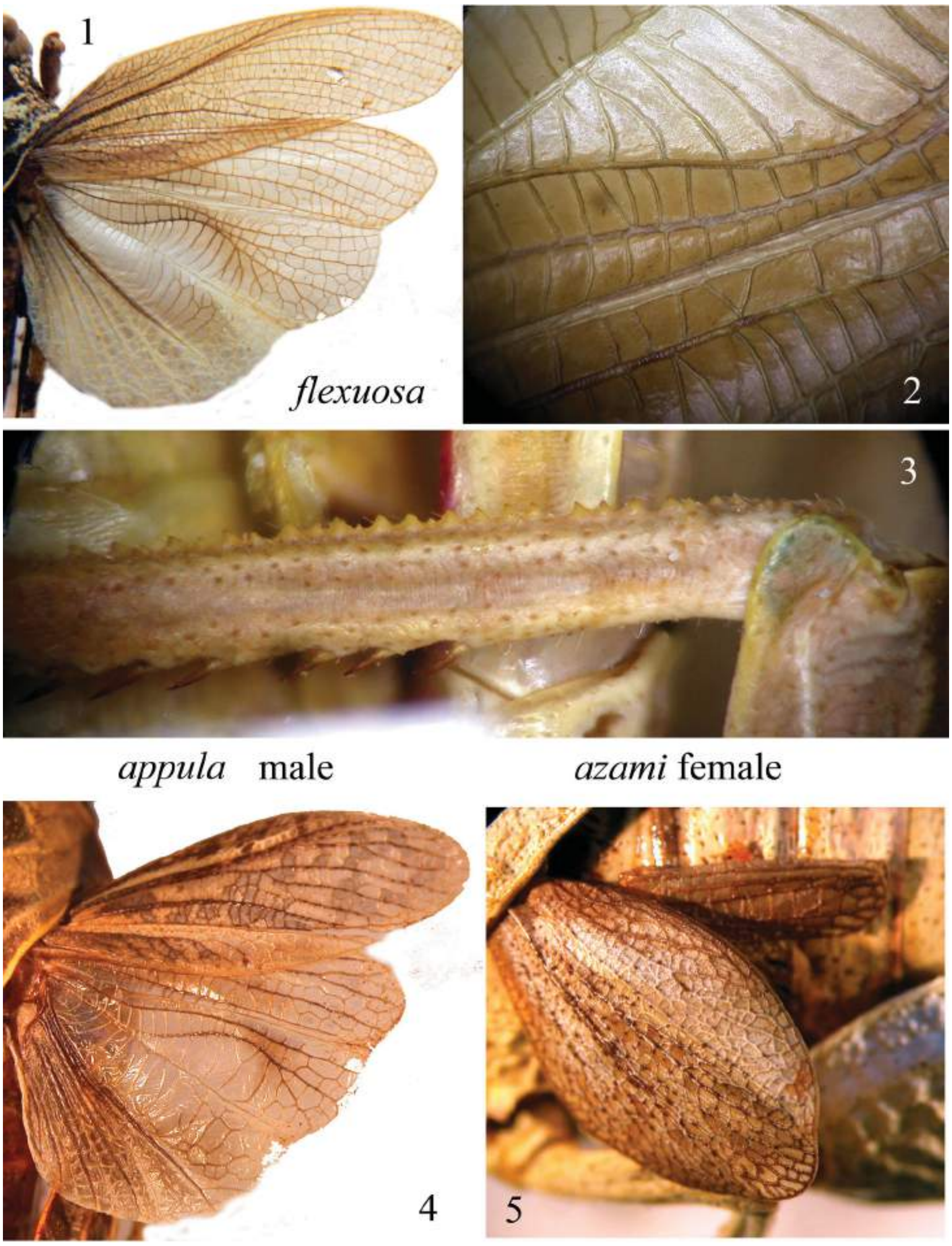
Results

Genus *Prionotropis* Fieber, 1853

Diagnosis. Vertex sloping obliquely towards the apex of the fastigium, more or less concave, eyes oval, shorter than the subocular furrow, antennae with 17–18 segments, the last 3–4 more thickly spotted, apical segments as long as both the previous ones. Frontal ridge deeply furrowed. Median carina of the pronotum arched or almost flat (mainly in females), prozona and mesozona tectiform, metazona flattened laterally (minute or even absent in females). The transverse sulcus lies about in the mid of the pronotum or just before it; sometimes also the first sulcus notches the dorsum of the prozona. Fore and hind angles of the pronotum rounded or acute, metazona long with a deeply angular hind margin. Prosternum just raised anteriorly. Mesosternal space in males ca. 2 times wider than long, in females 2.5–3.0 times wider than long. Males macropterous to sub-brachypterous, females squamipterous. Hind wings slightly shorter than tegmina, with embossed, curved 1st and 2nd anal veins (characters in common with the other Thrinchinae). Median carina of the abdomen projecting tooth-like at the end of tergites (mainly in males, less in females) with more or less long terminal spines. Dorsal carina of hind femora with some spines or finely denticulate. Mid tibia denticulate on upper margin (character in common with the other Thrinchinae). Opening of tympana not covered or partially covered by tegmina. Krauss' organ with fine tubercles or transverse rows. Epiproct of the male rectangular, pointed on the hind margin and with a longitudinal furrow, which has light carina at each side, in females long with transverse suture and a longitudinal furrow. Male cerci slender or only with a slender apical part, slightly incurved, in females triangular, pointed and incurved apically. Sub-genital plate of the male with a slightly transverse proximal suture, pointed or truncated or incised apically, that of the female with a triangular lobe in the middle. Epiphallus with short ancorae, pseudolophi present (Ünal 2014), valves of penis up-curved or straight. Ovipositor short, stout, wide.

Species belonging to the genus *Prionotropis* developed some specializations for stridulation, namely: 1) mid tibiae have the upper margin wrinkled and during flight they rub the lower side of their modified and wrinkled anal veins of the hind wings, like the bow of a violin (Pantel 1896, Bolívar 1921, Uvarov 1943); all the species, both sexes (also the females, which have micropterous wings), show this specialization (Figs 1–5), that characterizes the subfam. Thrinchinae; 2) the inner side of the hind femora bear minute rounded tubercles that could rub on Krauss' organ (Krauss 1878, Saussure 1888); it was found in both *P. hystrix* and *P. rhodanica*, but it is a specialization of most Thrinchinae (Foucart 1995, Popov 1997, Ünal 2007a, Massa 2012); 3) a tegmino-alar stridulation has been described for *P. rhodanica* by Foucart (1995) and for *P. appula* (Massa *et al*. 2012), and probably occurs in other species of the genus and of the subfam. Thrinchinae, as well as in many species belonging to the subfam. Pamphaginae (e.g., Johnsen 1972, López *et al*. 2008, Köhler & Friedrich 2013).

The genus *Prionotropis* covers isolated areas of Mediterranean region, in Spain, France, Italy, Croatia, Slovenia, Bosnia and Herzegovina, Greece and Turkey.



FIGURES 1–5. Specialization of the sound produced by Thrinchinae: genus *Prionotropis*. 1. Wings of the male *P. flexuosa*, showing the modification in the anal veins of the hind wing. 2. Detail of the wrinkled anal vein of the hind wings of *P. flexuosa*. 3. Mid tibia of *P. flexuosa*, showing the serrated upper margin. 4. Wings of the male of *P. appula*, showing the modification in the anal veins of the hind wing. 5 Detail of wings of the female of *P. azami*, showing that the modification in the anal veins of hind wing is present also in this sex.

Key to species (males or males+females)

1 Male macropterous, females squamipterous, penis valves long and narrow (Figs 53, 58). 6
- Male brachypterous or sub-brachypterous, females squamipterous 2
2 Tegmina of male reaching the epiproct, tegmina of female the 1st–2nd tergites (Figs 11, 19, 27, 35); pronotum metazona reaching the hind margin of the tympanum (Figs 11, 27); hind tibia yellow. Epiphallus with short posterior edge (Figs 43, 50). . . . . *P. willemsorum* **n. sp.** (Greece, Epirus)
- Tegmina of male shorter, not longer than 5th abdominal tergite, tegmina of female not exceeding the 1st tergite; pronotum meta-

zona shorter, just exceeding the fore margin of tympanum 3

3 Tegmina of male reaching the 5th abdominal tergite, tegmina of female the 1st tergite (Figs 10, 18, 26, 34); hind tibia orange, reddish or violet. Epiphallus with long posterior edge (Figs 41, 48). . . . . *P. appula* (O.G. Costa, 1836) (South Italy)

- Tegmina of male at the maximum just exceeding the 3rd abdominal tergite; hind tibia yellowish. 4

4 Body more dorso-ventrally compressed. Median carina of the pronotum low, blunt, fore angle of pronotum rounded, lower margin of lateral lobes of pronotum sinuous, upper carina of hind femora little toothed or only denticulate. Male tegmina exceed the 3rd tergite, female tegmina the 2nd tergite (Figs 7, 15, 23, 31). Abdominal spines of female cover ca. 1/4 of the following tergite (Fig. 60). . . . . *P. rhodanica* Uvarov, 1923 resurrected status (France, Crau, Rhone delta)

- Body laterally compressed. Median carina of the pronotum laterally compressed, sharp, fore angle of pronotum obtuse, lower margin of lateral lobes of pronotum straight, upper carina of hind femora clearly toothed. 5

5 Radial veins of male tegmina well developed, hind angle of pronotum acute. Tegmina of males exceeding the 3rd tergite, those of females just exceeding the 1st tergite, rounded and somewhat truncated (Figs 8, 9, 16, 17, 24, 25, 32, 33). Abdominal spines of female cover ca. 1/4 or less of the following tergite (Fig. 61). Pseudolophi of epiphallus out-curved spaced, posterior edge raised, penis valves long and enlarged (Figs 38, 45, 52). . . . . *P. hystrix* (Germar, 1817) (Bosnia, Slovenia, Croatia, North-East Italy)

- Radial veins of male tegmina confluent and anastomosed, hind angle of pronotum rounded, male tegmina just exceeding the 2nd tergite, female tegmina exceeding the 1st tergite, apically rounded (Figs 6, 14, 22, 30). Abdominal spines of female cover ca. 1/3 of the following tergite (Fig. 59). Pseudolophi of epiphallus straight, posterior edge normal, penis valves short (Figs 39, 46, 54).. . . . . *P. azami* Uvarov, 1923 n. status (France, Var region)

6 Tegmina of male reaching the apex of hind femora, lower ratio length tegmina male/length tegmina female (Figs 12, 20, 64, Table 1); abdominal tergites of females much spined (Fig. 63). Pseudolophi of epiphallus parallel (Figs 42, 49). . . . . *P. flexuosa* (Serville, 1838) (Spain)

- Tegmina of male exceeding the apex of hind femora, higher ratio length tegmina male/length tegmina female (Figs 13, 21, 68, Table 1); abdominal tergites of females less spined (Fig. 64). Pseudolophi of epiphallus parabolic (Figs 44, 51). . . . . *P. maculinervis* (Stål, 1878) (Turkey)

Prionotropis flexuosa (Serville, 1838)

Prionotropis flexuosa var. *pereezi* Bolívar, 1921 n. syn.
Prionotropis flexuosa var. *sulphurans* Bolívar, 1921 n. syn.
http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:42789

Material examined. (*flexuosa*) Spain, Ucles (5♂, 5♀); Spain, Aranjuez (1♂); Spain (1♂, 6♀); Spain, Madrid (9♂, 2♀) (coll. Azam); Spain, San Ildefonso 1893 (1♂, 1♀); Spain, Sierra de Sagra VII.1993, A. Foucart (1♂, 1♀) (MNHN); Spain, Sierra de Sagra VII.1993, A. Foucart (3♂, 2♀) (CBGP); Spain, Albarracin, Predota, 1700 m 2.VII.1927 (3♂); Spain, Azam (det. as *Prionotropis azami*) (1♂) (NMW); Spain, Montarco (Madrid) VI.1934, I. Bolivar (1♂); Spain, Colmenar, Viejo, J. Abojo (1♀) (det. V. Llorente, 1993) (AİBÜEM); (*sulphurans*) Spain, Muela de S Juan (1♀ lectotype, 2♂, 1♀ paralectotypes of *Prionotropis flexuosa sulphurans*); Spain, Albarracin (1♂ lectotype); (*pereezi*) Spain, Brunete (1♂ syntype); Spain, Madrid (1♂ syntype); Spain, Madrid, Brunete, 1878 (1♀ neotype of *Prionotropis flexuosa perezii*) (MNCN).

Remarks. *P. flexuosa* has a remarkable sexual dimorphism, with males fully winged and females squamipterous. Among the known species of the genus *Prionotropis*, only *P. flexuosa* (Spain) and *P. maculinervis* (Turkey) show this kind of dimorphism; it is noteworthy that these species cover the extremes West and East distribution of the genus.

Bolívar (1921) described two varieties (*pereezi* and *sulphurans*), that Uvarov (1943) raised to subspecies level. They differ from the typical *flexuosa* by colour of hind legs (cf. Presa & Llorente 1983, Llorente del Moral & Presa Asensio 1997); in addition, even if measurements overlap, according to Llorente del Moral & Presa Asensio (1997) *sulphurans* is of bigger size. However, the distribution map shows that they overlap (see Llorente del Moral & Presa Asensio 1997). In addition, only three localities of *sulphurans* are known. Specimen analysis did not allow us to find any peculiar character other than the colour of the hind legs. Thus, we consider that the three taxa lie within the chromatic variability range of the species, that consequently has to be considered monotypical.

