



RESEARCH ARTICLE

A new species of *Paranocarodes* Bolivar, 1916 (Orthoptera: Pamphagidae) from Turkey

Mustafa Ünal¹

¹*Abant İzzet Baysal Üniversitesi, Fen Edebiyat Fakültesi, Biyoloji Bölümü, 14280 Bolu, Turkey. E-mail: unal@ibu.edu.tr*

urn:lsid:zoobank.org:pub:C3B5BCA3-AAB4-4A5B-898C-27003CDC3DDB

urn:lsid:zoobank.org:author:F8F1E009-F7AC-4858-B65A-140689D6B536

Abstract: A new species, *Paranocarodes turkmen* **sp. nov.** is described from Eskişehir and Kütahya Provinces of Turkey. In the description, some terms are used for the first time to explain the structures have taxonomic value, were not mentioned or mentioned differently in the previous papers on Pamphagidae. These new terms are described and discussed.

Key words: Orthoptera, Pamphagidae, *Paranocarodes*, new species, morphology, Turkey.

Introduction

The first member of the genus *Paranocarodes* Bolivar, 1916 was described from north western Turkey by Fieber in 1853 as *Pamphagus straubei* Fieber, 1853. Brunner (1882) described the second species from western Turkey as *Nocarodes fieberi* Brunner, 1882. Bolivar (1912) gave the description of *Nocarodes straubei* var. *sulcatus* Bolivar, 1912 from Akbes (now in Hatay Province of Turkey). Subsequently, Bolivar (1916) erected the genus *Paranocarodes*, with *Paranocarodes straubei* (Fieber) as the type species. He included *P. sulcatus* as the variety of *P. straubei* and *P. fieberi* as a distinct species. Up to the present, 17 species and subspecies of *Paranocarodes* have been described (Uvarov 1949; Karabağ 1949; Mistshenko 1951; Ramme 1951; Peshev 1965; Demirsoy 1973). But now, 13 species and subspecies are valid and 4 taxa are synonyms (Demirsoy 1973, 1977; Presa & Garcia 1983; Eades *et al.* OSF-2014; Ünal TOS-2014).

The members of the genus are mostly distributed in the western half of Turkey. But *P. aserbeidshanicus* Ramme, 1951 in Azerbaijan, *P. chopardi* Peshev, 1965 in Bulgaria and Greece, *P. straubei insularis* Ramme, 1951 and *P. fieberi mytilenensis* Ramme, 1951 in

Greece are found. *Paranocarodes sulcatus* is recorded from Turkey, Syria, Iran and Armenia (Karabağ 1958; Bey-Bienko & Mistshenko 1951; Ramme 1951; Harz 1975; Kati & Willemse 2001; Willemse & Willemse 2008; Massa 2010).

In the present paper the description of a new species from Turkey, *Paranocarodes turkmen* **sp. nov.**, is given. In addition some new morphological terms, supraocular foveola found on the vertex, pseudolophi, arch of zygoma and tumida of zygoma found on the phallic complex, are used in describing the new species, and are discussed and explained in the “Discussion” section.

Material and methods

The grasshopper specimens were collected from two mountain ridges, Sündiken and Türkmen, between the years 2003 and 2006. Collecting these grasshoppers was mostly by hand, sometimes a hand net was used. They were prepared as museum material using the standard entomological methods. Photographs were taken by a DSLR camera. Drawings were made by a stereo microscope with a drawing attachment. The specimens of new species were compared with the type specimens of all known taxa of the genus in the collections of the Zoologisches Museum Berlin (ZMB), the Naturhistorisches Museum Wien (NMW), the Museo Nacional de Ciencias Naturales, Madrid (MNCN), the Natural History Museum, London (BMNH), and the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZIN).

The type materials of new species are preserved in Abant İzzet Baysal Üniversitesi Entomoloji Müzesi (AİBÜEM), Bolu, Turkey.

Results

Paranocarodes turkmen **sp. nov.** (Figs. 1–21)

[urn:lsid:zoobank.org:act:6100C937-ED0C-4FA1-9E42-150F3AA9B22C](https://zoobank.org/urn:lsid:zoobank.org:act:6100C937-ED0C-4FA1-9E42-150F3AA9B22C)

