

Remarks on the complex *Orthotylus* *(Parapachylops) junipericola* Linnauori, 1965, with description of two new subspecies from Morocco (Hemiptera: Heteroptera: Miridae)

S. PAGOLA-CARTE¹, A. MATOCQ²

¹Apdo. 70 P.K.; E-20150 Villabona (Gipuzkoa); E-mail: pagolaxpc@telefonica.net

²Muséum national d'Histoire naturelle; Département Adaptation du Vivant, MECADEV, UMR7179 MNHN/CNRS;
C.P. 50, Entomologie; 57 Rue Cuvier; F-75231 Paris cedex 05; E-mail: matocq.armand@wanadoo.fr

Abstract

Two new subspecies of *Orthotylus (Parapachylops) junipericola* Linnauori, 1965 (Hemiptera: Heteroptera: Miridae: Orthotylinae: Orthotylini) are described from Morocco: *O. (P.) j. magnieni* n. ssp. Matocq & Pagola-Carte and *O. (P.) j. carinatoides* n. ssp. Pagola-Carte & Matocq. The shape of their parameres and sclerotized appendages of the vesica (male genitalia) are sufficiently distinguishing as to clearly separate them from all other known subspecies. In addition, *O. (P.) carinatus* Wagner, 1968 is downgraded to subspecies of *O. (P.) junipericola*, and a *carinatus*-group of subspecies is proposed which includes also both new taxa. An updated checklist of the taxa included in *Parapachylops* is provided as a result.

Key words: *Orthotylus*, *Parapachylops*, *O. (P.) junipericola magnieni* n. ssp., *O. (P.) junipericola carinatoides* n. ssp., *O. (P.) junipericola carinatus* Wagner, 1968 (n. stat.), Heteroptera, Miridae, Orthotylinae.

Resumen

Dos nuevas subespecies de *Orthotylus (Parapachylops) junipericola* de Marruecos (Hemiptera: Heteroptera: Miridae)

Se describen dos nuevas subespecies de *Orthotylus (Parapachylops) junipericola* Linnauori, 1965 (Hemiptera: Heteroptera: Miridae: Orthotylinae: Orthotylini) de Marruecos: *O. (P.) j. magnieni* n. ssp. Matocq & Pagola-Carte y *O. (P.) j. carinatoides* n. ssp. Pagola-Carte & Matocq. La forma de sus parámeros y de los apéndices esclerificados de su vesica (genitalia masculina) son suficientemente distintivas como para permitir su separación nítida del resto de subespecies conocidas. Asimismo, se degrada *O. (P.) carinatus* Wagner, 1968 a subespecie de *O. (P.) junipericola*, y se propone el grupo de subespecies de *carinatus* incluyendo también a ambos nuevos taxones. Como corolario, se ofrece la lista actualizada de los taxones incluidos en *Parapachylops*.

Palabras clave: *Orthotylus*, *Parapachylops*, *O. (P.) junipericola magnieni* n. ssp., *O. (P.) junipericola carinatoides* n. ssp., *O. (P.) junipericola carinatus* Wagner, 1968 (n. stat.), Heteroptera, Miridae, Orthotylinae.

Laburpena

Orthotylus (Parapachylops) junipericolaren bi subespezie berri Marokokoak (Hemiptera: Heteroptera: Miridae)

Orthotylus (Parapachylops) junipericola Linnauori, 1965 (Hemiptera: Heteroptera: Miridae: Orthotylinae: Orthotylini) espeziearen Marokoko bi subespezie berri deskribatzen dira: *O. (P.) j. magnieni* n. ssp. Matocq & Pagola-Carte eta *O. (P.) j. carinatoides* n. ssp. Pagola-Carte & Matocq. Beren parameroen eta beren besikaren apendize esklifikatuen forma (arran genitalia) bereziki paregabe suertatzen dira beste subespezie ezagunengandiko bereizketan erabil-

tzeko. Halaber, O. (*P.*) *carinatus* Wagner, 1968 beheratzen da *O. (P.) junipericola*ren subespezie-mailara, eta *carinatus* subespezie-taldea proposatzan da, bi taxoi berriak ere barne hartuz. Ondorio modura, *Parapachylops* subgeneroko taxoi guztien zerrenda eguneratua eskaintzen da.

Gako-hitzak: *Orthotylus*, *Parapachylops*, O. (*P.*) *junipericola magnieni* n. ssp., O. (*P.*) *junipericola carinatoides* n. ssp., O. (*P.*) *junipericola carinatus* Wagner, 1968 (n. stat.), Heteroptera, Miridae, Orthotylinae.

Introduction

Parapachylops Ehanno & Matocq, 1990 is one of the 10 subgenera recognized in the Palaearctic Region within the genus *Orthotylus* Fieber, 1858 (Miridae: Orthotylinae). This genus is the species-richest among orthotylines, with about 400 species described worldwide, ca. 150 of them known from the Palaearctic (Schuh, 1995, 2002-2013; Kerzhner and Josifov, 1999; Aukema *et al.*, 2013; Aukema, 2018).

Eight species are currently included in *O. (Parapachylops)*, which was originally diagnosed by the following characters (Ehanno and Matocq, 1990): pubescence exclusively composed of semierect setae of brownish to dark brown colour, parameres of complex morphology and sclerotized appendages of the vesica profusely branching and serrated. Carapezza (1997), being the author who proposed the current arrangement and composition of the subgenus, defined it as «a group of closely related taxa, all living on *Juniperus* or other Cupressaceae, externally similar to each other, with one or more sclerotized processes in the genital opening and provided with similar parameres» (p. 84). Dorsal setae were thus put aside as a diagnostic character for the subgenus, in concordance with a previous comment about «the unsatisfactory subdivision of *Orthotylus* in subgenera mainly based on differences in the dorsal hair covering» (p. 82). It can be added that the species currently belonging to the subgenus *Parapachylops* are all small-sized and generally their parameres fit the following pattern: left paramere transversely wider and more flattened and right paramere more expanded longitudinally and provided with teeth (see also: Wagner, 1955, 1968, 1974; Linnavuori, 1965; Josifov, 1974a, 1974b; Ribes, 1978, 1990; Carapezza, 1984; Ribes and Borges, 2001).