The male of *P. flexuosa* is macropterous, wings exceed the abdomen, whereas the female is micropterous, and shows the well-spined abdominal tergites. The epiphallus is similar to that of other species (with the exception of *P. hystrix*), penis valves are long and narrow (Figs 42, 49, 53), similar to those of *P. maculinervis*, *P. hystrix*, *P. appula* and *P. willemsorum* **n. sp.**

Measurements. See Table 1. On average it is the smallest species of the genus *Prionotropis* and biometric ratios lie within the group *maculinervis/azami/hystrix/appula/willemsorum* (males) and *rhodanica/azami/hystrix* (females), while the ratio length of tegmina of males/length of tegmina of females is in common only with *P. maculinervis* (Fig. 68).

Distribution. Spain (see Llorente del Moral & Presa Asensio 1997).

TABLE 1. Biometrics (mean in mm ± s.d.) of *Prionotropis* species (*P. sontiaca* is here confirmed synonym of *P. hystrix*). TL=Total length; PL=Length of pronotum; PH=Height of pronotum; HFL=Length of hind femora; HFH=Height of hind femora; TGL=Length of tegmina. Different letters in the column indicate significant differences (one-way ANOVA, followed by Tukey post-hoc test, $p<0.05$).

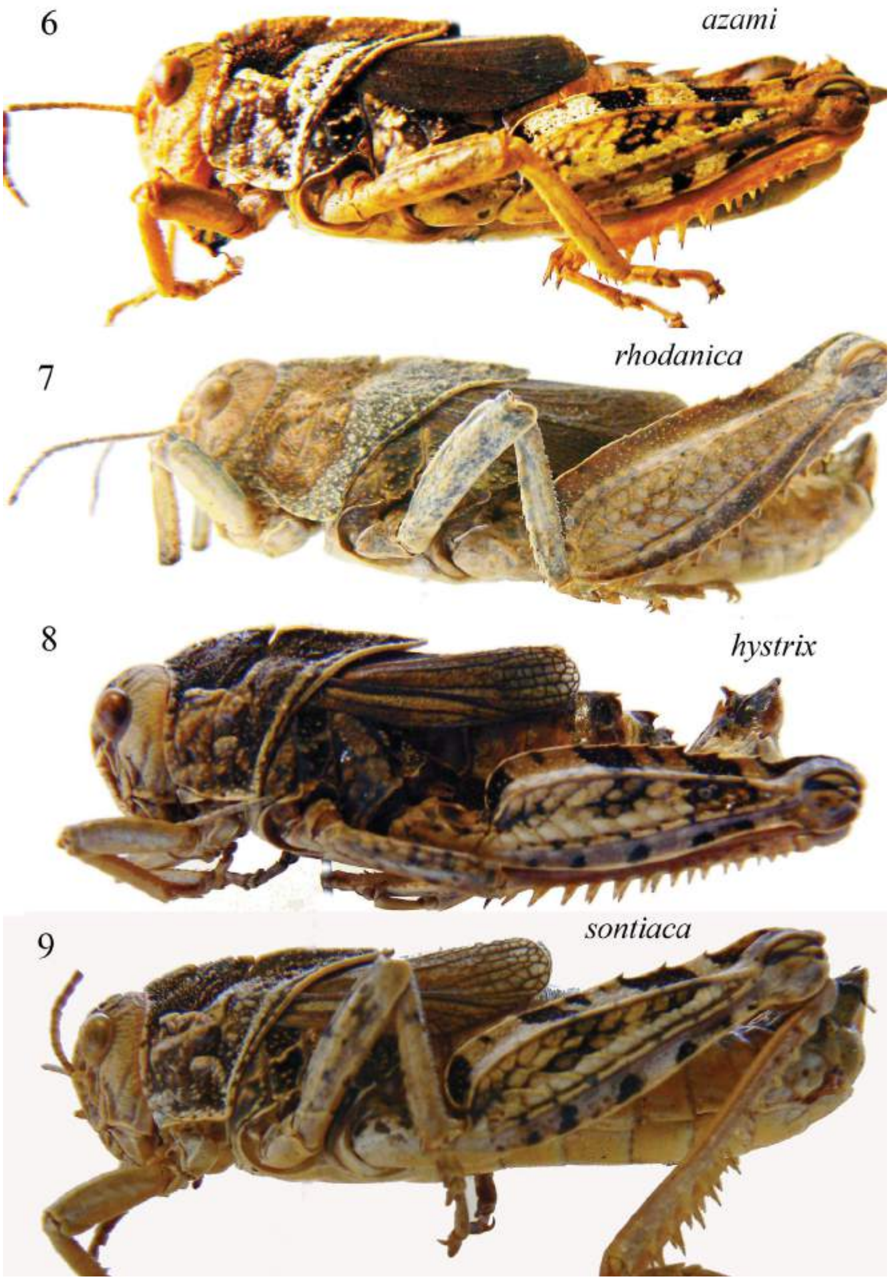
males (n)	TL	PL	PH	HFL	HFH	TGL
appula (9)	37.60±2.8; a	13.60±0.9; b	10.94±0.5; a	20.43±0.2; a	6.39±0.3; ab	18.96±2.0; c
willemsorum (5)	39.42±1.5; a	15.32±0.5; a	11.22±0.3; a	20.42±0.8; a	6.68±0.2; a	21.58±1.5; c
rhodanica (16)	36.74±1.4; ab	12.58±0.7; b	10.78±0.4; a	19.41±1.1; ab	6.36±0.3; ab	12.95±0.9; b
azami (14)	31.40±2.3; cd	10.93±0.6; c	9.00±0.9; bc	15.14±1.1; d	5.30±0.3; c	10.86±0.4; a
hystrix (10)	35.63±1.3; ab	12.87±0.5; b	10.74±0.4; a	17.48±0.7; c	6.12±0.1; ab	12.28±1.0; b
(*sontiaca*) (6)	36.05±3.1; ab	13.12±0.2; b	11.05±0.4; a	18.29±2.0; bc	6.54±0.4; ab	12.94±0.95; b
flexuosa (15)	29.31±2.3; d	10.96±0.8; c	8.64±1.0; c	15.15±1.2; d	4.91±0.4; c	26.20±2.3; d
maculinervis (6)	33.70±2.9; bc	12.50±1.9; b	9.95±1.8; ab	18.13±1.5; bc	5.90±0.7; b	28.93±3.1; d

females (n)	TL	PL	PH	HFL	HFH	TGL
appula (9)	47.58±3.3; e	16.96±1.5; de	13.94±1.0; d	22.86±1.4; ab	7.64±0.8; cd	12.88±2.0; a
willemsorum (3)	49.00±1.1; de	19.27±1.3; e	15.10±0.1; d	24.17±0.3; a	8.37±0.2; d	14.20±0.7; a
rhodanica (12)	42.06±1.1; c	15.28±0.9; d	13.29±0.7; cd	20.96±0.5; c	7.51±0.2; cd	10.75±0.7; b
azami (11)	38.24±2.0; b	13.38±0.4; b	11.44±0.5; b	19.16±0.9; d	6.79±0.3; b	9.39±0.9; cd
hystrix (7)	42.15±1.9; bcd	15.20±0.7; cd	12.78±0.4; cd	20.60±0.5; cd	7.00±0.3; bc	8.70±0.6; d
(*sontiaca*) (9)	43.61±2.7; cde	16.62±1.5; de	13.59±1.1; cd	21.43±1.5; bc	7.31±0.5; bcd	10.35±1.1; bc
flexuosa (7)	32.79±2.0; a	11.29±0.6; a	10.37±0.5; a	16.83±2.1; e	5.37±0.3; a	10.16±0.4; bcd
maculinervis (7)	41.30±5.8; bc	13.57±2.4; bc	12.34±1.8; bc	21.64±1.1; bc	7.46±0.6; bcd	4.77±0.7; e

Prionotropis hystrix (Germar, 1817)

Prionotropis hystrix sontiaca Uvarov, 1923, confirmed synonym
http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:42772

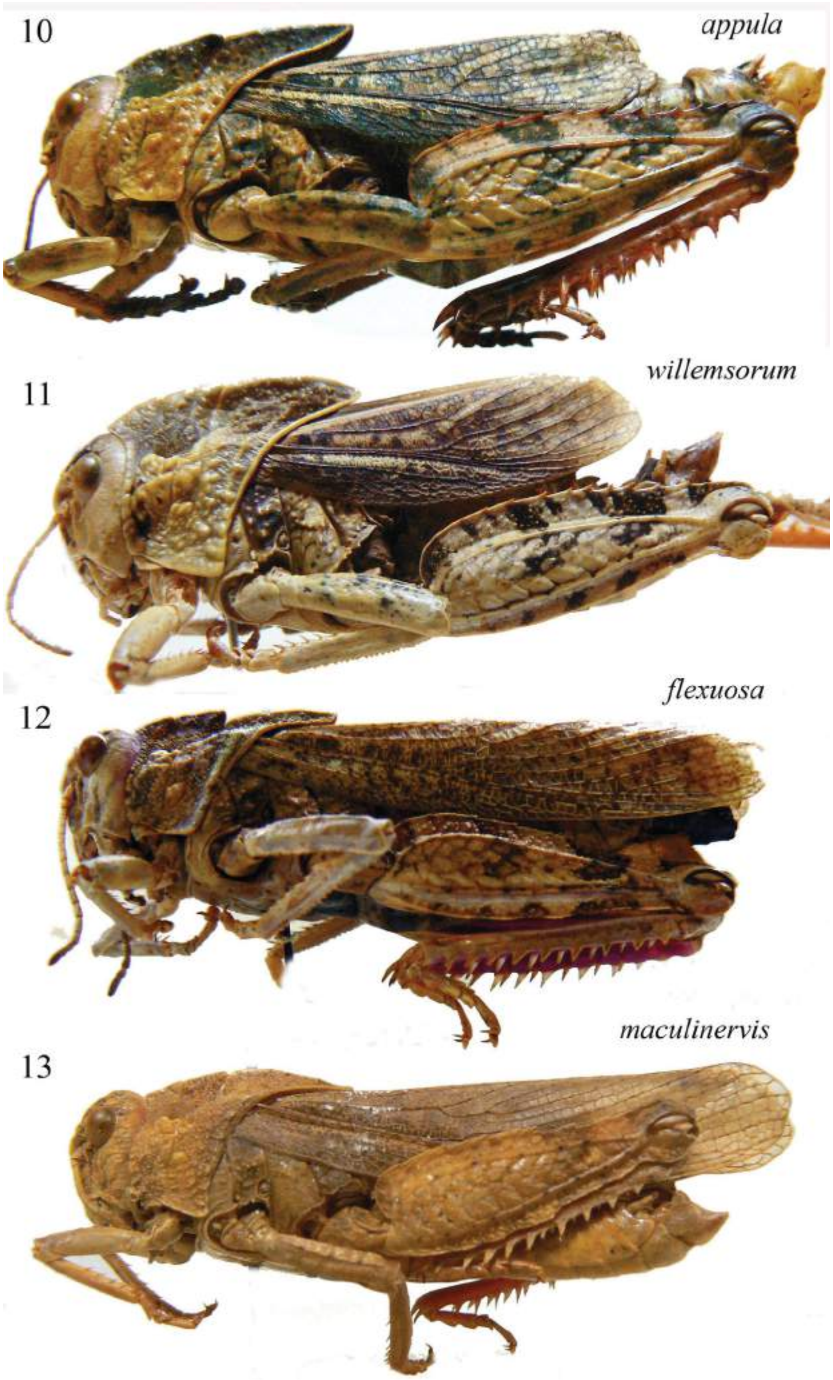
Material examined. Croatia, Krk Is. 29.VII.1998, A. Foucart (13♂, 7♀) (MNHN); Croatia, Krk Is. 29.VII.1998, A. Foucart (2♂, 2♀) (CBGP); Slovenia, Col de Brod, Azam (1♂, 1♀) (MNCN); Dalmatia (1♀); Slovenia, Carniola (1♂, 1♀); Bosnia (1♂, 1♀); Croatia, Fiume (3♂, 1♀); Croatia, Istria, ex Brunner (4♀); Slovenia, Veliki Dol VI.1909 (2♀) (identified as *P. sontiaca*) (MNHN); Croatia, Grobnik III.1877, Krauss (1♀); Croatia, Pola [Pula] III.1877, Krauss (1♂); Croatia, Pola (2♂, 1♀); Croatia, Rovinj, Kaltenbach (1♂); Croatia, Zengg [Senj] (3♀); Croatia (1♀ nymph); Bosnia and Herzegovina, Mostar (1♂) (NMW); Croatia, Senj (Adria), VIII.1929, W. Ramme (1♂, 1♀) (AİBÜEM); Italy, "Österreichisches Küstenland", Görzer Karst 1909, Ebner (1♂ holotype, 3♀, 1♀ nymph paratypes of *P. hystrix sontiaca* Uvarov, 1923) (NMW); Italy, Carso Triestino VII.2012, P. Fontana (1♂, 1♀) (BMCP); Italy, Gabrovizza (Carso Triestino) 9.VIII.1929, Stolfa (5♂, 5♀); same locality 16.VII.1958, Solari (1♂); Italy, Duino (Trieste) 12.VII.1936, A. Schatzmayr (1♂, 2♀); Italy, Mt. San Michele (Carso Triestino) 5.VII.1936, F. Capra (1♂); Italy, Monfalcone, loc. Redipuglia (Gorizia) VII.1958 (1♂); Italy, Sistiana (Trieste) 15.VIII.1930 (1♂, 1♀); Croatia, Rovigno 17.VI.1929, A. Schatzmayr (1♂); Slovenia, Comeno 17.VII.1926, A. Schatzmayr (1♀) (identified as *P. hystrix sontiaca*) (MSNG).