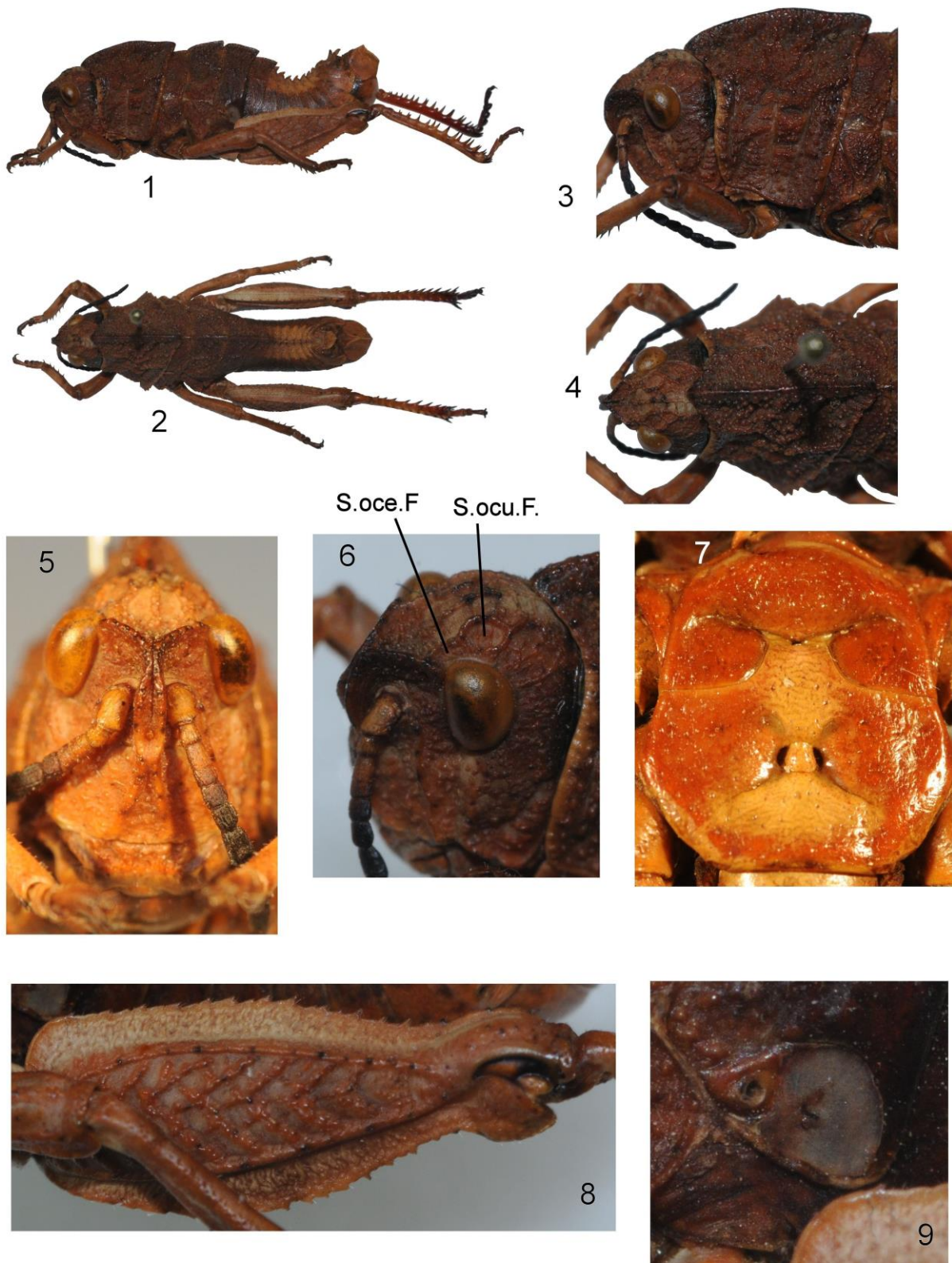
Diagnosis: This new species is easily separated from all known species of the genus by the structure of phallic complex, the large and stout body and the coloration of the hind legs. Phallic complex large; apodemes S-shaped in dorsal view; lobes of zygoma narrow along its length; tumida of zygoma present; arch of zygoma elongated far beyond the lobes; lateral aperture of the sheath of penis wide. Supraocular foveolae on vertex closed. Inner surface of hind femur blackish red basally and creamish red distally in male; orange basally and creamish grey distally in female. Hind tibia orange basally and reddish distally in male, yellow in female.