Particularly interesting is the high geographic variability of the species *O. (P.) junipericola* Linnavuori, 1965, for which up to 8 subspecies have been described since Linnavuori (1965). According to Carapezza (1997), the subspecies of *O. (P.) junipericola* may

be split into two aggregates: a North-African group, including *O. (P.) j. contractulus*, *O. (P.) j. junipericola* and *O. (P.) j. regularis*, and an European-Anatolian one, including *O. (P.) j. armoricanus*, *O. (P.) j. attilioi*, *O. (P.) j. balcanicus*, *O. (P.) j. castellanus* and *O. (P.) j. terminalis*. All subspecies are externally similar and can only be distinguished by differences in the male genitalia; moreover, the mentioned groups are separated exclusively by the shape of the sclerotized appendages of the vesica (with branches very elongate in the first group, sensibly shortened in the second).

In this paper, we describe two further North-African subspecies of *O. (P.) junipericola* based on material collected in Morocco. The examination of their male genitalia has revealed that they cannot be ascribed to any of the previously known taxa. Moreover, after the present descriptions, the variability of the male genitalic structures within the species is so great that another species, *O. (P.) carinatus* Wagner, 1968, becomes therein included. Consequently, the latter is downgraded to subspecies of the former and a third group of mainly Moroccan subspecies is proposed to cluster it and the newly described ones on the basis of their similarities. Finally, an updated checklist of the taxa included in the subgenus will be provided.

Descriptions

As the adults of both new taxa are externally very similar to all eight other subspecies of *O. (P.) junipericola*, the genitalic characters will be described and illustrated more thoroughly. In the first subspecies, based on a longer series of males and females, some morphometric characters are given as the average value followed by the whole range in parentheses; measurements are indicated separately for males and for females only for those characters markedly showing sexual dimorphism.

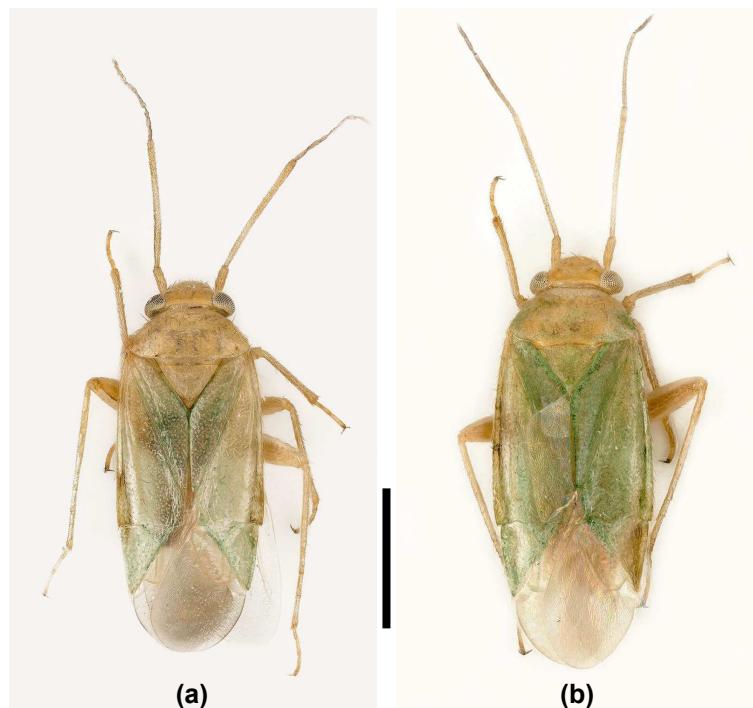


FIGURE 1. *Orthotylus (Parapachylops) junipericola magnieni* n. ssp., habitus: (a) Male (holotype); (b) Female (Scale bar = 1 mm).

Orthotylus (Parapachylops) junipericola magnieni n. ssp. Matocq & Pagola-Carte

Habitus as in Fig. 1. Pale green, turning to yellowish in dry specimens (particularly head, pronotum and scutellum). Membrane uniformly greyish, rather pale or translucent, with the veins enclosing minor cell greenish. Rostral segment IV apically darkened. Tibial spines pale, transparent to amber coloured. Tarsomere III of posterior legs apically darkened in some specimens; more rarely also in other legs. Dorsal pubescence consisting of long, semierect, whitish to slightly brownish setae; in some specimens all setae pale.

Total length (mm) = 2.58–2.78. Body elongate to moderately ovate, rather ovate in females, $3.19(3.06–3.38) \times (\sigma\sigma)$, $3.05(2.94–3.12) \times (\varphi\varphi)$ longer than pronotum width. Head $0.70–0.80 \times$ as wide as pronotum. Vertex marginate near eyes, seldom

entirely. Ocular index = $2.04(2.00–2.17) (\sigma\sigma)$, $2.39(2.16–2.73) (\varphi\varphi)$. Rostrum slightly surpassing metacoxae. Length of antennal segments (mm) = $0.20–0.25$ (I) – $0.82–0.93$ (II) – $0.37–0.50$ (III) – $0.25–0.30$ (IV). Ratio antennal segment II / pronotum width = $1.05(0.97–1.16) (\sigma\sigma)$, $1.00(0.94–1.06) (\varphi\varphi)$. Pronotum strongly transverse, $2.29–2.62 \times$ as wide as medially long; anterior margin insinuate, posterior margin sub-straight; lateral margins gently convex. Hemelytra long, distinctly surpassing abdomen in both sexes. Ratio metatibiae length / pronotum width = $1.32–1.47$. Tibial spines equal or longer than tibial diameter. Approximate proportions between metatarsomeres = 8–11–15.