FIGURES. 6–9. Lateral view of males of *Prionotropis azami* (6), *P. rhodanica* (7), *P. hystrix* (8) and *P. sontiaca* (9); the latter is here synonymized with *P. hystrix*.

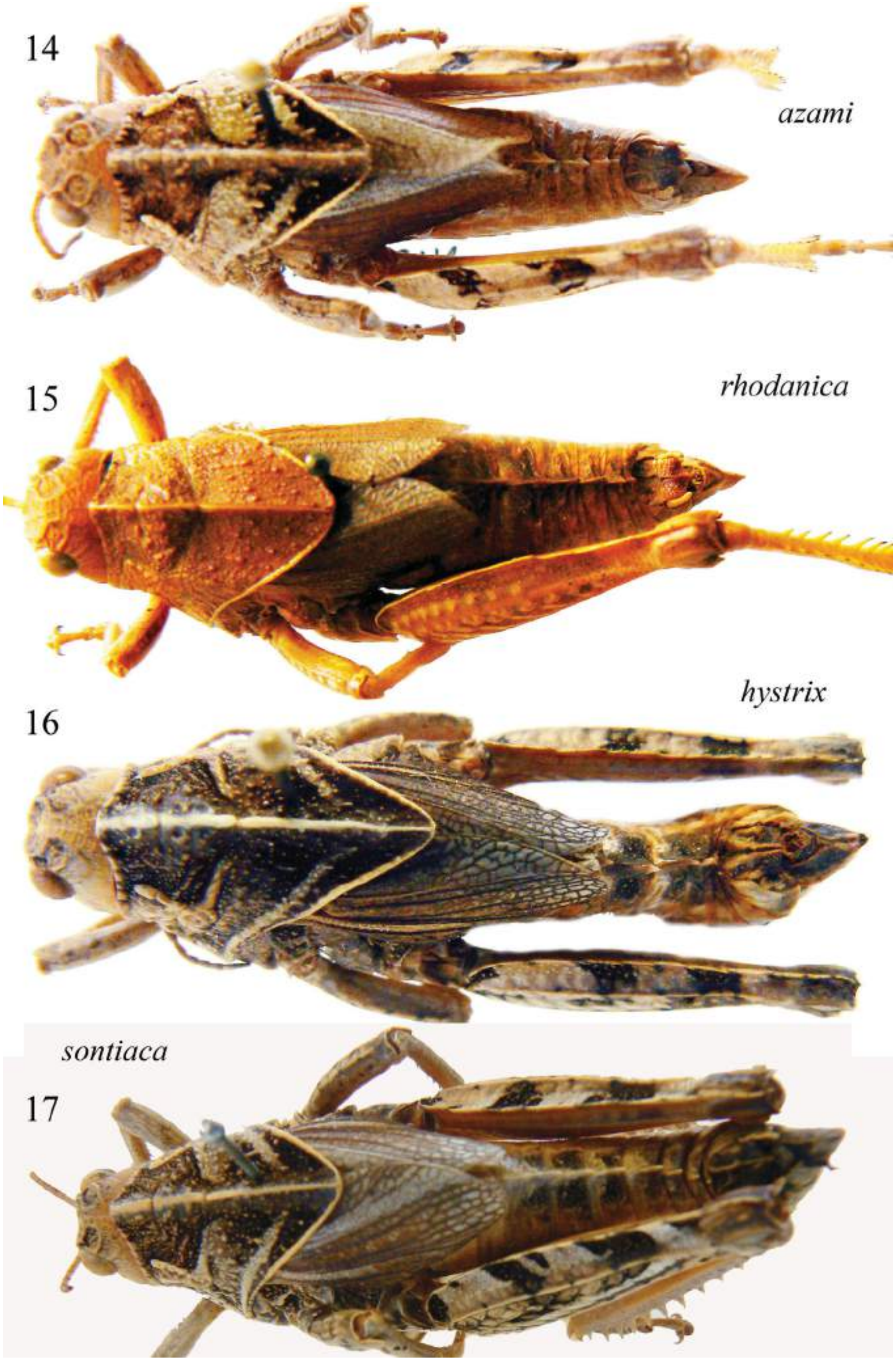
Remarks. *P. hystrix* was described from specimens collected in the Veglia Is., actually Krk Is. Even if it was not possible to examine the type, we were able to study a long series from the type locality, collected by A. Foucart. Specimens from the "Görzer Karst" (= Carso Goriziano; see above and Uvarov 1923) were described as a separated subspecies, *P. hystrix sontiaca* Uvarov, 1923, that we consider synonym of *hystrix*.

The tegmina of males exceed the 3rd tergite, their maximum width lies before the centre, tegmina of females exceed just the 1st tergite and are rounded and apically cut. According to Uvarov (1923), tegmina of males of "*sontiaca"* exceed the 2nd tergite, those of the females reach just the 1st tergite and have parabolic apex and hind margin convex. However, female tegmina of "*sontiaca*" specimens examined by us clearly exceed the 1st tergite and lie within the variability of *hystrix* (Figs 24, 25, 32, 33); indeed Harz (1975) synonymized it with the latter taxon. The epiphallus is rather different from that of the other species, it is short and pseudolophi are parabolically placed, the posterior edge is clearly raised (Figs 38, 45); penis valves are of intermediate length between those of *P. appula*/*P. willemsorum* **n. sp.** and *P. rhodanica*/*P. azami* (Figs 52, 54, 55, 56, 57).



FIGURES 10–13. Lateral view of males of *Prionotropis appula* (10), *P. willemsorum* **n. sp.** (11), *P. flexuosa* (12) and *P. maculinervis* (13).

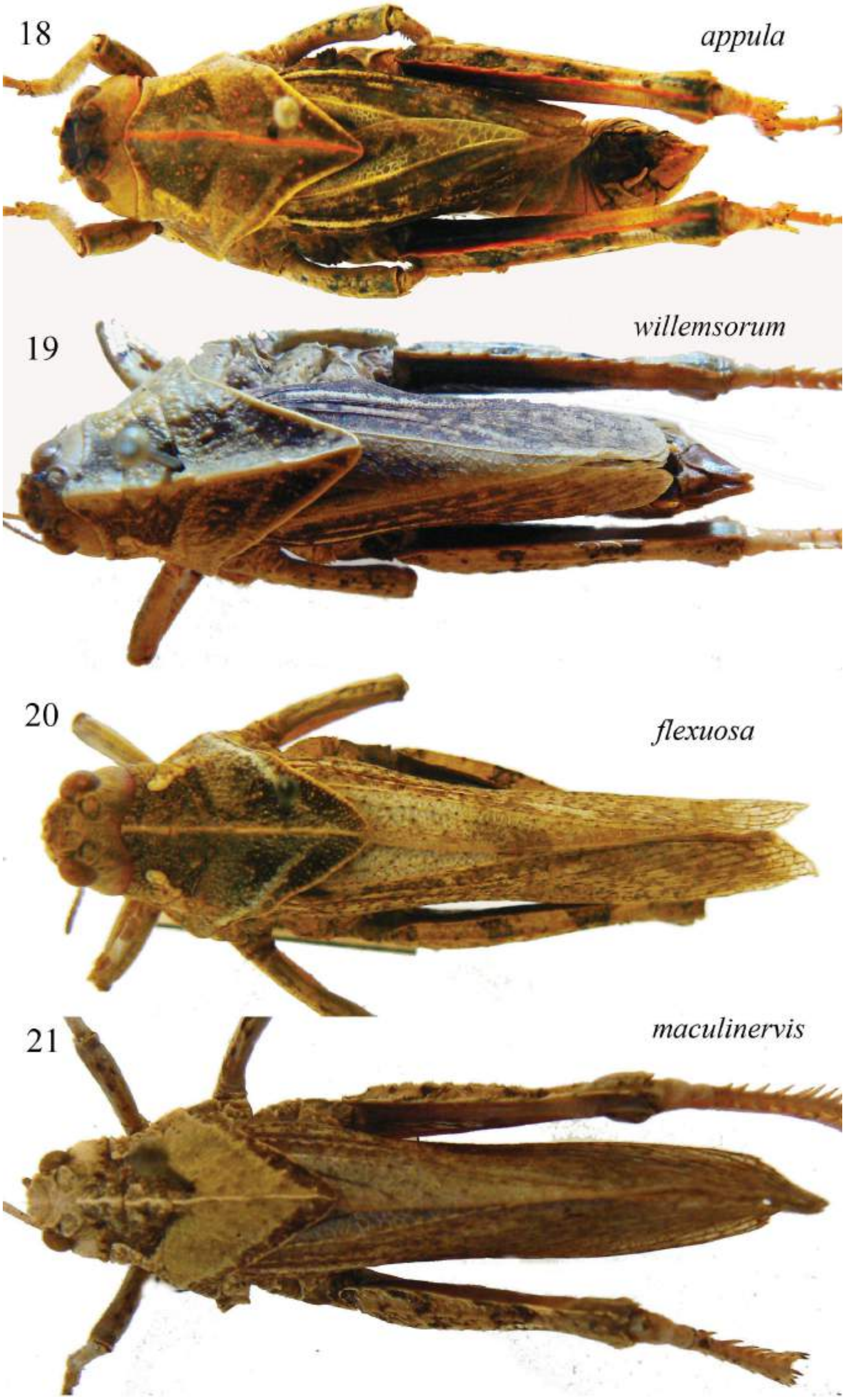
More recently Ingrisch & Böhme (2011), examining the photo of a female specimen collected about 20 km North-West of Trieste (Carso Triestino), found a shorter tegmina than conspecific from Dalmatian area, and proposed detailed studies of more material to solve the question of synonymy proposed by Harz (1975). We compared also the phallic complex of specimens from Carso Triestino and found the same characteristics of specimens originating from Krk Is., namely the parabolic position of pseudolophi, the raised posterior edge and the shape of the penis valves. Although *P. hystrix* is smaller in size than "*sontiaca*" (Table 1; no statistical differences were found), from the biometrical point of view, "*sontiaca*" lies within the range of *hystrix* (Figs 67a, 67b). We highlight that the comparison between *hystrix* and "*sontiaca*" corresponds to that of insular and continental populations; small differences in size are quite normal in such cases. Thus, we confirm the synonymy of *P. hystrix sontiaca* with *P. hystrix hystrix*; the species consequently is monotypical.



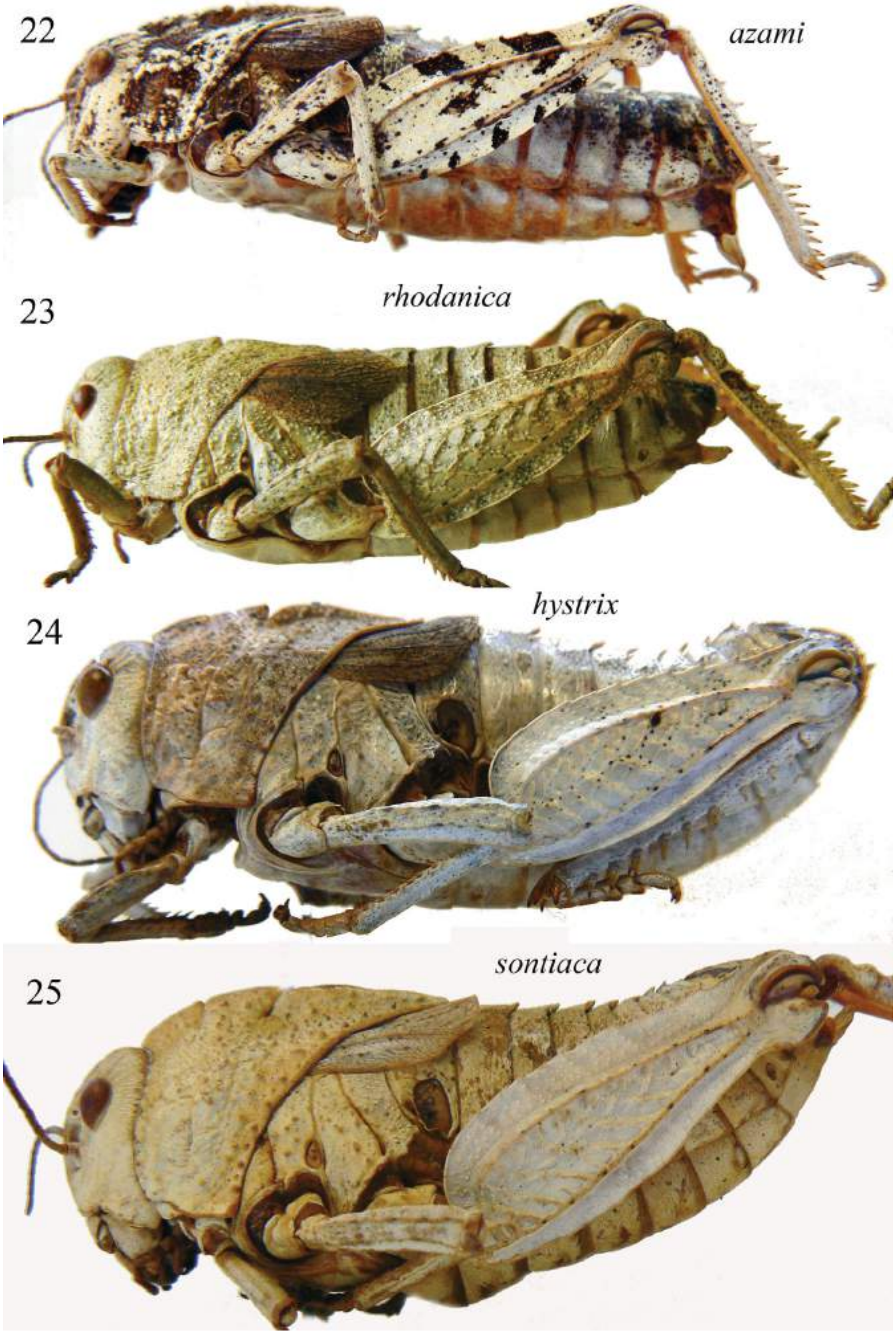
FIGURES 14–17. Dorsal view of males of *Prionotropis azami* (14), *P. rhodanica* (15), *P. hystrix* (16) and its synonym *P. sontiaca* (17).