Description

Male (holotype): Body large and stout as for the genus, compressed laterally (Figs. 1-2). Fastigium of vertex distinctly pitted (Figs. 5-6). Supraocular foveolae (Fig. 6) very distinct on both sides of vertex, rounded and closed; in some males slightly square; between them vertex divided into small cells by median carinula of vertex and small carinulae (Figs. 4, 6). Supraocellar foveola (Fig. 6) small parallelogram. Distance between eyes as long as vertical diameter of eye and 1.3 times longer than horizontal diameter of eye. Antennae shorter than head and pronotum together (Figs. 3-4), with 14 segments. Frontal ridge (Fig. 5) narrow reaching to clypeus, strongly narrowed just below the median ocellus then diverged towards clypeus. Pronotum (Figs. 3-4) compressed laterally, strongly tuberculate; anterior margin

triangularly projected forwardly, posterior margin triangular but hind corner blunt, not reaching to end of mesothorax; with high and distinctly raised median carina, very convex in lateral view, without longitudinal groove (it can only be seen indistinctly in front of the median carina in a very short distance); lateral carinae of pronotum very slightly distinct in prozona and metazona, almost lost among the pronotal tubercles. Prosternum raised, with a sharp spiniform projection. Mesosternal lobes (Fig. 7) wider than long and 1.3 times wider than mesosternal interspace. Fore tibia with 3-4, mid tibia with 4-5 ventral spines on each row. Hind tibia with 9 inner, 10 outer spines dorsally including apical spines of both row, with 4 apical spurs. Upper carina of hind femur (Fig. 8) slightly convex, strongly and sharply serrated; lower carina with strong and blunter teeth. First abdominal tergum with a large tympanum (Fig. 9), almost 3.5 times larger than spiracle. Abdominal tergites (Fig. 1) distinctly raised, median projections extending beyond the posterior margin of tergites. Epiproct heptagonal, 1.3 times longer than wide; its surface almost smooth, no any distinct carinula or sulcus. Cercus short distinctly incurved along its length. Subgenital plate compressed, its upper corner pointed, posterior margin sharp, roof-shaped (Figs. 1-2). Pallium not raised. Phallic complex (Figs. 10-12) quite large as for the genus. Apical valves of penis (Fig. 10) large, its ventral margin turns to lateral sides at apex, this part formed elongated elliptical in posterior view; basal valves of penis (Figs. 10-11) plate-shaped, long and broadly rounded at base, clearly longer than apodemes. Apodemes S-shaped in dorsal view (Fig. 11), distal tips narrowed; dorsal aperture between 2 branches of apodemes narrow. Posterior lobes of zygoma narrow, its width almost the same along its length; tumidae of zygoma (lower swellings of posterior lobes) present, with rough surface (Figs. 10-11); arch of zygoma lower than lobes of zygoma (Fig. 10), distinctly elongated towards the apical valves of penis. Apical valves of penis covered by the sheath of penis in posterior view; lateral aperture of the sheath wide and a big portion of apical valves of penis visible in lateral view. Rami with a narrow postero-ventral rod which is base of the sheath of penis. Dorsal surface of epiphallus (Fig. 12) strongly swelled, ancorae large; pseudolophi with 22-24 spines in each group, positioned on anterior wall of dorsal swelled part.

Female: Body (Figs. 13-14) very large, compressed laterally, but anterior portion from pronotum to 2nd abdominal tergite widened in dorsal view. Head (Figs. 17-18) as in male but eyes smaller; distance between eyes 1.3 times longer than vertical diameter of eye and 1.8 times longer than horizontal diameter of eye. Antennae (Figs. 15-16) clearly shorter than length of pronotum; with 14 segments. Pronotum (Figs. 15-16) high, compressed laterally, 1.2 times higher than long; median carina raised, without longitudinal groove; no lateral carinae; metazona in both sides of median carina depressed at posterior end; anterior and posterior margins of pronotum as in male; posterior margin reaching slightly beyond hind margin of mesonotum, but in some females shorter. Prosternum as in male. Mesosternal lobes (Fig. 19) 1.5 times wider than its length and mesosternal interspace. Fore and mid tibia with 4 ventral spines on each row. Hind tibia as in male. Hind femur (Fig. 20) with straighter upper carina than that of male, but in some females as in male. Abdominal tergites (Figs. 13-14) raised; median projections of first 3 tergites extending beyond hind margin of tergites. Epiproct pentagonal, 1.9 times longer than wide, pointed at apex; apical triangular part separated by a transversal groove; with 2 longitudinal carinulae formed a median longitudinal sulcus. Cercus very small, compressed laterally, triangular in lateral view. Tympanum (Fig. 21) slightly more than twice as large as spiracle. Subgenital plate almost rectangular, posterior margin with a small rounded projection in middle, in some females posterior margin weakly trilobate. Ovipositor with large and stout valves; outer side of lower valves with very small teeth that indistinct in some females.



Figures 1–9. *Paranocarodes turkmen* sp. nov., male. **1**, habitus; **2**, ditto dorsal view; **3**, head and pronotum; **4**, ditto, dorsal view; **5**, head, frontal view; **6**, head, dorsolateral view (**S.oce.F.**: supraocellar foveola, **S.ocu.F.**: Supraocular foveola); **7**, meso- and metasternae; **8**, left hind femur, outer surface; **9**, tympanum.