Male genitalia: Pygophore (Fig. 2) short, cone-like, its dorsal margin of genital opening provided with two median, highly sclerotized processes: to the left, a small one of horn-like shape; to the right, a large one of feather-like appearance, profusely covered

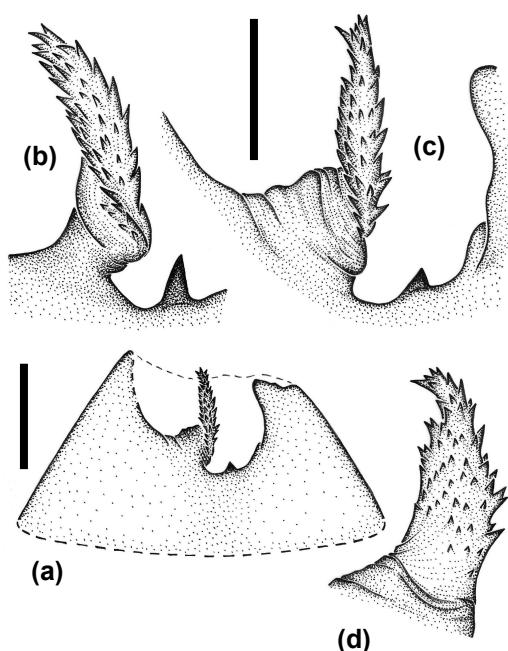


FIGURE 2. *Orthotylus (Parapachylops) junipericola magnieni* n. ssp., pygophore: (a) Simplified view of the whole; (b)-(d) Detail of the structures on the dorsal margin: (b)-(c) Dorsal view; (d) Lateral view (Scale bars: (a) = 0.2 mm; (b)-(d) = 0.1 mm).

with spines and basally twisted, arising from a stout protuberance. Right paramere as in Fig. 3a, with about a dozen of teeth on one side, separated in two groups, and a protruding structure ending in two points on the apex of opposite side. Left paramere as in Fig. 3b, with sensory lobe elongate, curved and ending in two small teeth, and hypophysis noticeable and with a hook-like curvature apically. Sclerotized appendages of the vesica (Fig. 4) consisting of two pieces: an outer, major one, provided with three elongate branches, one unarmed, the other two serrated, one of them profusely and including a «super-numerary» row of teeth with respect to the marginal rows of the main plane; a inner, minor one, provided with one elongate and apically serrated branch, and another one shorter and spine-like (unarmed).

Female genitalia: Genital chamber (Fig. 5a) sub-round; dorsal wall with conspicuous sclerotized rings, its inner margin nearly straight; vermiciform gland

and lateral oviducts without particularities; dorsal sac conspicuous, forming a wide and distinct structure on the posterior third. Dorsal lobes of interramal sclerites (= K structures) as in Fig. 5b, densely covered with spines, with some areas showing very long ones; each lobe is basally embraced by an additional area of long spines.

Type material:

HOLOTYPE (♂): «Maroc : Amizmiz, //N 31° 12 424, // W 8°14 697, Alt. // 1083 m, 11-V-2009, // A. Matocq leg».

PARATYPES: 40 specimens (21 ♂♂ + 19 ♀♀): same data as the holotype (12 ♂♂ + 14 ♀♀); «11 V 2009 Amizmiz Maroc // N31°12,43' W8°14,69' // 1081m sur Juniperus Ph. // Magnien leg.» (8 ♂♂ + 3 ♀♀); «Maroc : Tigoulit , // N 32° 04,016° W 6° // 15,342' ; alt 1638 m. ;19- // VI-2013 A. Matocq leg» (1 ♂ + 2 ♀♀).

A red label is now added below: «HOLOTYPE [or PARATYPE] ♂ [or ♀] // *Orthotylus (Parapachylops) junipericola magnieni* n. ssp. // Matocq & Pagola-Carte, 2020». The specimens are mounted on a white card; the genitalia examined are mounted below on a transparent card.

Deposited in the Muséum national d'Histoire naturelle (MNHN), Paris (HT + 2 PT ♂♂ + 2 PT ♀♀), Coll. A. Matocq, Paris (9 PT ♂♂ + 12 PT ♀♀), Coll. Ph. Magnien, Paris (6 PT ♂♂ + 1 PT ♀), Coll. S. Pagola-Carte, Villabona (4 PT ♂♂ + 4 PT ♀♀). Holotype numbered MNHN/EH 24750.

Etymology:

Kindly dedicated to our colleague and friend, Philippe Magnien, who collected specimens of this species in Morocco with one of us (AM). An invariable genitive.

Type locality:

Morocco: Region of Marrakech-Safi: Amizmiz.

Distribution and biology:

The new subspecies has been collected in two localities of Morocco (Amizmiz and Tilougguit, regions of Marrakech-Safi and Béni Mellal-Khénifra, respectively), in the High Atlas Mountain Range and distant from each other about 200 km.

According to the collecting data, adults live in May-June at altitudes between 1000-1700 m, on *Juniperus* sp. (Cupressaceae).

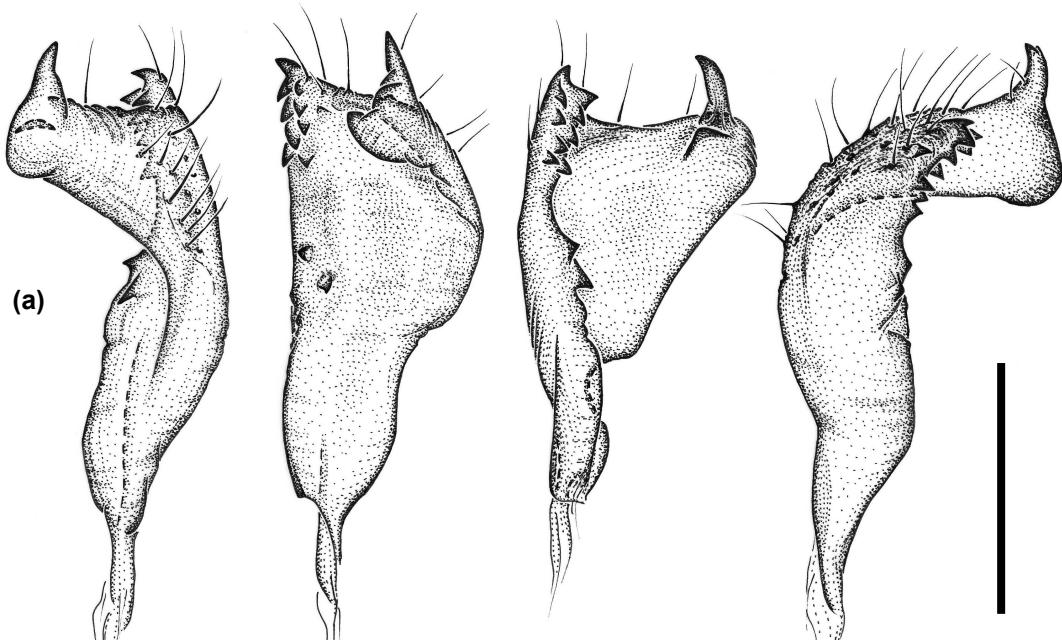


FIGURE 3. *Orthotylus (Parapachylops) junipericola magnieni n. ssp.*, male genitalia: (a) Right paramere in different views and/or specimens; (b) Left paramere (Scale bar = 0.2 mm).