Measurements. see Table 1. Biometric ratios lie within the group *flexuosa/maculinervis/azami/appula/willemsorum* (males) and *rhodanica/azami/flexuosa* (females), and do not show any important sexual dimorphism in the length of tegmina (Fig. 68).

Distribution. It is a Balkanic species present in Croatia, Bosnia and Herzegovina, Slovenia (including several islands) and reaching Italy province of Trieste and Gorizia (Carso Triestino and Goriziano) (Fontana *et al*. 2005, Ingrisch & Böhme 2011; see material examined).



FIGURES 18–21. Dorsal view of males of *Prionotropis appula* (18), *P. willemsorum* **n. sp.** (19), *P. flexuosa* (20) and *P. maculinervis* (21).



FIGURES 22–25. Lateral view of females of *Prionotropis azami* (22), *P. rhodanica* (23), *P. hystrix* (24) and its synonym *P. sontiaca* (25).

Prionotropis rhodanica Uvarov, 1923, resurrected status

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:42808

Material examined. France, Rhone delta VII.1920 (♂ holotype, 3♀ paratypes); France, Rhone delta, Crau VI.1919, P. Marchal (8♀); France, Rhone delta, Crau VI.1921, P. Marchal (2♀); France, Rhone delta, La Crau VII.1949, C. de Vichet (9♂, 8♀); France, Rhone delta, La Crau VII.1947, Delmas (1♂, 1♀); France, Rhone delta 28.VII.1953, A. Rambier (2♂, 1♀); France, Rhone delta, St. Martin de Crau 22.VI.1990 and 22.VI.1991, A.

Foucart (2♂, 2♀) (MNHN); France, Rhone delta, 12.VII.1991, A. Foucart (3♂, 3♀) (CBGP); France, Crau Dist., Bouches du Rhône, P.R. Fowe (1♂, 1♀ paratypes); France, Bouches du Rhône, Martin de Crau 24.VI.1991, A. Foucart (4♂, 5♀) (NHM); France, Crau, ex Delmas (1♂, 1♀) (MSNG).

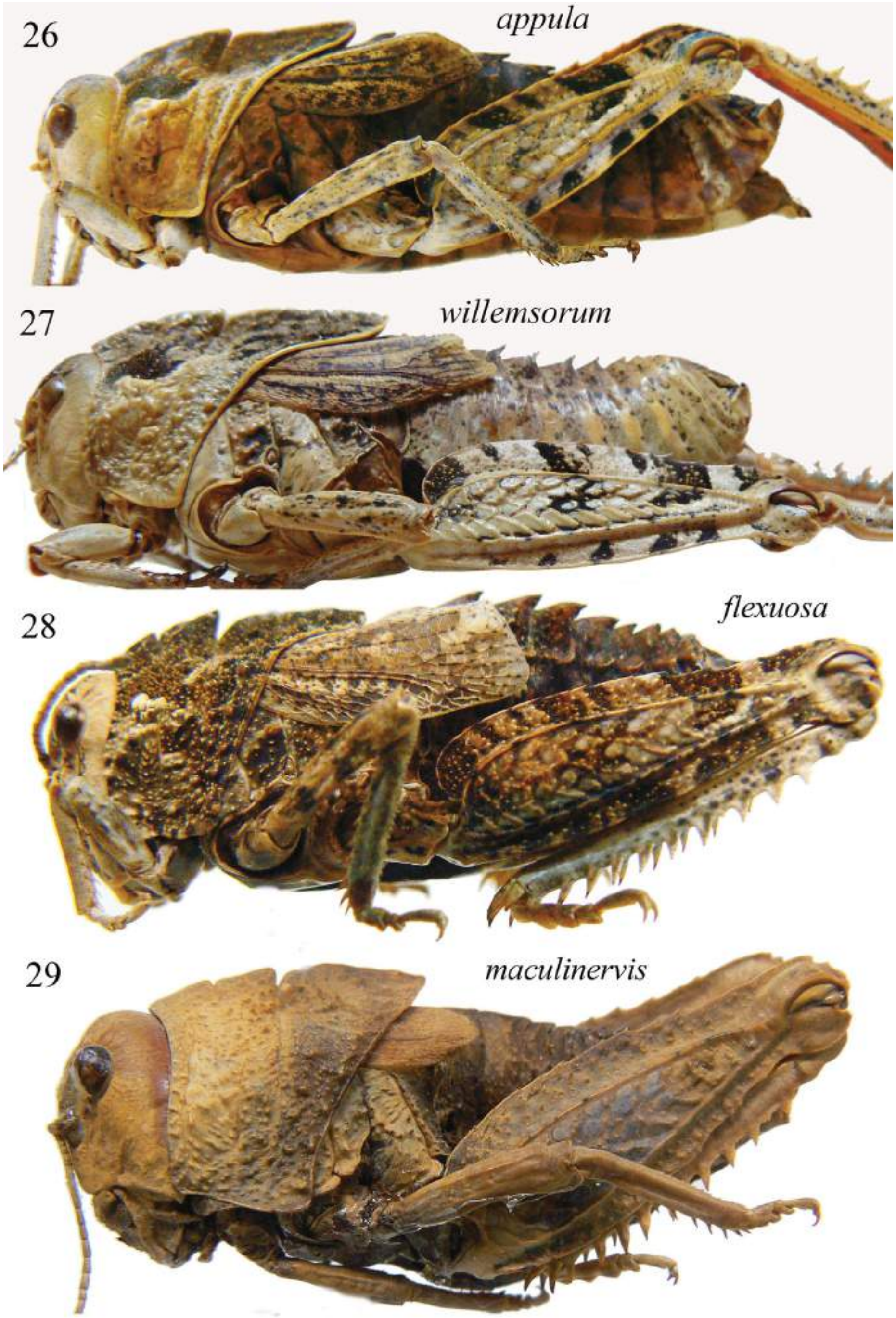
Remarks and distribution. The distribution of *P. rhodanica* is very interesting because it covers a very narrow area of the Rhone river (Crau), ca. 50 km from the area of Var, where the other taxon *P. azami* lives (see below). When they were discovered, both *P. rhodanica* and *P. azami* were considered to be disjoint populations of the Balkanic *P. hystrix* (Chopard 1922). However, Uvarov (1923) found differences between the two populations and named them *P. hystrix azami* and *P. hystrix rhodanica* respectively, but later he raised *P. rhodanica* to species level, and maintained *azami* as subspecies of *hystrix* (Uvarov 1943). Also Harz (1975) followed this arrangement, while Foucart (1995), finding a wide variability within the populations of the three taxa, proposed to consider again *azami* and *rhodanica* subspecies of *P. hystrix*, as in the initial view of Uvarov (1923). The same arrangement has been maintained by Streiff et al. (2002, 2005). Finally, Defaut & Morichon (2015) have proposed to consider the specific taxon *P. rhodanica*, with two subspecies, *rhodanica* and *azami*.

Morphological differences between *P. rhodanica* and *P. azami*. *P. rhodanica* is clearly more dorso-ventrally compressed, and its pronotal carina is less raised than in *P. azami*. This produces a shorter projection of fore margin of the pronotum and a less pronounced angle of hind margin of the pronotum in *P. rhodanica*, compared to *P. azami*. Tegmina of males of *P. rhodanica* exceed the 3rd tergite, females the 2nd tergite, while those of males of *P. azami* just exceed the 2nd tergite, and females just cover the 1st tergite. In addition the spines of abdominal tergites of *P. rhodanica* are shorter than spines of *P. azami*, every spine covering only ¼ in *P. rhodanica*, and 1/3 of the following tergite in *P. azami*. In this respect, *P. rhodanica* and *P. hystrix* are more similar than with *P. azami*. Both *P. rhodanica* and *P. azami* have less evident spines on the upper margin of the hind femora, compared to *P. hystrix*. Concerning the genitalia, they are very similar, both in the shape of the epiphallus and penis valves; in *P. rhodanica* pseudolophi of epiphallus are more disorderly placed, while in *P. azami* are more regularly placed (Figs 6, 7, 14, 15, 22, 23, 30, 31, 35, 36, 39, 40, 46, 47, 54, 55).

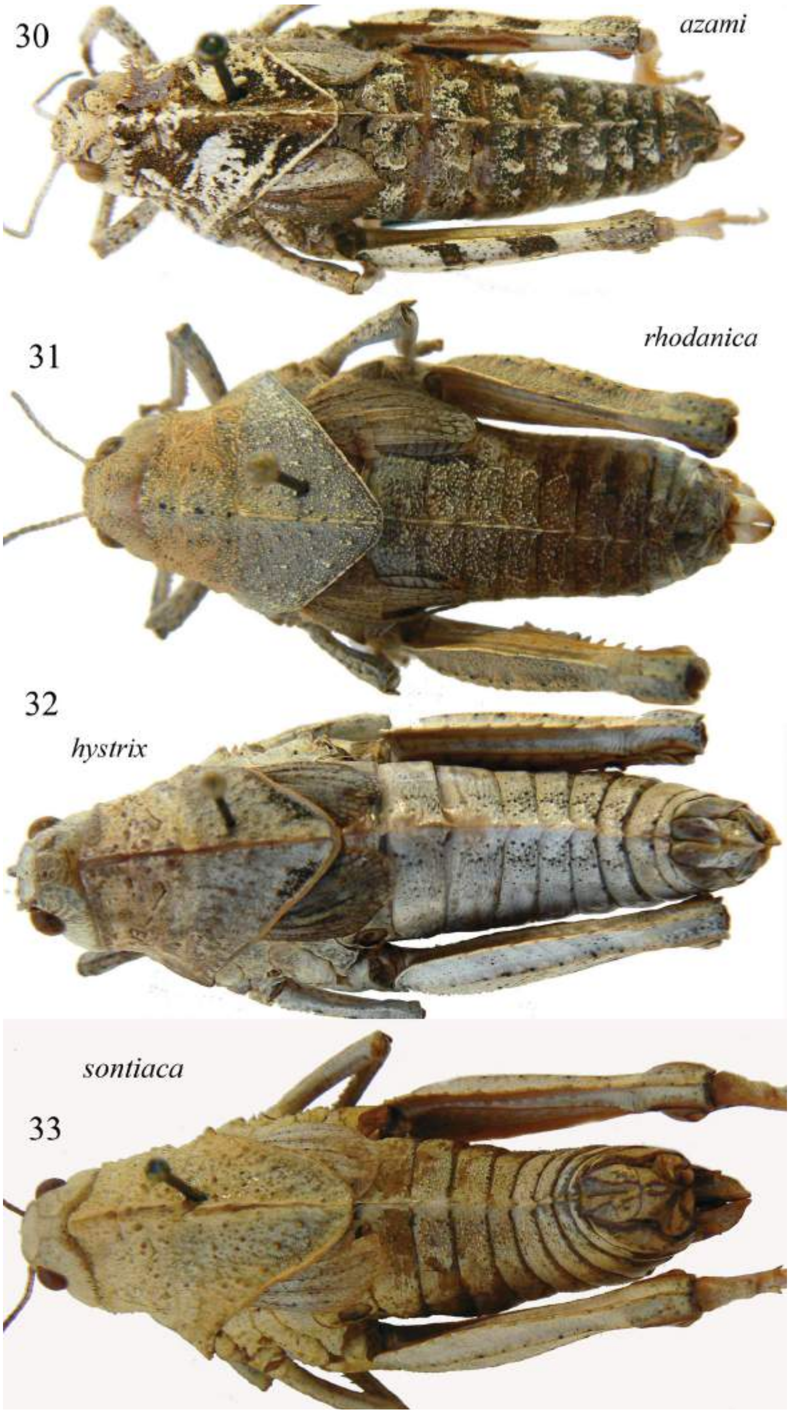
From the genetic point of view, Streiff *et al*. (2005) found that genetic diversity at eight microsatellite loci was highly structured, indicating substantial isolation of populations of the two taxa living in the area of the Rhone delta; genetic drift was the major force involved in the genetic structure, with very little gene flow at the regional scale, consistent with both the limited dispersal of this flightless species and the patchy configuration of its habitat. The authors were unable to find significant differences in the extent of genetic diversity and concluded that the two taxa have to be considered as subspecies of *P. hystrix*. However, Streiff *et al*. (2005) gave information on the population genetic structure, they worked on microsatellites, that did not give phylogenetical information, but only information on relationships among individuals, and consequently on the structure and distance among groups and populations. They found the presence of shared loci and alleles between the two taxa, but this does not provide information about taxa identification. Thus, as significant morphological differences were found during our research both between distant (e.g., *P. hystrix* and *P. azami*) and near populations (e.g., *P. azami* and *P. rhodanica*) we consider that raising them to the species level is justified. Based on the considerations reported above, we propose to consider *P. rhodanica* a valid species, separated from both *P. azami* and *P. hystrix*.