Coloration: Male: brown, slightly reddish-brown with indistinct small black spots. Head weakly reddish brown, anterior carinae and lateral carinulae of fastigium of vertex, median carina of vertex, lateral carinae of frontal ridge and subocular carina with small black spots. First 3 segments of antennae brown, remaining part black. Pronotum brown with small black spots along median carina; anterior and posterior margins of paranota with thin, light brown bands. Abdomen except first 2 tergites lighter; between 2nd abdominal tergite and epiproct dorsally with a light (milky brown) band as in most of the males of the genus *Paranocarodes*. Subgenital plate and abdominal sternites milky or yellowish brown. Legs reddish brown with small sparse black spots. Outer surface of hind femur brown, its upper portion of dorsal carinula milky brown; inner surface blackish red in basal part turns to cream red and cream towards apex, no distinct transversal band; inner half of lower surface reddish. Inner surface of hind tibia orange in basal part, indistinctly turns to red towards apex; outer half of tibia in dorsal view yellow or yellowish; tips of tibial spines black. Tarsus red on dorsal surface. Female: One female as in male with light brown body color. All the other females grey with small black spots. Last 5-8 segments of antennae blackened, basal portion grey, in one female brown. Inner surface of hind femur orange in basal part, turns to greyish cream in apical part; inner half of lower surface of hind femur pale orange. Inner and dorsal surface of hind tibia yellow; tibial spines with black tips. Dorsal surface of tarsus yellow or greyish yellow.

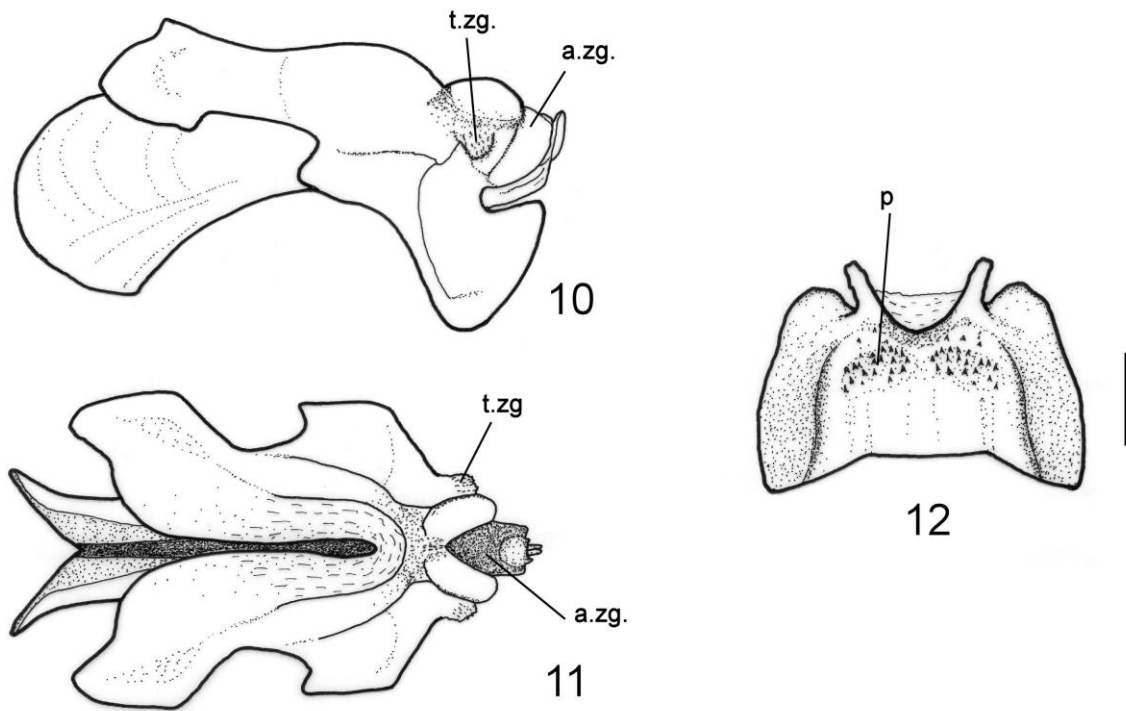
Measurements (mm): Holotype: length of body: 29.1; pronotum: 8; hind femur: 12.5. Paratypes: length of body: male 28.8-31.3, female 47.1-52.9; pronotum: male 8.0-9.1, female 13.6-15.2; hind femur: male 12.3-12.9, female 16.9-18.