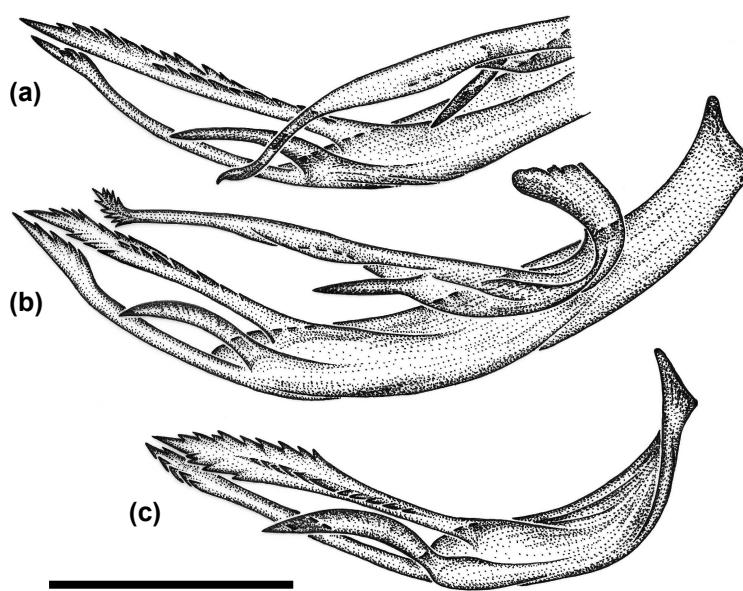


FIGURE 4. *Orthotylus (Parapachylops) junipericola magnieni n. ssp.*, male genitalia: (a)-(c) Sclerotized appendages of the vesica in different views and/or specimens (in (c) only major appendage illustrated) (Scale bar = 0.2 mm).

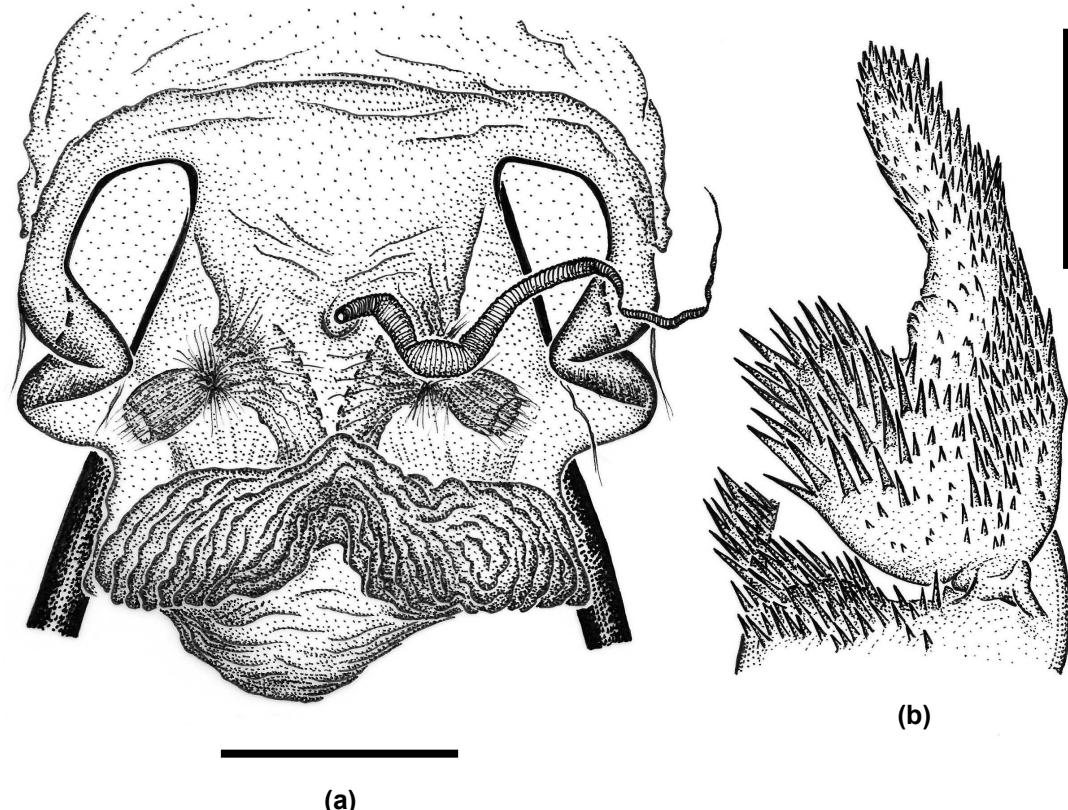


FIGURE 5. *Orthotylus (Parapachylops) junipericola magnieni* n. ssp., female genitalia: (a) Genital chamber, dorsal wall; (b) Right dorsal lobe of interramal sclerites (K structure) (Scale bars: (a) = 0.2 mm; (b) = 0.1 mm).

Orthotylus (Parapachylops) junipericola carinatoides n. ssp. Pagola-Carte & Matocq

Habitus as in Fig. 6. Intense green; head, pronotum and scutellum turning to yellowish in dry specimens; scutellum most markedly yellow, probably also so in living specimens (as in members of the subgenus *Litocoris*). Membrane uniformly greyish, all veins intense yellow (at least in dry specimens). Rostral segment IV apically darkened. Tibial spines pale, amber coloured. Tarsomere III of all legs apically darkened. Dorsal pubescence consisting of long, semierect, whitish to slightly brownish setae.