Measurements. see Table 1. Biometric ratios of males resulted different from all other species, while those of females lie within the group *azami/hystrix/flexuosa*, with the exclusion of the ratio length of tegmina of males/length of tegmina of females for the latter (Figs 65–68).

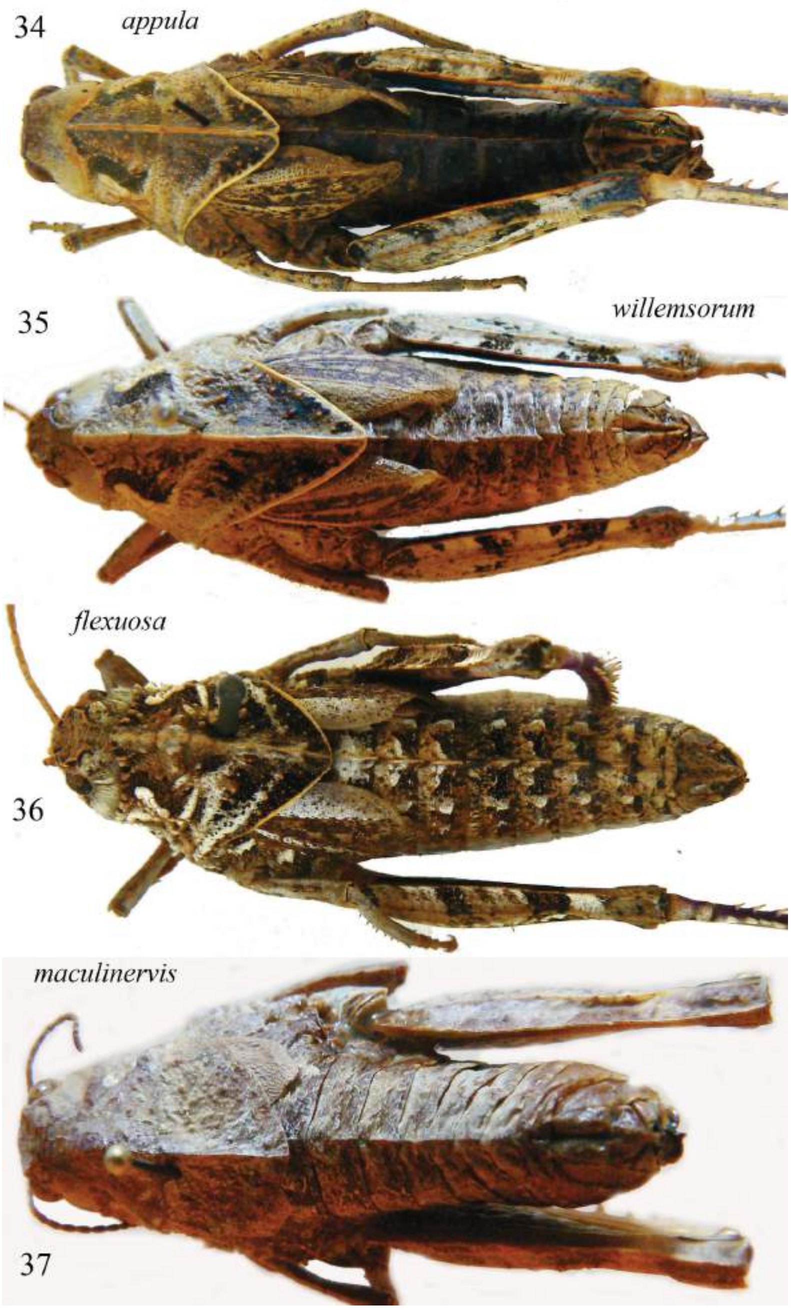
Conservation of the taxon. This taxon is listed as Critically Endangered on the IUCN Red List since 2012, is protected by French Legislative text of 3rd August 1979 (Protection of Insects in France), and its distribution area lies within the Coussouls de Crau Nature Reserve since 2004 (Foucart 1995, Foucart *et al*. 1999). Considering it a species will have quite strong consequences for its conservation and ongoing conservation projects.



FIGURES 26–29. Lateral view of females of *Prionotropis appula* (26), *P. willemsorum* **n. sp.** (27), *P. flexuosa* (28) and *P. maculinervis* (29).



FIGURES 30–33. Dorsal view of females of *Prionotropis azami* (30), *P. rhodanica* (31), *P. hystrix* (32) and its synonym *P. sontiaca* (33).

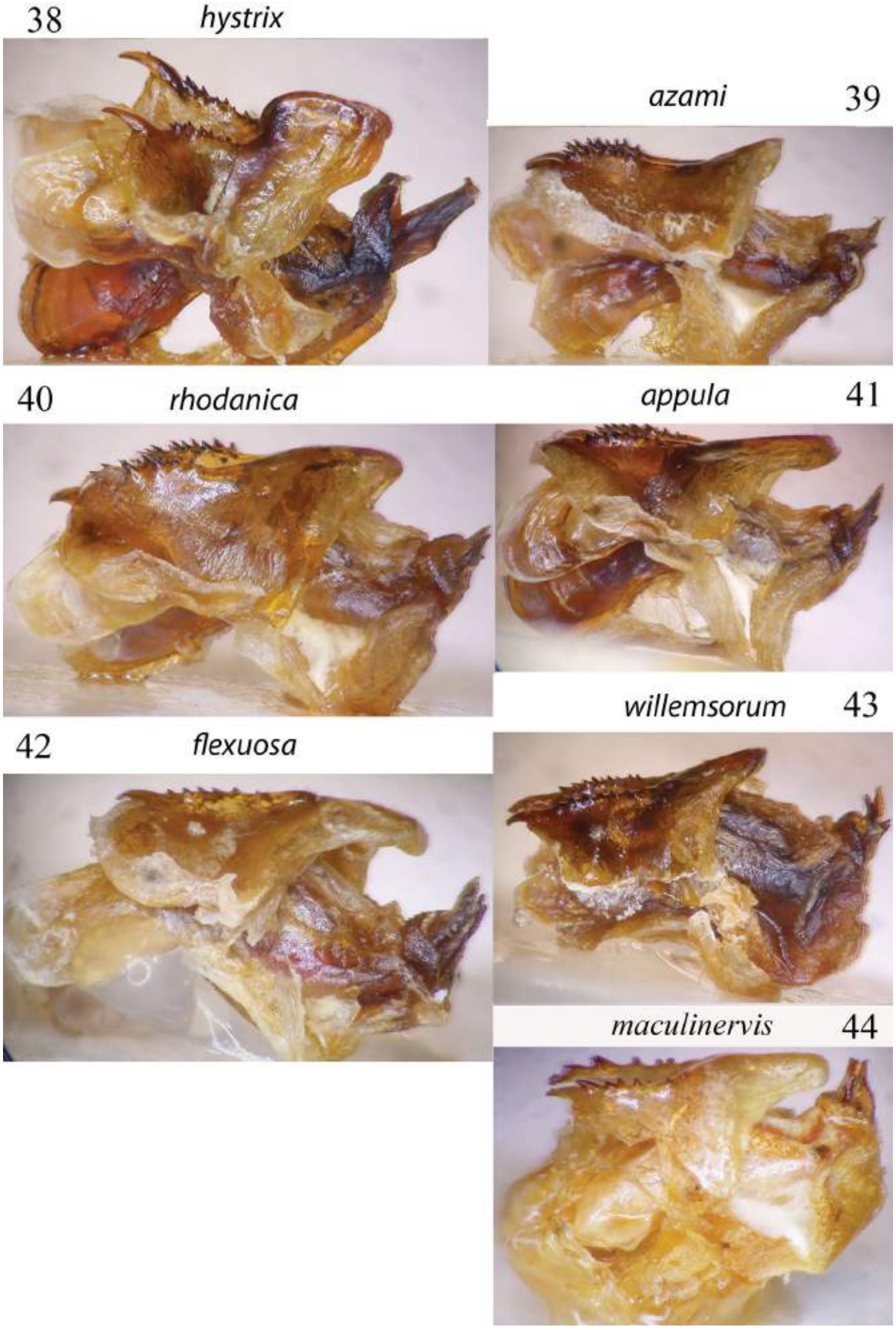


FIGURES 34–37. Dorsal view of females of *Prionotropis appula* (34), *P. willemsorum* **n. sp.** (35), *P. flexuosa* (36) and *P. maculinervis* (37).

Prionotropis azami Uvarov, 1923 new status

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:472689
Material examined. France, Broves (♂ holotype, 1♂, 5♀ paratypes); France, Broves 2.VII.1906 (coll. Azam) (5♂); France, Broves 2.VIII.1906 (1♂); France, Broves 1924, Berland (1♂); France, Broves VII.1905 (5♀); France, Broves 5.VII.1964 (1♀); France, Var, Les Arc, G. de Vichet (1♂); France, Plan des Canjuers VII.1947, Delmas (1♂, 1♀); France, Plan des Canjuers 14.VII.1907 (coll. Azam) (8♂, 3♀); France, Plan des Conjuers 29.VII.1962, G. Colas (2♂); France, Plan des Conjuers, Aiguines 8.VII.1955 (7♂, 3♀); France, Plan des Conjuers, Aiguines 18.VI.1991, A. Foucart (2♂, 4♀); France, Rhone delta, Mt St Victoire, Col des Perves 15.VI.1991, A. Foucart (8♂, 10♀) (MNHN); France, Rhone delta, Mt St Victoire 16–18.VI.1991, A. Foucart (5♂, 7♀) (CBGP); France, Broves 14.VII.1907 (1♂, 1♀ paratypes) (NHM); France, Var, North of Pzin, Poumiels 15.VI.1991, A.

Foucart (2♂); France, Var, Plan des Conjuers, Aiguines VI.1991, A. Foucart (2♂, 5♀); France, Bouches du Rhône, Vicraine 18.VI.1991, A. Foucart (6♂, 1♀); France, Bouches du Rhône, Sambuc 16.VI.1991, A. Foucart (2♂, 5♀); France, Bouches du Rhône, Panves 16.VI.1991, A. Foucart (3♀); France, Var, Riani 15.VI.1991, A. Foucart (1♂) (NHM).

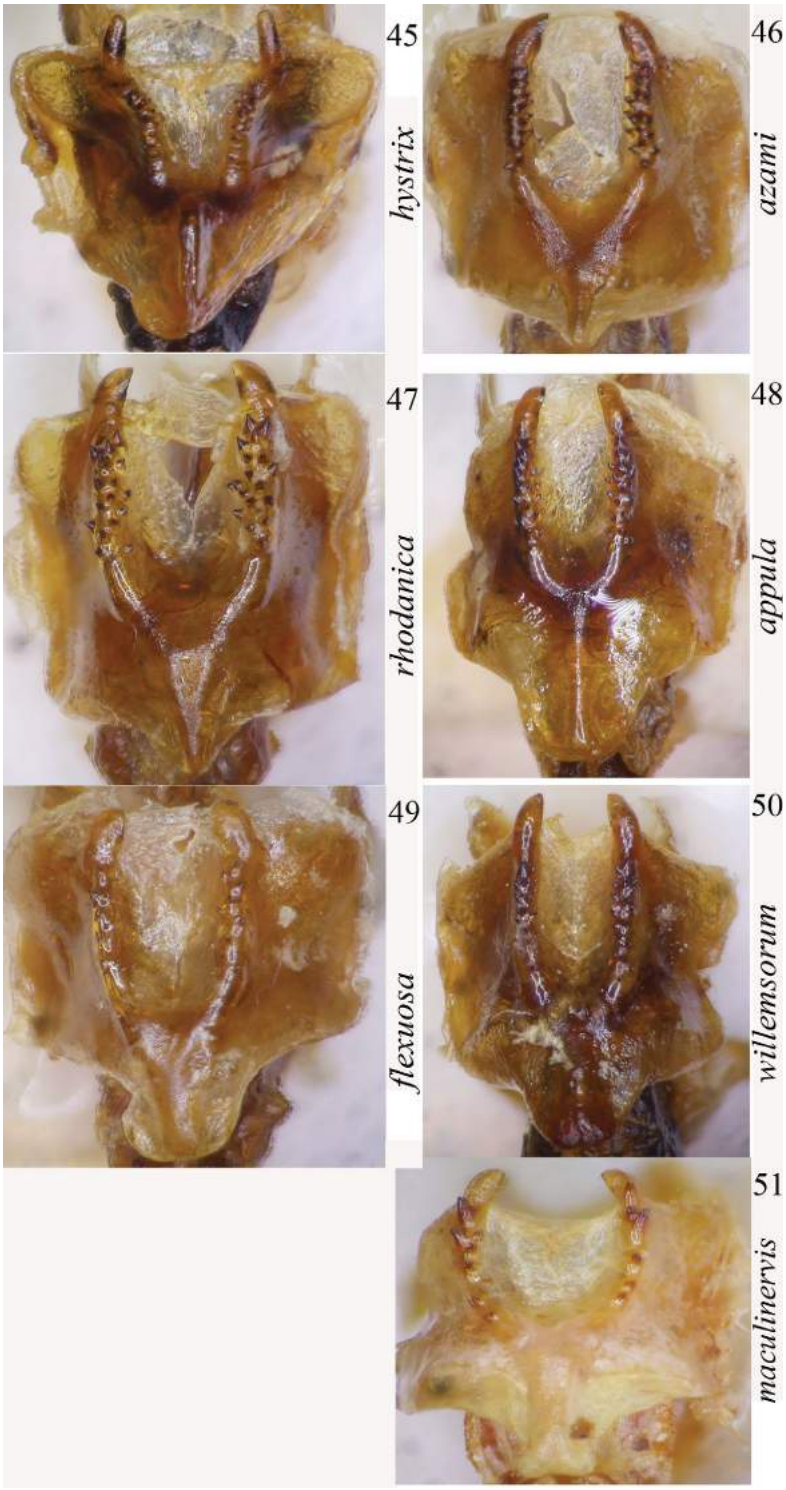


FIGURES 38–44. Lateral view of the epiphallus of *Prionotropis hystrix* (38), *P. azami* (39), *P. rhodanica* (40), *P. appula* (41), *P. flexuosa* (42), *P. willemsorum* **n. sp.** (43) and *P. maculinervis* (44).