Type material: Holotype ♂, TURKEY, Eskişehir Province, Sündiken Dağları, Türkmen Tepesi, 39°54'439" N 30°41'584" E, 1524 m, 4.vi.2006 (leg. M. Ünal) (AİBÜEM). Paratypes, 4♂, 2♀, same data with holotype; 1♂, same locality with holotype, 6.vi.2006; 1♀, TURKEY, Kütahya Province, Türkmen Dağı, Söğüt Yaylası, 39°22'574" N 30°16'726" E, 1530 m, 21.vii.2003; 1♀, same locality with previous one, 1555 m, 20.vii.2004; 1♀, same locality with previous one, 1570 m, 5.vi.2006; (all leg. M. Ünal) (AİBÜEM).

Etymology: This new species were collected from "Türkmen" hill in Eskişehir Province and from "Türkmen" Mountain in Kütahya Province. It is named after both known localities.

Differential diagnosis

The colors of hind legs of new species are similar with *Paranocarodes chopardi* Peshev, 1965 and *P. straubei straubei* (Fieber, 1853). The new species is different from *P. chopardi* in details of the colors of hind legs. Inner and lower surfaces of hind femur black in *P. chopardi* (orange in the new species); hind tibia darker red or orange in male and bright orange in female of *P. chopardi* (orange-red in male, yellow in female of the new species); besides the larger and higher body, the shapes of the apodemes, posterior lobes of zygoma, arch or zygoma and the hind femora in both sexes are clearly different from *P. chopardi*. The coloration of hind legs in *P. straubei straubei*: inner surface of hind femur blackened in male, mostly body color slightly orange in basal part in female, with a small blackish spot in some females of (orange at basal part and creamish grey in apical part in the new species); inner surface of hind tibia in male similar with the new species but darker, orange in female (yellow in the new species); besides the larger and distinctly stouter body (clearly slender in *P. straubei straubei*); very different phallic complex, the presence of tumidae of zygoma (absent in *P. straubei straubei*), the shapes of the apodemes, posterior lobes of zygoma and arch of zygoma are different.



Figures 10–12. *Paranocarodes turkmen* sp. nov., male. **10**, phallus, lateral view (**a.zg.**: arch of zygoma, **t.zg.**: tumida of zygoma); **11**, ditto dorsal view habitus; **12**, epiphallus (**p.**: pseudolophi).

This new species is easily separated from *P. straubei straubei* (Fieber, 1853), *P. straubei serratus* Uvarov, 1949, *P. straubei paphlagonicus* Ramme, 1951, *P. fieberi fieberi* (Brunner, 1882), *P. fieberi tolunayi* Karabağ, 1949 and *P. atympanicus* Ramme, 1951 by the structure of phallic complex, especially by the presence of the tumidae of zygoma. All these species and subspecies do not have this structure. *Paranocarodes chopardi* Peshev, 1965, *P. fieberi anatoliensis* Demirsoy, 1973, *P. sulcatus* (Bolivar, 1912) and *P. beieri* Ramme, 1951 have the tumidae of zygoma. But all the other characters are very different from these species. Coloration of hind legs slightly similar to *P. sulcatus*, but the size and shape of body, the pronotum without longitudinal groove (with a distinct groove in *P. sulcatus*), the structure of phallic complex completely different.

This new species is different from *P. straubei insularis* Ramme, 1951 and *P. fieberi mytilenensis* Ramme, 1951 in the stouter and less compressed body, distinctly (deeply) pitted fastigium of vertex (slightly pitted in *P. straubei insularis* and *P. fieberi mytilenensis*), the colors of hind legs with yellow and orange (inner and lower surface of hind femur pale cream, hind tibia brownish cream in female holotype, slightly bluish in female paratype of *P. straubei insularis*. According to Harz (1975), hind tibia of *P. straubei insularis* blackish or dark brown in both sexes. Inner and lower surface of hind femur and tibia slightly darkened pale cream, darker apical part of tibia in female holotype of *P. fieberi mytilenensis*), the closed supraocular foveola (open and united with supraocellar foveola in *P. straubei insularis* and *P. fieberi mytilenensis*). It is also distinctly separated from *Paranocarodes asebeidshanicus* Ramme, 1951 in the all characters except the similar colors of hind legs of the female holotype of this species.