Total length (mm) = 2.82–3.39. Body elongate to moderately ovate, 2.95–3.38 × longer than pronotum

width. Head 0.75–0.79 × as wide as pronotum. Vertex slightly marginate near eyes. Ocular index = 1.75. Rostrum reaching mesocoxae. Length of antennal segments (mm) = 0.22–0.25 (I) – 0.95–1.08 (II) – 0.42–0.50 (III) – 0.25–0.26 (IV). Ratio antennal segment II / pronotum width = 1.00–1.08. Pronotum transverse, 2.17–2.50 × as wide as medially long; anterior margin slightly insinuate medially, posterior margin sub-straight; lateral margins gently convex to sub-straight. Hemelytra long, distinctly surpassing abdomen in both sexes. Ratio metatibiae length / pronotum width = 1.33–1.39. Tibial spines equal or longer than tibial diameter. Approximate proportions between metatarsomeres = 8–13–19.

Male genitalia: Pygophore (Fig. 7) short, cone-like,



FIGURE 6. *Orthotylus (Parapachylops) junipericola carinatoides* n. ssp., habitus of the male (holotype) (Scale bar = 1 mm).

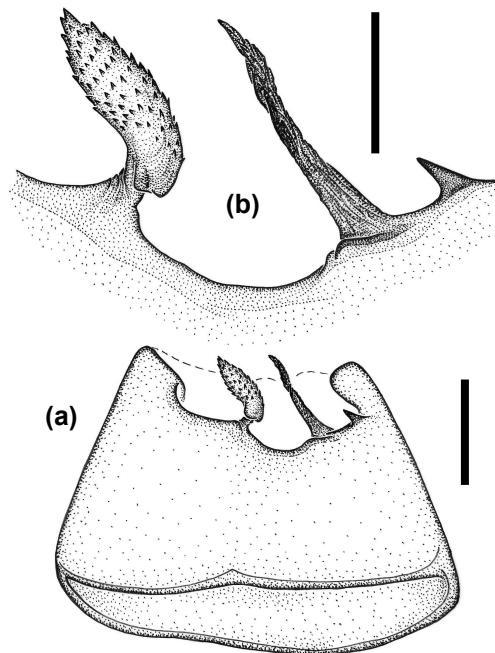


FIGURE 7. *Orthotylus (Parapachylops) junipericola carinatoides* n. ssp., pygophore: (a) Simplified view of the whole; (b) Detail of the structures on the dorsal margin (Scale bars: (a) = 0.2 mm; (b) = 0.1 mm).

its dorsal margin of genital opening provided with three, highly sclerotized processes: to the left, two horn-like ones, the more lateral small, the more central very long and granulated or coarsely shaped; to the right, a large one of leaf-like appearance, profusely covered with spines and basally twisted, arising from a stout protuberance. Right paramere as in Fig. 8a, elongate, with a roundish, long apical prolongation and about a dozen of teeth on one side not forming groups. Left paramere as in Fig. 8b, sub-triangular and slender, its hypophysis noticeable and with a hook-like curvature apically. Sclerotized appendages of the vesica (Fig. 9) consisting of two pieces: an outer, major one, provided with four elongate branches, one unarmed and spine-like, the other three serrated, more or less twisted and of diverse development; a inner, minor one, provided with one elongate, twisted and apically serrated branch, and another one shorter and with three teeth.

Female: Unknown.

Type material:

HOLOTYPE (♂): «Maroc: Environ de Aqesri, // N 30° 37 549, W 9° 30 511 // Alt. 207 m, 6-V-2009 // A. Matocq leg.».

PARATYPES: 5 ♂♂: same data as the holotype.

A red label is now added below: «HOLOTYPE [or PARATYPE] ♂ // *Orthotylus (Parapachylops) junipericola carinatoides* n. ssp. // Pagola-Carte & Matocq, 2020». The specimens are mounted on a white card; the examined genitalia are mounted below on a transparent card.

Deposited in the Muséum national d'Histoire naturelle (MNHN), Paris (HT), Coll. A. Matocq, Paris (3 PT ♂♂), Coll. S. Pagola-Carte, Villabona (2 PT ♂♂). Holotype numbered MNHN/EH 24751.

Etymology:

Named for the similarities of the male genitalia to those of the species *O. (P.) carinatus* Wagner, 1968,