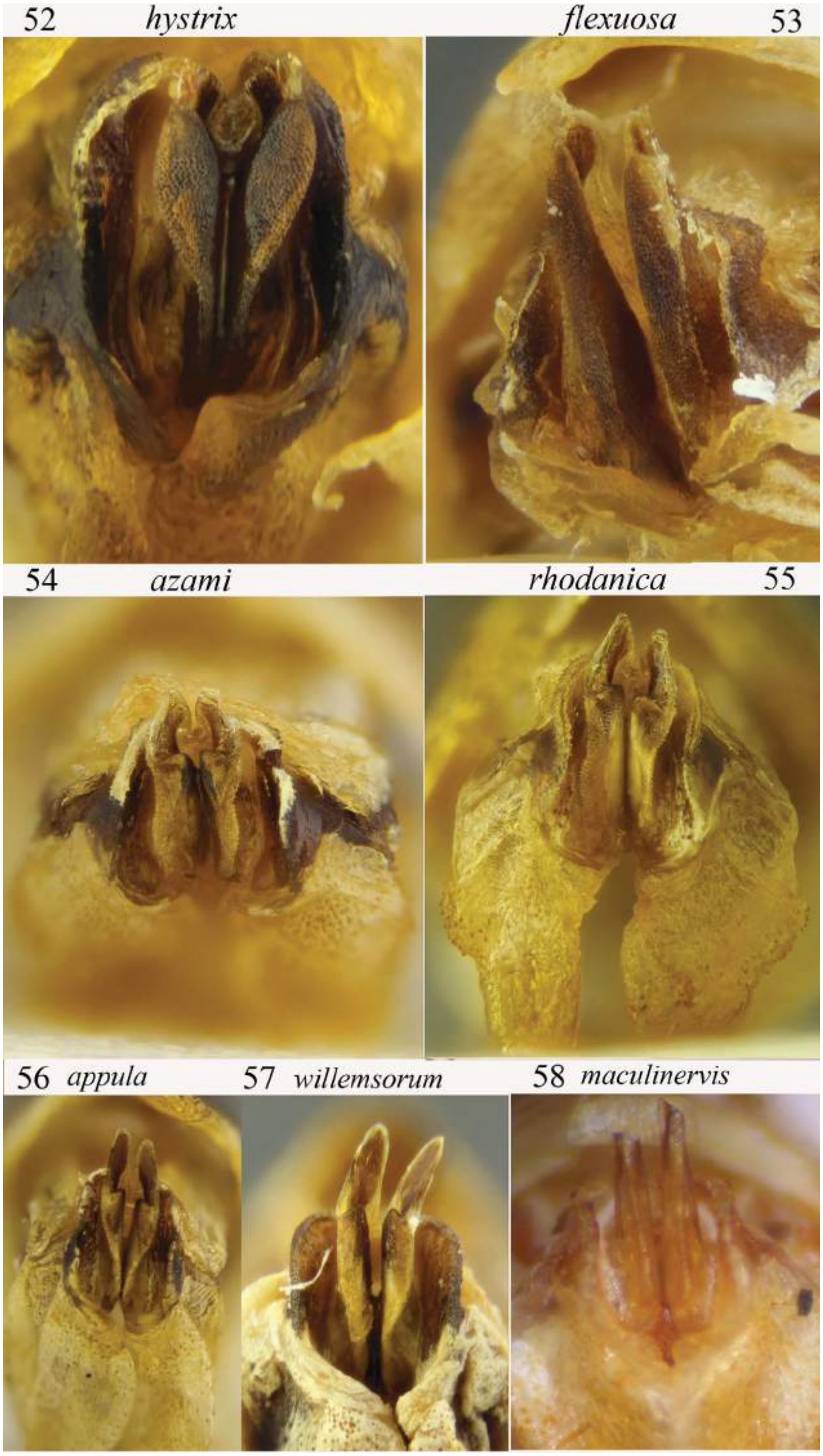
Remarks and distribution. See also *P. rhodanica*. This taxon differs from the nearby occurring *P. rhodanica* by pronotum shape, tegmina shape and length, and spines of abdominal tergites, both in males and females. Actually, we believe that *P. azami*, *P. rhodanica*, *P. hystrix*, *P. appula* and *P. willemsorum* **n. sp.** constitute a group of related species, very probably of Balkanic origin.

Measurements. see Table 1. Biometric ratios lie in the group *hystrix/flexuosa/maculinervis*, but the ratio length of tegmina of males/length of tegmina of females is similar only to that of *P. hystrix* and *P. rhodanica* (Figs

65–68). For the considerations reported above, we think that *P. azami* is not really related to *P. hystrix* and may be considered a valid species, well separated from the nearly cohabiting *P. rhodanica*.



FIGURES 45–51. Dorsal view of the epiphallus of *Prionotropis hystrix* (45), *P. azami* (46), *P. rhodanica* (47), *P. appula* (48), *P. flexuosa* (49), *P. willemsorum* **n. sp.** (50) and *P. maculinervis* (51).



FIGURES 52–58. Frontal view of penis valves of *Prionotropis hystrix* (52), *P. flexuosa* (53), *P. azami* (54), *P. rhodanica* (55), *P. appula* (56), *P. willemsorum* **n. sp.** (57) and *P. maculinervis* (58).

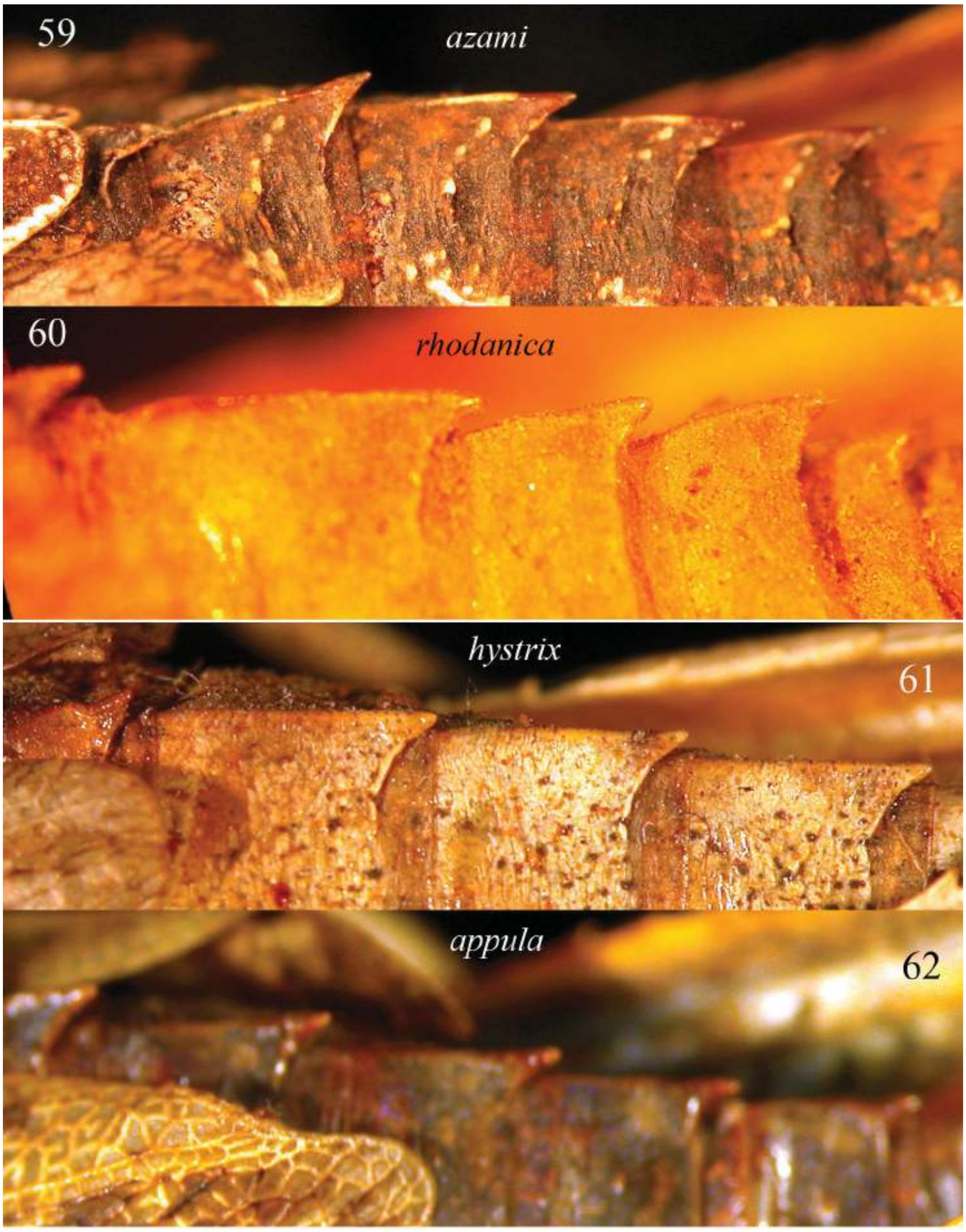
Prionotropis appula (O.G. Costa, 1836)

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:42811

Material examined. Italy, Basilicata, Campomaggiore (Potenza) 14.VII.1974 (1♂, 1♀); Italy, Campania, Naples (ex Costa) (2♀); Italy, Apulia, Otranto (ex Costa) (1♂, 2♀) (MNCN); Italy, Campania, Naples (ex Costa, ex

Brunner, 1891, ex Pantel) (2♂, 2♀); Italy (coll. Azam) (4♂, 2♀); Italy, Apulia, Mt. S. Angelo 28.VII.1929, C. Confalonieri (1♂, 1♀); Italy, Basilicata, Matera 18.VI.2003, Delobel (2♂, 1♀) (MNHN); Italy, Apulia, Mt. S. Angelo 28.VII.1929, C. Confalonieri (23♂, 23♀); Italy, Apulia, Manfredonia 29.VII.1929, C. Confalonieri (3♂, 2♀); Italy, Apulia, Altamura VI.1909, A. Andreini (2♂, 2♀); Italy, Apulia, Foggia VII.1917 (1♂, 1♀); Italy, Apulia, Otranto 12.VI.1929, C. Confalonieri (6♂, 2♀); Italy, Basilicata, Melfi (1♀) (MSNG); Italy, Calabria 1892 (1♂); Italy, Apulia, Masseria Resecata 12.VI.2007, B. Massa (1♂, 2♀); Italy, Apulia, Manfredonia 14.VI.2007, B. Massa (1♂); Italy, Apulia, Altamura 12.VI.2007, B. Massa (1♂); Italy, Apulia, Alberobello 6.VII.1970 (1♀); Italy, Molise, Macchiav. Fontane (Campobasso) 30.VI.1997, Mancini (1♀) (BMCP).

Remarks. *P. appula* differs from *P. hystrix* by the pronotal shape, the colour of the hind tibia and inner side of the hind femur and the length and the shape of the wings (Figs 8, 10, 16, 18, 24, 26, 32, 34); differences from *P. willemsorum* **n. sp.** are reported below. The epiphallus has a longer apex than in *P. willemsorum* **n. sp.**, but penis valves are very similar (Figs 37, 39, 44, 46, 52, 53).



FIGURES 59–62. Lateral view of tergites of females of *Prionotropis azami* (59), *P. rhodanica* (60), *P. hystrix* (61) and *P. appula* (62).

Distribution. *P. appula* occurs in Latium, Molise, Campania, Apulia, Basilicata and Calabria (Fontana *et al.* 2005, Massa *et al.* 2012). It was recorded from Greece by Brunner von Wattenwyl (1882), and recovered in the area of Epirus (Ioannina) by Foucart & Ponel (1999) and Willemse & Willemse (2008). Previous authors did not find differences between Italian and Greek specimens, but a more careful comparison allowed us to find unique characteristics in the Greek population, and we describe it here as a new taxon (see below). In particular, in *P. appula* the pronotum and tegmina are shorter and posterior edge of epiphallus is longer than in *P. willemsorum* **n. sp.**

Measurements. see Table 1. Biometric ratios show that the two species of Italy and Greece are related, and we may consider the Italian *P. appula* of transjonian origin (Figs 65–68).

Prionotropis willemsorum **Massa et Ünal, new species**

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:472690

Material examined. Greece, Epirus, Ioannina, 4 km W Aristi (700 m) 29.VI.1986, F. Willemse (1♂ holotype, 4♀ paratypes) (NBC); Greece, Epirus, Ioannina, Aristi 10.VI.1997, P. Ponel (1♂ paratype) (MNHN).