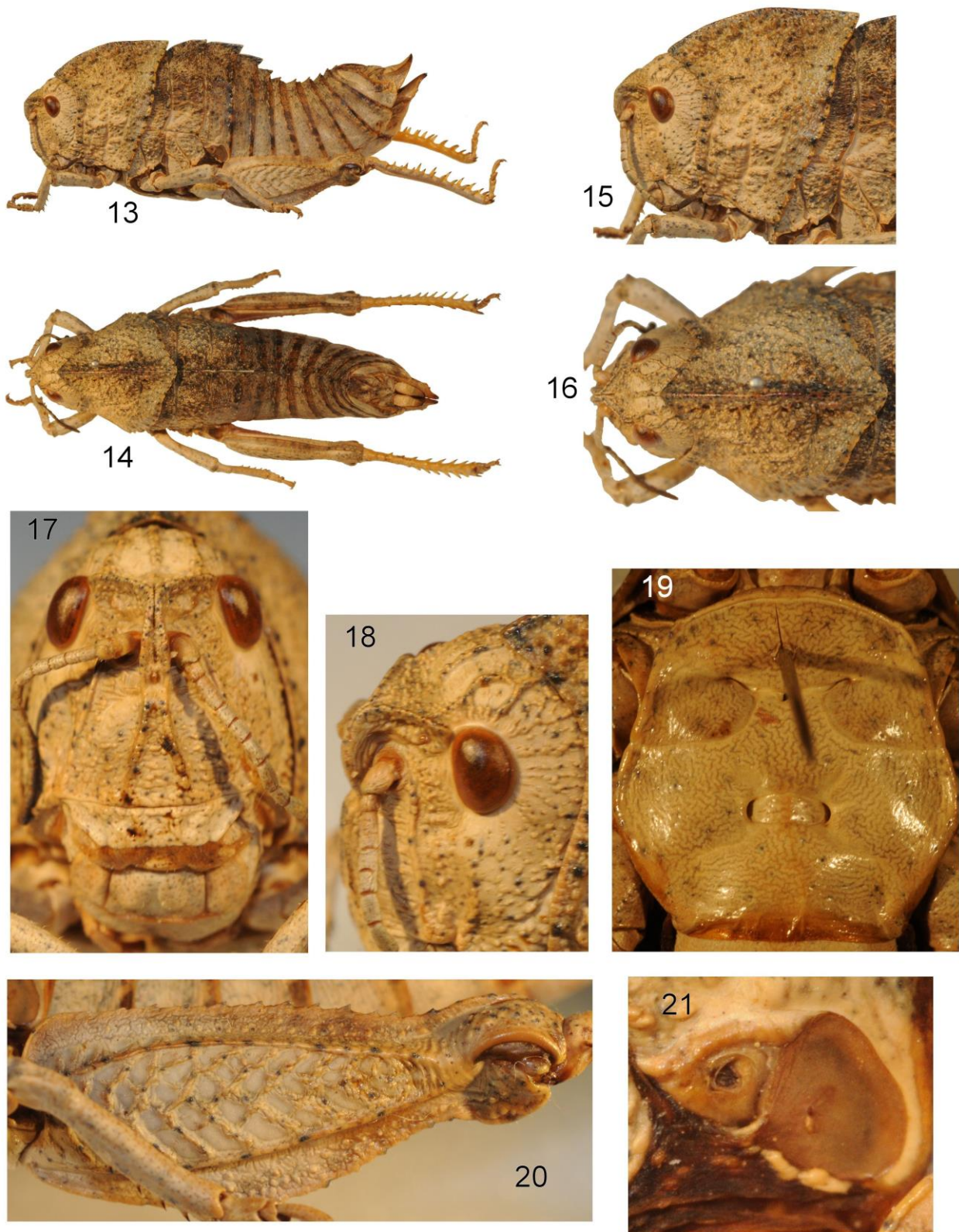
Discussion

The members of the genus *Paranocarodes* are mostly very similar to each other. Not only the recognition and description of new species but also the identification of unidentified specimens are very difficult unless all known species are seen together. However in spite of this I recognised this new species when I found the first female from Türkmen Mountain in Kütahya Province, because this new species can be recognised even by general appearance. On the other hand I found opportunities to study the type specimens of all known species of the genus including the synonyms in the relevant museums, and after these comparisons I have easily decided that this is a distinct undescribed species.

In the description section of *Paranocarodes turkmen* **sp. nov.** some terms are used for the first time to describe some stable characters that were not mentioned or mentioned without a differentiating name in the previous papers of Acridoidea, Acrididae and Pamphagidae (Roberts 1941; Uvarov 1943; Dirsh 1956; Harz 1975; Ihsan & Donskoff 1988; La Greca 1993).

Supraocular foveola (Figs. 6, 18) found on both lateral sides of vertex (just above the eye) is a typical structure for the most species of Pamphagidae. It is delimited by the lateral carinula of vertex from outer side and by the lateral carinula of fastigium of vertex from inner side. This typical state of this foveola is closed type. In some species lateral carinula of vertex is short and does not reach to the lateral carinula of fastigium of vertex in front part. In this case supraocular foveola is united with supraocellar foveola. This state is open type of supraocular foveola. Uvarov (1943) determined and described the foveolae, carinae and carinulae of vertex in the Thrinchinae, but a much more distinct foveola in the Pamphaginae was not mentioned. This paired structure on the vertex is a stable character for some species with its open or closed states and its shape. This structure is described in *Paranocarodes turkmen* **sp. nov.** and is named as *supraocular foveola*.