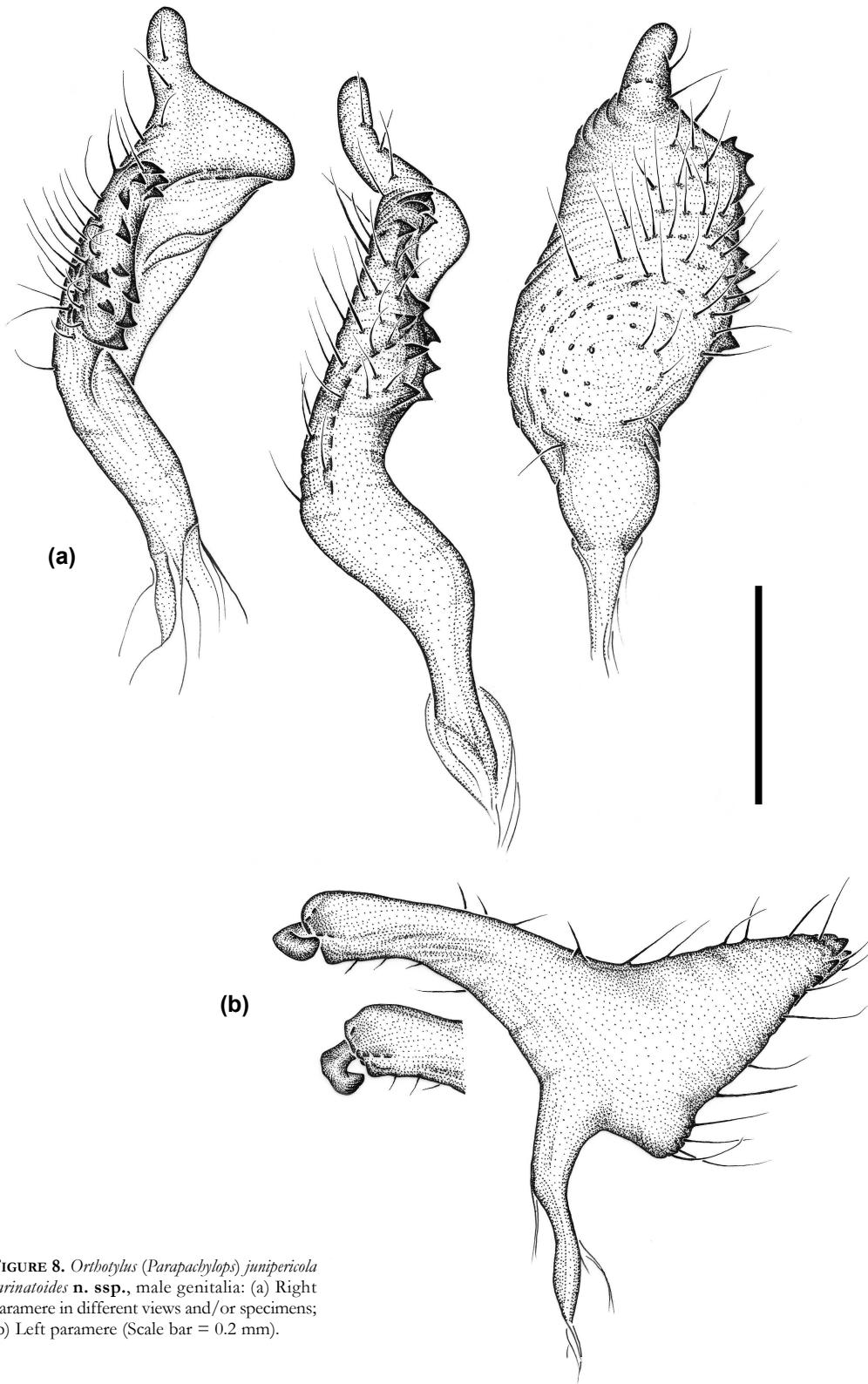


FIGURE 8. *Orthotylus (Parapachylops) junipericola carinatoides* n. ssp., male genitalia: (a) Right paramere in different views and/or specimens; (b) Left paramere (Scale bar = 0.2 mm).

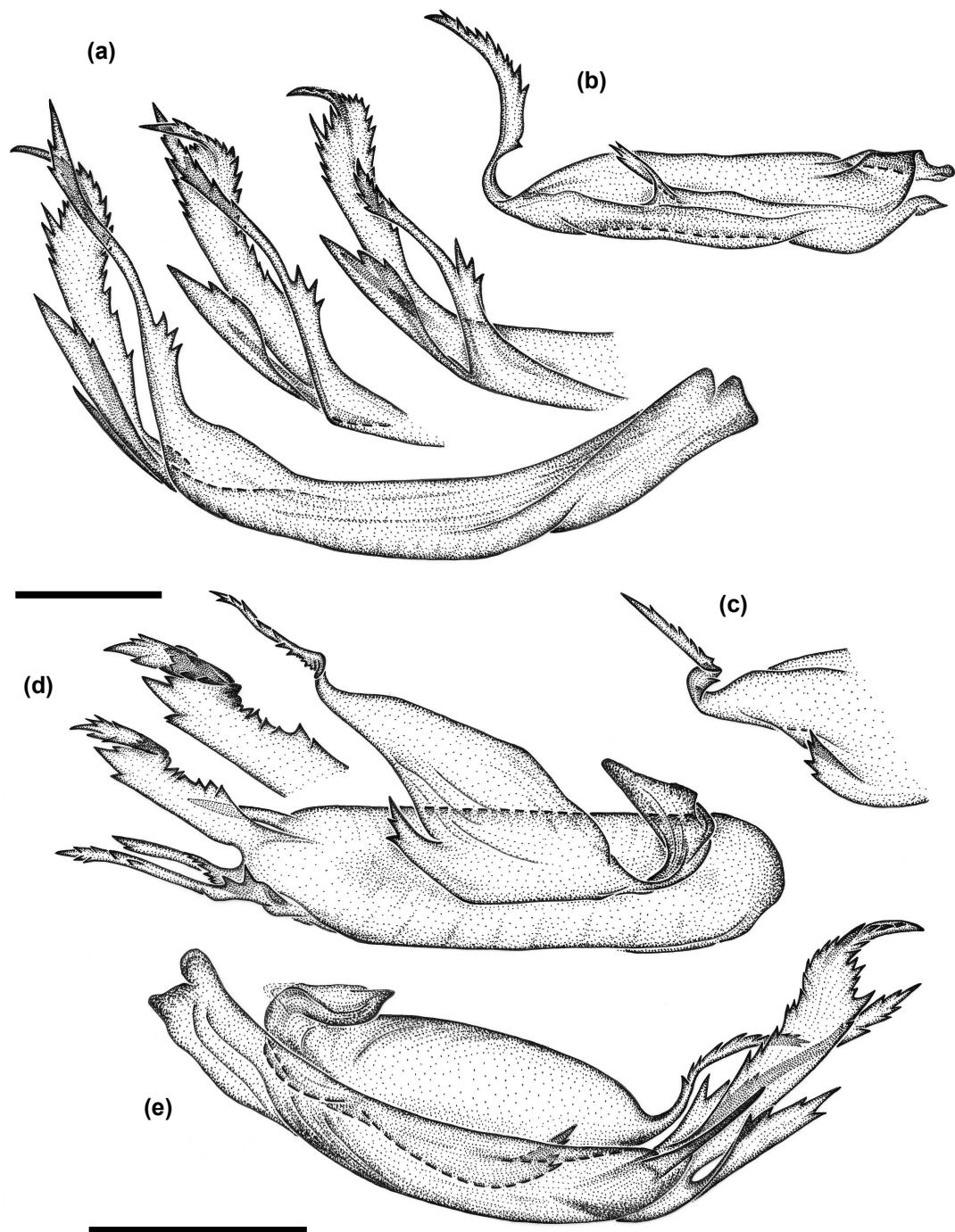


FIGURE 9. *Orthotylus (Parapachylops) junipericola carinatoides* n. ssp., male genitalia: (a)-(e) Sclerotized appendages of the vesica in different views and/or specimens (only (d)-(e) showing both major and minor appendages together) (Scale bar = 0.2, except for the magnified detail in (d) = 0.1 mm).

the Greek suffix «-oides» meaning «resembling». (See Discussion for a revised status of this species.). An invariable noun in apposition.

Type locality:

Morocco: Region of Souss-Massa: Aqesri.