Description. Male. General coloration brown with blackish spots, hind tibia reddish, inside hind femora blue. Cuticle of whole body granulate. Fastigium of the vertex projecting forward, rounded, dorsum of head concave with obtuse-angular anterior part, raised margins, so that a shallow groove is formed; frontal ridge with shallow sulcus, interrupted at the ocellus level. 17–18 antennal segments, apical longer than basal ones. Prosternal process reduced to a small collar. Pronotum laterally compressed, with a raised carina (Fig. 11); anterior margin of carina elongated, projecting above part of the head. Carina arcuate and interrupted by two sulci. Tegmina reaching the epiproct, tips evenly rounded. Hind wings shorter than tegmina. Fore and mid femora unarmed. Upper margin of hind femur with 8–10 spines. Fore and mid tibiae ventrally with double rows of 6–8 yellow spines; hind tibiae with double rows of several stout spines and a pair of larger stout spurs on each side. Krauss' organ with fine tubercles or transverse rows. Hind apex of abdominal tergites with a spine covering ca. 1/3 of the following tergite. Male epiproct rectangular, pointed on the hind margin and with a longitudinal furrow; cerci stout, pointed and longer than epiproct. Subgenital plate with sharp median concavity. Epiphallus with short posterior edge, penis valves long and divided into two portions (Figs 43, 50, 57).

Female: Similar to male, but much larger and more stout, with shorter wings. Supra-anal plate elongate with median groove. Epiproct long with transverse suture and a longitudinal furrow. Cerci very short and thick with broadly rounded tips. Ovipositor valves cream coloured, stout with slightly curved black tips. Sub-genital plate rectangular, with a triangular lobe in the middle.

Etymology. This species is dedicated to the late Fer Willemse and to his son Luc Willemse, who have widely contributed to the knowledge of Orthopterofauna of Greece.

Morphological differences between *P. appula* and *P. willemsorum* n. sp. *P. willemsorum* is clearly related to *P. appula* and until now considered to belong to the same taxon (but see Uvarov 1923). The most evident difference between these two species is the longer metazona of the pronotum in *P. willemsorum* compared to *P. appula*, mainly in males; however, males of *P. willemsorum* have a more projecting fore margin of pronotum than *P. appula*, which in turn has a more projecting anterior margin of lateral lobes of the pronotum than *P. willemsorum* (compare Figs 10, 18 with 11, 19). *P. willemsorum* is larger than *P. appula* (Table 1); in addition tegmina of males of *P. willemsorum* are longer than those of *P. appula*, and reach the epiproct, while in *P. appula* they reach the 5th abdominal tergite, leaving exposed the terminal part of abdomen; tegmina of females of *P. willemsorum* have a more pointed apex than those of *P. appula* (compare Figs 26, 34 with 27, 35). The epiphallus has a shorter posterior edge than in *P. appula*, while penis valves are very similar, long and divided into two portions (compare Figs 41, 48, 56 with 43, 50, 57).

Measurements. See Table 1 and Figs 65–68.

Distribution. Greece, Epirus (Foucart & Ponel 1999, Willemse & Willemse 2008, see material examined).

FIGURES 63–64. Lateral view of tergites of females of *Prionotropis flexuosa* (63) and *P. maculinervis* (64).

Prionotropis maculinervis (Stål, 1878)

Prionotropis urfensis Ramme, 1933 new synonym
http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:42784

Material examined. Turkey, Kahramanmaraş (1♂, 1♀) (MNCN); Turkey, Diyarbakır, Bismil, Kezban Çesmesi 6.VI.1961 (2♂); Turkey, Diyarbakır (mountain) 6.VI.1961, M. Donskoff (1♂); Turkey, Oued Diyarbakır 5.[1]VII.1959, G. Remaudière (1♀) (identified as *P. m. maculinervis*) (MNHN); Turkey, Urfa, Eshref Bey (1♂); Turkey, [Urfa], Süverek [Siverek], 1914, Pietschmann (1♀); Turkey, Elazığ 29.VI.1952, Ö.K. Gülen (1♂, 2♀) (det. Uvarov); Turkey, Erzincan, K.M. Guichard & D.H. Harvey (5♂, 1♀) (cf. Karabağ 1963); Turkey, Antitaurus, Maraş, Göksun, between Yalak and foot of Binboğa Dağ, 1500 m, in steppe 14.VII.1952, P.H. Davis (3♀) (cf. Karabağ, 1963) (NHM); Turkey, Amasia [Amasya], Staudinger (2♂ syntypes) (MfN); Turkey, [Diyarbakır], Heine [Hani] (1♀); Turkey, Malatia [Malatya], (2♂ syntypes); Turkey, Amasia (1♂); Turkey, [Elazığ], Kharput [Harput] 1914 (1♀ nymph) (NMW); Turkey, West Anatolia, Gebirge b. Malatia [Malatya], Yokarbanassiya (1600 m) 6–7.VII.1937, W. Ramme (1♂, 1♀); Turkey, Erzurum, Pazaryolu, 14 km W. Çatakbahçe Köyü (1312 m) 40.25.129 N, 40.42.592 E, 17.VII.2013, M. Ünal & A. Erden (1♂); Turkey, Erzurum, Pazaryolu (1280 m) 17.VII.2013, M. Ünal & A. Erden (6♀); Turkey, Diyarbakır, Bismil, Kezban Çeşmesi, 6.VI.1961 (1♂, 1♀) (AİBÜEM); Turkey, Elazığ, Harput, 13.VII.1952, Ö.K. Gülen (1♂) (AÜZM); Turkey, Diyarbakır, Bismil, Kezban Çeşmesi, 6.VI.1961 (13♂, 1♀) (NTM); Turkey, Mesopotamia, Urfa 1931, Sureya (1♂ holotype of *P. urfensis*, 1♀ allotype of *P. urfensis*, 1♂, 1♀ paratypes of *P. urfensis*) (MfN); Turkey, [Urfa], Siverek, 1914, Pietschmann (2♀) (NMW).

Remarks. *P. maculinervis* has a very prominent sexual dimorphism, males are fully winged, while the tegmina of females just cover the 1st tergite (Figs 13, 21, 29, 37). The pseudolophi of the epiphallus are few and small and parabolically placed; penis valves are straight and thin (Figs 44, 51, 58).

Ramme (1933) describing *Prionotropis urfensis*, separated it from *P. maculinervis* by the shape of the male pronotum which should be more robust, more arched and convex, coarser tubercles and a steeper typical sulcus in lateral view and by the coloration of the hind legs, of which hind femur has a discoloured inner side (instead of

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[1] This specimen was recorded by Descamps & Donskoff (1965).

blackish), hind tibia pale orange instead of reddish-yellow to red. However, Uvarov (1943) considered the morphological differences of *P. urfensis* small and moved it at subspecies level of *P. maculinervis*, because of the coloration of the hind legs. Ramme (1951) agreed with Uvarov's opinion and treated *P. urfensis* as a subspecies of *P. maculinervis*. Later, all the authors used the characters given in the original description and reported this taxon as a subspecies of *P. maculinervis* (Bey-Bienko & Mistshenko 1951, Karabağ 1958, Weidner 1969, Demirsoy 1977). However, the material we examined showed that the coloration of the hind legs is quite variable as well as the shape of the pronotum. There is no morphological stability in accordance with the geographical distribution of each morph. For example, the hind tibia of *maculinervis* is red, but the specimens found in Diyarbakır province close to the type locality of *urfensis* have a red hind tibia; in addition, some specimens found in Northern Turkey, geographically much closer to the type locality of *maculinervis*, have an orange hind tibia. Hind legs colouration cannot be used to separate *maculinervis* from *urfensis*, as this may vary in different shades of red, orange and yellow. Similar variations are also present in the coloration of the inner side of the hind femora and the shape of the pronotum. There is no difference in the male phallic complex of the specimens examined. Finally, it is not possible to consider *maculinervis* and *urfensis* as subspecies, because their distribution is overlapping. In view of the above listed reasons, we propose that *P. urfensis* has to be considered as junior synonym of *P. maculinervis*.

Measurements. See Table 1 and Figs 65–68.

Distribution. Eastern half of Turkey.

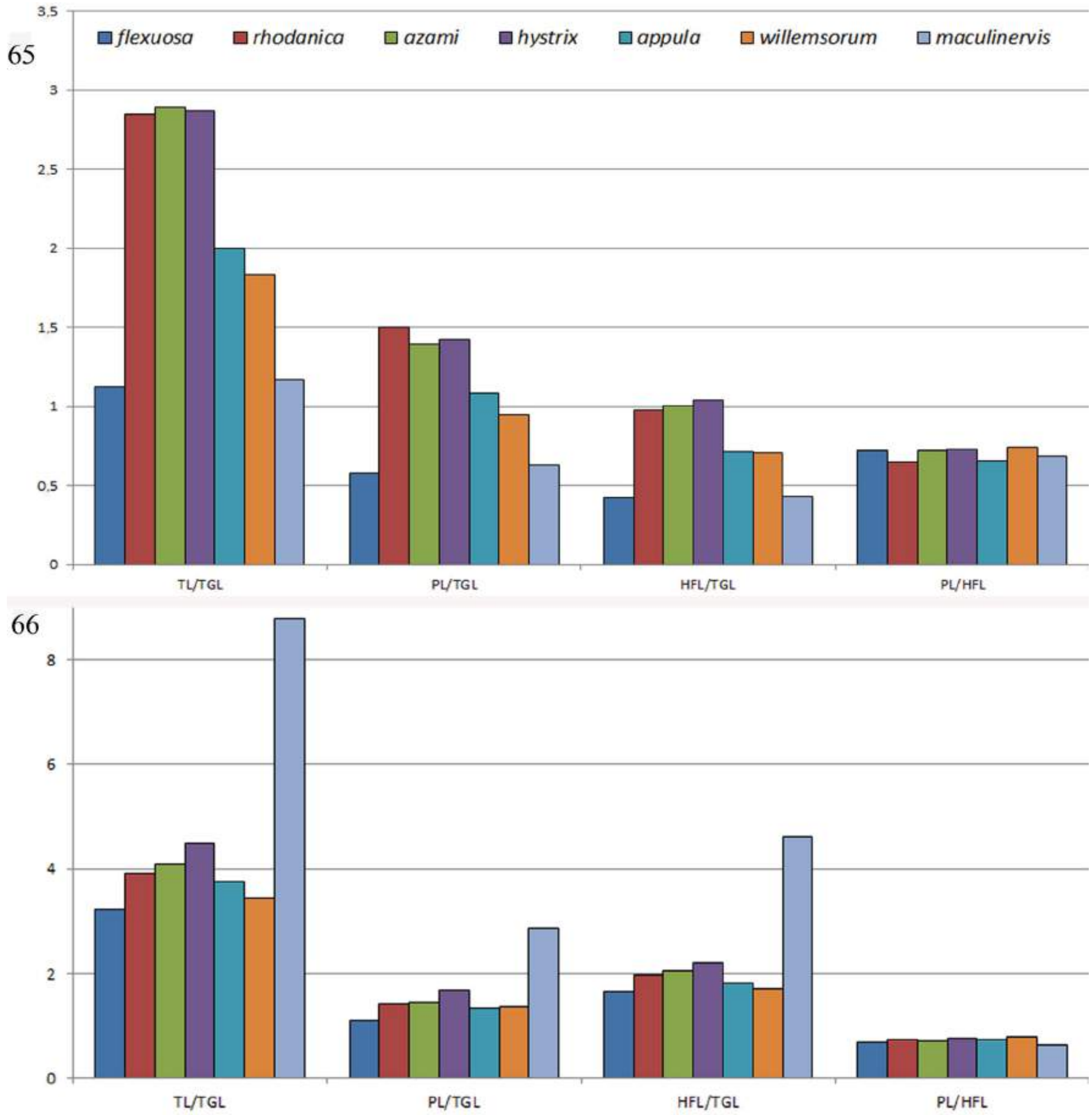
Concluding remarks on the species of the genus *Prionotropis*

Morphometric analyses applied to biometrics are shown in the Figs 65–68. Males of *P. azami*, *P. rhodanica* and *P. hystrix* have a similar ratio between total length of body and length of tegmina (TL/TGL), length of pronotum and length of tegmina (PL/TGL), and length of hind femora and length of tegmina (HFL/TGL), while in *P. flexuosa* and *P. maculinervis* these ratios are lower, and in *P. appula* and *P. willemsorum* are intermediate. The ratio between length of pronotum and length of hind femora (PL/HFL) is quite similar in all the species (Fig. 65). Concerning females, due to shorter tegmina than in males, results are different. The female micropterism is not proportional to the length of male tegmina; indeed in *P. appula*, *P. azami*, *P. rhodanica*, *P. hystrix* and *P. flexuosa* ratios are quite similar, while in *P. maculinervis* they are higher, mainly LT/TGL (some females of this taxon are very big and have very short tegmina), or slightly lower, like PL/HFL (Fig. 66). The difference in the length of tegmina of males and females is shown in Table 1 and Figs 22–37. The ratio of the length of tegmina of males/length of tegmina of females (Fig. 68) shows again the evident biometric difference in *P. maculinervis*, of which males have the longest wings within the genus.