Pseudolophi (Fig. 12) is used for the structure consist of two groups or rows of spines on dorsal surface of epiphallus in Pamphagidae. The two groups of spines of epiphallus are only known in the family Pamphagidae (Roberts 1941; Uvarov 1943; Dirsh 1956). It was described by Roberts (1941: 214) as “The two lateral, and longitudinal rows of spines, and pair of hooks (ancorae?) on its [epiphallus] anterior margin are characteristic”, by Uvarov (1943: 13) as “...the broad, plate-like epiphallus armed with two groups of spines...”, by Dirsh (1956: 242) as “Two symmetrical rows, or groups, of strong spines or small ridges on dorsal surface”, by Ihsan & Donskoff (1988) as echinulation of epiphallus. But, none of them used a special name for this structure. Uvarov (1943: 24) stated after Boldyrev's (1929) study on the epiphallus of *Locusta migratoria* (Acrididae) that the position of two groups of spines of epiphallus in Pamphagidae agree with the expanded lophi of *L. migratoria*. According to Roberts (1941: 244) lophi is only characteristic of the Cryptosacci [not included the family Pamphagidae]. Dirsh (1956) stated that lophi is completely absent [in Pamphagidae] and the two groups of spines of epiphallus probably perform the grasping function, replacing the absent lophi. According to La Greca (1993) there are two areas [on epiphallus] spinulate that he considered to be an extremely primitive lophi of the families of more advanced Acridomorpha. Later, the present author (Ünal 2007) and Massa (2013) used the term lophi for this structure. The origin of lophi is unknown and there is no evidence that this type of epiphallus is more advanced (Uvarov 1943) or more primitive (La Greca 1993) than the usual Acridid type. Even if either of these opinions is true this special structure would not be an actual lophi. Therefore this structure found only in the family Pamphagidae is named as *pseudolophi*.



Figures 13–21. *Paranocarodes turkmen* sp. nov., female. 13, habitus; 14, ditto dorsal view; 15, head and pronotum; 16, ditto, dorsal view; 17, head, frontal view; 18, head, dorsolateral view; 19, meso- and metasternae; 20, left hind femur, outer surface; 21, tympanum.

Arch of zygoma (Figs. 10-11) is used for a structure positioned between the posterior lobes of zygoma and the apical valves of penis. This structure seen mainly in the tribe Nocarodeini is an important taxonomic character in genus and species levels. Dirsh (1956: 225) included the term “arch of dorsal valves” of Roberts (1941: 241) into his term “arch of cingulum”. But, according to Dirsh (1956) arch of cingulum is absent and zygoma connected directly with apical valves of penis in *Pamphagus elephas* (Pamphaginae). In the present tribe Nocarodeini including the all members of the genus *Paranocarodes* possess a structure between the posterior lobes of zygoma and apical valves of penis has not been showed in the previous papers (Roberts 1941; Uvarov 1943; Dirsh 1956; Harz 1975; Ihsan & Donskoff 1988; La Greca 1993). Therefore this character should be named to use in the descriptions. Because of its position I prefer to use the term “*arch of zygoma*” for this specific structure in the description of *Paranocarodes turkmen* **sp. nov.**

Tumida of zygoma (Figs. 10, 11), lower swelling of the posterior lobes of zygoma, is described for this new species. This structure is absent in some species of *Paranocarodes* that can be used to separate these taxa. It is not only found in Nocarodeini but also in Thrinchini.

Acknowledgements

I would like to thank to Judith Marshall (BMNH, London) for reading the manuscript as well as her helpful opinions and suggestions; to Michael Ohl (ZMB, Berlin), Susanne Randolf (NMW, Vienna), Mercedes París and Vincenta Llorente (MNCN, Madrid), George Beccaloni (BMNH, London), Andrej Gorochov (ZIN, St. Petersburg) for their assistance during my studies in the Museums; to the anonymous reviewers for their valuable suggestions. Some of the studies in the European Museums were supported by the European Commission's Research Infrastructure Action via the following SYNTHESYS Projects: DE-TAF-3895, ES-TAF-3897 and AT-TAF-3896.