Distribution and biology:

Only known from the type locality, at the beginning of May. Host plant unknown.

Discussion

Both new taxa can be ascribed to *Orthotylus* (*Parapachylops*) for sharing the diagnostic characters of external morphology and male genitalia as established and/or discussed by Ehanno and Matocq (1990) and Carapezza (1997) (see Introduction). They can be easily separated from the remaining taxa included in the subgenus, and specifically from other subspecies of *O. (P.) junipericola*, mainly by the unique combination of characters of their male genitalic structures. All the available illustrations of parameres and sclerotized appendages of the vesica (Wagner, 1955, 1968, 1974; Linnnavuori, 1965; Josifov, 1974a, 1974b; Ribes, 1978, 1990; Carapezza, 1984, 1997; Ehanno and Matocq, 1990; Ribes and Borges, 2001) have been examined in a comparative way.

A difficult task has been the assignment of specific or subspecific rank, particularly so in the case of *O. (P.) junipericola carinatoides n. ssp.* Finally, in view of the high variability of male genitalia shown by *O. (P.) junipericola* across its geographic distribution (best appreciated in: Carapezza, 1997), we have adopted a «conservative» criterion, considering both new taxa as subspecies of it. Indeed, the complex *O. (P.) junipericola* represents one of the most intriguing taxa among circum-Mediterranean mirids. In connection with the unclear boundaries between some of its subspecies and a likely clinal variation, it can be considered a «Rassenkreis» (see: Carapezza, 1997; Ribes and Borges, 2001) even though nothing is known about the underlying genetic structure of the complex, its geographic origin, interfertility between populations, etc.

Such high variability shown by the male genitalic structures within *O. (P.) junipericola* is even higher after the present descriptions. For example, in *O. (P.) junipericola magnieni n. ssp.* the sclerotized appendages of the vesica are rather disparate, since the major

piece is only divided into three branches (instead of four) and one of those branches shows a «supernumerary» row of teeth. In *O. (P.) junipericola carinatoides n. ssp.* the parameres exhibit a high similarity to those of *O. (P.) carinatus* Wagner, 1968 (see: Carapezza, 1997: figs. 26c-d), including the fact of their comparatively greater size (compare scales on drawings), which is not due to the larger size of the insects but very partly.

Interestingly, *O. (P.) carinatus*, known from Morocco and Tunisia (Wagner, 1968; Carapezza, 1997; Aukema, 2018), can also be included within the range of variability currently recognized for *O. (P.) junipericola*, so that a new status is proposed for it: *Orthotylus* (*Parapachylops*) *junipericola carinatus* Wagner, 1968 (**new subspecific status**). The most straightforwardly unifying character among all subspecies of *O. (P.) junipericola* is the drill-shaped left paramere, distinguishing them from the other species of the subgenus.

As indicated in the Introduction, the previously known subspecies of *O. (P.) junipericola* were aggregated in two groups by Carapezza (1997) on the basis of the shape of the sclerotized appendages of the vesica. Which group do *O. (P.) j. carinatus n. stat.*, *O. (P.) j. magnieni n. ssp.* and *O. (P.) j. carinatoides n. ssp.* belong to?

According to the length of the branches of the sclerotized appendages of the vesica, both *O. (P.) j. magnieni n. ssp.* and *O. (P.) j. carinatoides n. ssp.* could belong to the *junipericola*-group. However, we are inclined to consider these new taxa as forming their own, third group of subspecies together with *O. (P.) j. carinatus n. stat.* (see «Updated checklist» section below), on the basis of a probably close phylogenetic relationship suggested by similarities concerning the right paramere and the processes on the margin of the genital opening, one of them leaf- or feather-like at least in the two new subspecies.

Updated checklist

All known species and subspecies of *Orthotylus* (*Parapachylops*) are alphabetically listed, including the groups of subspecies proposed for *O. (P.) junipericola* by Carapezza (1997) and ourselves. As to these groups, informal appellations such «North-African» or «European-Anatolian» groups have been obviated due to their innaccuracy from current chorological knowledge. Distributions are mainly those given by Aukema (2018).

Orthotylus (Parapachylops) buresci Josifov, 1969 – EUROPE: Bulgaria, Greece.

Orthotylus (Parapachylops) caprai Wagner, 1955 – EUROPE: Austria, Belgium, Croatia, France (Monaco), Germany, Great Britain, Italy, Netherlands, Sardinia, Spain, Switzerland. – ASIA: Asian Turkey.

Orthotylus (Parapachylops) hodiernus Linnauvori, 1961 – ASIA: Turkey, Israel, Jordan.

Orthotylus (Parapachylops) junipericola Linnauvori, 1965

– *junipericola*-group:

Orthotylus (Parapachylops) junipericola contractulus Linnauvori, 1965 – NORTH AFRICA: Libya.

Orthotylus (Parapachylops) junipericola junipericola Linnauvori, 1965 – NORTH AFRICA: Tunisia.

Orthotylus (Parapachylops) junipericola regularis Linnauvori, 1965 – EUROPE: France (Monaco), Sicily. – NORTH AFRICA: Tunisia.

– *terminalis*-group:

Orthotylus (Parapachylops) junipericola armoricanus Ehanno & Matocq, 1990 – EUROPE: France, Spain.

Orthotylus (Parapachylops) junipericola attilioi J. Ribes & Borges, 2001 – NORTH AFRICA: Azores.

Orthotylus (Parapachylops) junipericola balcanicus Josifov, 1974 – EUROPE: Bulgaria, France (Monaco), Greece.

Orthotylus (Parapachylops) junipericola castellanus J. Ribes, 1978 – EUROPE: Spain.

Orthotylus (Parapachylops) junipericola terminalis Linnauvori, 1965 – EUROPE: Greece (Rhodes). – ASIA: Turkey.

– *carinatus*-group:

Orthotylus (Parapachylops) junipericola carinatoides Pagola-Carte & Matocq **n. ssp.** – NORTH AFRICA: Morocco.

Orthotylus (Parapachylops) junipericola carinatus Wagner, 1968 (**new subspecific status**) – NORTH AFRICA: Morocco, Tunisia.

Orthotylus (Parapachylops) junipericola magnieni Matocq & Pagola-Carte **n. ssp.** – NORTH AFRICA: Morocco.