The univariate analysis of biometric data provided a large number of significant differences among the species for each variable both in males and females (Table 1). The length of tegmina is the character for which differences among the *Prionotropis* males are more evident, leading to group *P. flexuosa* with *P. maculinervis*, *P. rhodanica* with *P. hystrix* (including "*sontiaca*") and *P. appula* with *P. willemsorum*. Significant differences in the PL resulted for the latter two species. While significant differences were detected in all biometric characters of *P. flexuosa* and *P. maculinervis*, except TGL, among characters of *P. maculinervis*, *P. rhodanica* and *P. hystrix* no significant differences resulted, again with the exception of TGL. Concerning *P. azami,* which has the shortest tegmina in the genus, no significant differences were observed from *P. flexuosa* for all characters (except TGL) and from *P. maculinervis* for TL and PH. Differences among females did not resulted clearly, with the exception of *P. flexuosa*, the biometric characters of which (except TGL) resulted significantly different from other species.

The results of the univariate analysis on males are in agreement with the separation of *P. flexuosa* and *P. maculinervis,* mainly based on the total length of tegmina, and *P. azami, P. appula* and *P. willemsorum* in the PCA (Fig. 67a). Concerning females, only *P. azami, P. flexuosa* and *P. maculinervis* clearly separated from the other species (Fig. 67b). Overall, the biometric analyses confirm the differences detected by morphology.

The genera of the subfamily Thrinchinae show some primitive characters (e.g., Krauss's organ, tympanum) and some derived or specialized characters (e.g., spines on upper margin of mid tibiae, anal veinlets of male hind wings modified, dorsal spines on abdominal tergites in most genera). The presence of spines on upper margin of mid tibiae and modified veinlets on hind wings (Figs 1–5) also in the females could be evidence that the latter characters evolved when both sexes of ancestor species were fully winged. The actual micropterism of females in some species of Thrinchinae (like *Prionotropis*) possibly forced some populations to remain isolated and to differentiate.



FIGURES 65–66. Biometrics of the genus *Prionotropis*. Ratio length of pronotum/length of hind femora (PL/HFL), length of hind femora/length of tegmina (HFL/TGL), length of pronotum/length of tegmina (PL/TGL) and total length of body/length of tegmina (TL/TGL) in males (65) and in females (66) of *Prionotropis appula*, *P. willemsorum* **n. sp.**, *P. rhodanica*, *P. azami*, *P. hystrix*, *P. flexuosa*, and *P. maculinervis*.

Some previous authors (e.g., Uvarov 1943, Foucart 1995) have considered *P. hystrix* more related to *P. azami* than to *P. rhodanica*; however, females of *P. hystrix* and *P. rhodanica*, seen from above, show a very stout and large pronotum, that in *P. azami* and other taxa is not present (Figs 22–25, 30–33). In addition, abdominal spines of tergite in females are more similar (shorter) in *P. hystrix* and *P. rhodanica* than in *P. azami* (Figs 59–62). Interestingly, females of *P. appula* and *P. willemsorum* **n. sp.** have abdominal spines similar to those of *P. hystrix*. Moreover, the male of *P. hystrix* has a very different shape of the pronotum (with hind angle more acute: Figs 8, 16), both from *P. rhodanica* (rounded angle: Figs 7, 15) and *P. azami* (nearly right angle: Figs 6, 14); the latter is more similar to that of *P. appula* and *P. willemsorum* **n. sp.** (Figs 10, 11, 18, 19). Females of *P. flexuosa*, have some other supplementary spines on lateral margins of tergites (Fig. 63). This may also be considered a character that was derived independently, this taxon being at the extreme western areas of the distribution of the genus.

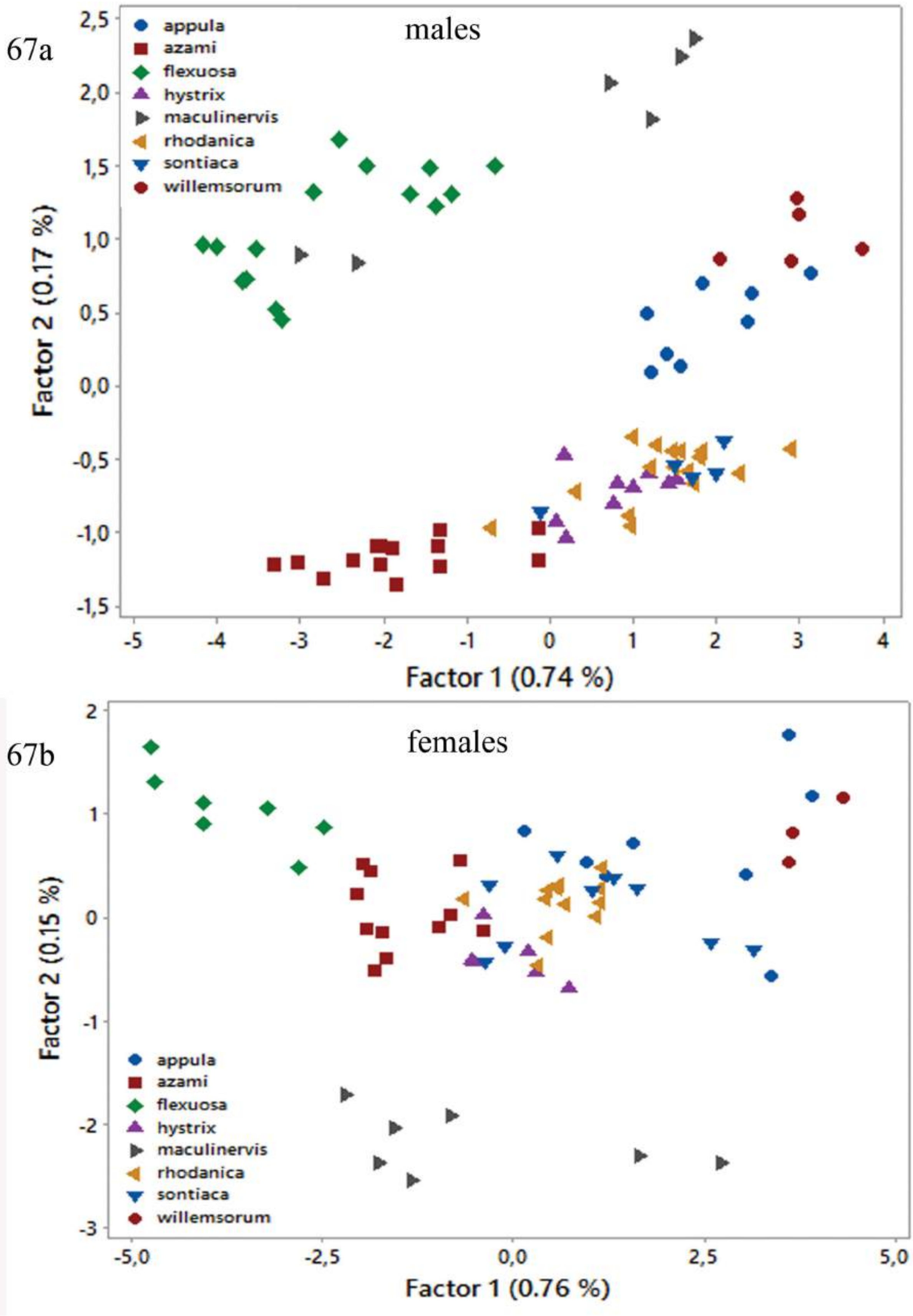


FIGURE 67. Scatterplot of the first two factors resulting from the PCA analysis of biometrics of *Prionotropis appula*, *P. willemsorum* **n. sp.**, *P. rhodanica*, *P. azami*, *P. hystrix*, its synonym *P. sontiaca*, *P. maculinervis* and *P. flexuosa* males (a) and females (b).

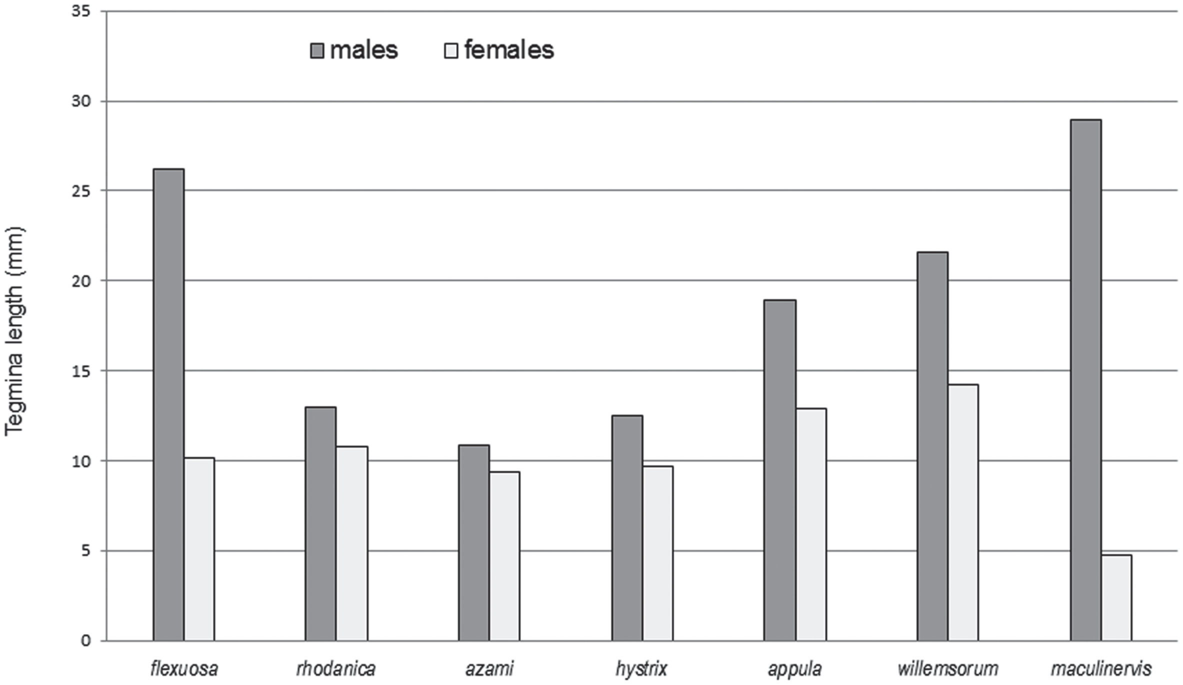


FIGURE 68. Length of tegmina of males and females of *Prionotropis appula*, *P. willemsorum* **n. sp.**, *P. rhodanica*, *P. azami*, *P. hystrix*, *P. flexuosa* and *P. maculinervis*.

Thrinchinae are mainly linked to steppes and similar xeric ecosystems; these habitats in the Mediterranean Sea have undergone several periods of expansion and contraction, correlated with the disappearance and spread, respectively, of deciduous forest and evergreen Mediterranean oak forest. In the last 20,000 years climatic changes occurred which may have been responsible for the current discontinuous configuration of these open, arid and semi-arid habitats; the latter have been in continual regression since the last ice age (Adams & Faure 1997). The ancestor of *Prionotropis* may have colonized areas in the Mediterranean before glaciations, and during glacial periods populations could remain isolated in different areas and undergone differentiation. The current distribution of the genus *Prionotropis* covers only some scattered areas from Turkey to Spain, and possibly are the result of a much wider past distribution of a common ancestor, whose populations remained isolated in small suitable habitats (Fig. 69). Regrettably, some of these habitats are also under threat by changing land use, and one of these species, *P. rhodanica*, is listed as Critically Endangered by the IUCN Red List and even a strategic conservation plan exists (Foucart 1995, Foucart *et al.* 1999).

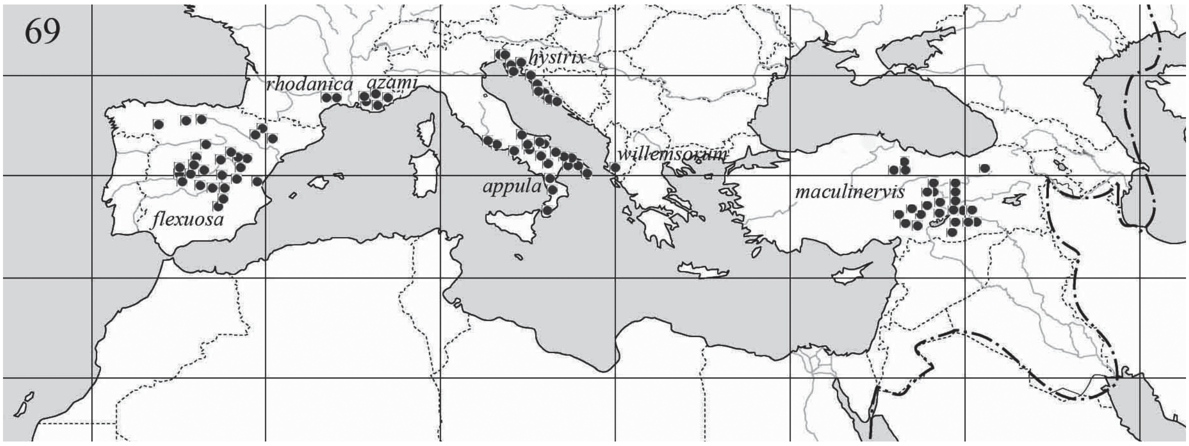


FIGURE 69. Distribution of the species of the genus *Prionotropis*.

The taxonomic situation of *Prionotropis* resembles that of the genus *Tmethis* Fieber, 1853 (Pamphagidae: Thrinchinae), whose distribution covers North Africa and Middle East; in North Africa only four species occur;

one of them, *T. cisti* (Fabricius, 1787) has a wide distribution from Morocco to Libya, several populations differ from the type (mainly in the tegmina length) and were described as unique taxa, but their distribution overlaps, and they cannot be considered different taxa from *T. cisti* (Massa 2013). Probably, in the case of *Tmethis*, isolation of single populations was not effective to trigger any radiation as observed in *Prionotropis*.

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