Orthotylus (Parapachylops) mariagratiæ Carapezza, 1984 – EUROPE: Crete, Greece.

Orthotylus (Parapachylops) matocqi Carapezza, 1997 – NORTH AFRICA: Tunisia.

Orthotylus (Parapachylops) putshkovi Josifov, 1974 – ASIA: Iran, Kirgizia.

As can be seen, the three subspecies of the *carinatus*-group are present in Morocco, but their known distributions do not overlap. By contrast, the problem of different subspecies occurring together in small areas has been raised by Ponel *et al.* (2013: 229) for *O. (P.) j. balcanicus* and *O. (P.) j. regularis* in Monaco: «*La présence à Monaco de deux sous-espèces d'Orthotylus junipericola, vérifiées sur les genitalia mâles, pose évidemment un problème taxinomique [...]*». An explanation of this coexistence was given by Carapezza and Cusimano (2014: 373-374), who observed that *O. (P.) j. regularis* in the last 20 years is spreading northwards its range and maybe regarded as an invasive taxon of the type «alien in Europe» (*sensu* Rabitsch, 2010). The same phenomenon regards another taxon of *Parapachylops*: *O. (P.) caprai* was considered an endemic of Sardinia until 25 years ago and now is present in most of Europe. But it could affect also other taxa of the subgenus *Parapachylops*, resulting in the «meeting» of lineages (species or subspecies) originating from different geographic origins, similarly to the mentioned case of Monaco (A. Carapezza, pers. comm.).

Acknowledgements

We are greatly indebted to Jean-Claude Streito (INRA, Montpellier), for the photographs of Fig. 1, and Attilio Carapezza (Palermo), for reviewing the manuscript thus improving it.

References

- AUKEMA B (Ed.). 2018. *Catalogue of the Palaearctic Heteroptera*. Naturalis Biodiversity Center. Available from: <https://catpalhet.linnaeus.naturalis.nl>. Last accessed: 7/09/2020.
- AUKEMA B, RIEGER CH, RABITSCH W. 2013. *Catalogue of the Heteroptera of the Palaearctic Region, volume 6*. The Netherlands Entomological Society. Amsterdam.
- CARAPEZZA A. 1984. Miridi nuovi o poco noti di Grecia e Creta (Heteroptera). *Bollettino della Società Entomologica Italiana* 116(1-3): 5-9.

- CARAPEZZA A. 1997. Heteroptera of Tunisia. *Il Naturalista Siciliano* **21**(Suppl. A): 1-331.
- CARAPEZZA A, CUSIMANO C. 2014. Heteroptera in the aeroplanton of Palermo town, with two new records for Italy (Hemiptera Heteroptera). *Il Naturalista Siciliano* **38**(2): 367-380.
- EHANNO B, MATOCQ A. 1990. Compléments à la faune de France des Hétéroptères Miridae. *Orthotylus (Parapachylops n. subgen.) armoricanus n. sp.* *Bulletin de la Société Entomologique de France* **94**(9-10): 265-272.
- JOSIFOV M. 1974a. Neue südpaläarktische Miriden (Hemiptera, Heteroptera). *Reichenbachia* **15**(8): 61-68.
- JOSIFOV M. 1974b. Eine neue *Psallus*-Art aus Bulgarien und eine neue *Orthotylus*-Art aus Kirgisien (Heteroptera, Miridae). *Reichenbachia* **15**(13): 89-92.
- KERZHNER IM, JOSIFOV M. 1999. Miridae Hahn, 1833. In: Aukema B, Rieger Ch (Eds.). *Catalogue of the Heteroptera of the Palaearctic Region, volume 3. Cimicomorpha II*. The Netherlands Entomological Society. Amsterdam.
- LINNAURO R. 1965. Studies on the South- and Eastmediterranean hemipterous fauna. *Acta Entomologica Fennica* **21**: 1-70.
- PONEL PH, MATOCQ A, LEMAIRE J-M. 2013. Hétéroptères de la Principauté de Monaco: premier inventaire comprenant six taxons de Miridae nouveaux pour la faune franco-monégasque (Hemiptera). *Bulletin de la Société Entomologique de France* **118**(2): 223-234.
- RABITSCH W. 2010. True bugs (Hemiptera, Heteroptera). Chapter 9.1. In: Roques A et al. (Eds.). Alien terrestrial arthropods of Europe. *BioRisk* **4**(1): 407-433.
- RIBES J. 1978. Míridos interesantes de la provincia de Soria (Castilla) (Insecta Heteroptera). *Misclánea Zoológica* **4**(2): 51-75.
- RIBES J. 1990. Miscl·lània hemipterològica ibèrica (Heteroptera). *Sessió Conjunta d'Entomologia ICHN-SCL* **6**[1989]: 19-35.
- RIBES J, BORGES PAV. 2001. A new subspecies of *Orthotylus junipericola* Linnavuori, 1965 (Insecta, Heteroptera) from the Azores. *Arquipélago. Life and Marine Sciences* **18**A: 1-4.
- SCHUH RT. 1995. *Plant bugs of the world (Insecta: Heteroptera: Miridae). Systematic catalog, distributions, host list, and bibliography*. The New York Entomological Society. New York.
- SCHUH RT. 2002-2013. *On-line systematic catalog of plant bugs (Insecta: Heteroptera: Miridae)*. Available from: <http://research.amnh.org/pbi/catalog/>. Last accessed: 7/09/2020.
- WAGNER E. 1955. Eine neue *Orthotylus*-Art von der Insel Sardinien (Hem. Het. Miridae). *Bollettino della Società Entomologica Italiana* **85**(5-6): 92-93.
- WAGNER E. 1968. Über einige Miriden aus Marokko (Heteroptera). *Notulae Entomologicae* **48**: 103-112.
- WAGNER E. 1974. Die Miridae Hahn, 1831, des Mittelmeerraumes und der Makaronesischen Inseln (Hemiptera, Heteroptera). Teil 2. *Entomologische Abhandlungen herausgegeben vom Staatlichen Museum für Tierkunde in Dresden* **39**(Suppl.1)[1973]: 1-421.

Received / Recibido / Hartua: 30/09/2020

Accepted / Aceptado / Onartua: 1/11/2020

Published / Publicado / Argitaratua: 31/12/2020