References

- Bey-Bienko G. Ya & Mishchenko L. L. 1951.** *Fauna of the U.S.S.R. Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries. Part 1.* Zoological Institute of the U.S.S.R. Academy of Sciences, 38: 400 pp.
- Bolivar I. 1912.** Estudios entomológicos. I Los panfaginos paleárticos. *Trabajos del Museo Nacional de Ciencias Naturales Serie Zoológica* 6: 3–32.
- Bolivar I. 1916.** *Orthoptera Fam. Acridiidae. Subfam. Pamphaginae.* In: Wytzman, P. [ed.]. *Genera Insectorum* 170: 1–40, pl. 1; Bruxelles (V. Verteneuil & L. Desmet).
- Brunner von Wattenwyl C. 1882.** *Prodromus der europäischen Orthopteren.* XXXII+ 466 pp., Leipzig.
- Demirsoy A. 1973.** Revision der anatolischen Pamphagidae (Saltatoria, Caelifera, Pamphagidae). *Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg* 4: 403–428.
- Demirsoy A. 1977.** *Türkiye Caelifera (Insecta, Orthoptera) faunasının tesbiti ve taksonomik incelenmesi* (1). Atatürk Ünversitesi, Fen Fakültesi Yayınları, No: 80, 252 pp., Erzurum.
- Dirsh V. M. 1956.** The Phallic complex in Acridoidea (Orthoptera) in Relation to Taxonomy. *Transactions of the Royal Entomological Society of London* 108(7): 223–356.
- Eades D. C., Otte D., Cigliano M. M. & Braun H.** *Orthoptera Species File.* Version 5.0/5.0. [April 2014], <<http://Orthoptera.SpeciesFile.org>>.
- Fieber F. X. 1853.** *Synopsis der europäischen Orthopteren mit besonderer Rücksicht der*

- Böhmischen Arten*. Lotus (Prag) vol. 3: 90–104, 115–131, 138–154, 168–176, 184–188, 201–207, 232–238, 252–261;(separate, issued 1854, Prag (Gerzabek), pp. 1–79 + (index) I–IV).
- Harz K. 1975.** *The Orthoptera of Europe II*. Series entomologica, 11: 939 pp., The Hague (Dr. W. Junk N.V.).
- Ihsan S. & Donskoff M. 1988.** Catalogue et clés de détermination illustrés des Pamphagidae du Proche-Orient (Orth.). *Bulletin de la Société Entomologique de France* 93: 13–31.
- Karabağ T. 1949.** *Ankara vilayeti dahilinde mevcut çekirgelerin ekolojik, coğrafi ve sistematik durumları üzerine araştırmalar*. Ankara Üniversitesi Yayınları, 4: 1–121.
- Karabağ T. 1958.** *Türkiye'nin Orthoptera faunası (The Orthoptera Fauna of Turkey)*. Ankara Üniversitesi Fen Fakültesi Yayınları, 81: 1–198.
- Kati V. & Willemse F. 2001.** Grasshoppers and crickets of the Dadia Forest Reserve (Thraki, Greece) with a new record to the Greek fauna. *Articulata* 16: 11–19.
- La Greca M. 1993.** Le specie marocchine dei generi *Euryparyphes* Fischer, *Paraeumigius* Bolivar, *Paraeuryparyphes* gen. n., *Nadigeumigius* gen. n., *Pseudamigus* Chopard, e *Amigus* Bolivar (Orthoptera, Pamphagidae). *Bollettino dell'Accademia Gioenia di Scienze Naturali* 26: 293–414.
- Massa B. 2010.** New or interesting records of Palaearctic Orthoptera (Insecta). *Journal of the Entomological Research Society* 12(2): 75–85.
- Massa B. 2013.** Pamphagidae (Orthoptera: Caelifera) of North Africa: key to genera and the annotated check-list of species. *Zootaxa* 3700(3): 435–475.
- Mistshenko L. L. 1951.** Revision of Orthoptera of the genus *Paranocarodes* I.Bol. (Saltatoria - Orthoptera, Acrididae) and their closest relatives. *Dokladij Akademii Nauk SSSR* 77: 517–520. [In Russian].
- Peshev G. P. 1965.** Une nouvelle espèce du *Paranocarodes* I.Bolivar, 1916 (Orthoptera, Acrididae) de Bulgarie. *Izvest. Zool. Inst. Mus. [Bulletin de l' Institute de Zoologie et Musee, Academie des Sciences, Sofia]* 19: 73–83.
- Presa J. J. & Garcia M. D. 1983.** Inventario preliminar de los Pamphagidae (Orthoptera) de la región paleártica. *Anales de la Universidad de Murcia* 42: 3–42.
- Ramme W. 1951.** Zur Systematik, Faunistik und Biologie der Orthopteren von Südost-Europa und Vorderasien. *Mitteilungen aus dem Zoologischen Museum, Berlin* 27: 1–432 pp., pls 1–39.
- Roberts H. R. 1941.** A comparative study of the subfamilies of the Acrididae (Orthoptera) primarily on the basis of their phallic structures. *Proceedings of the Academy of Natural Sciences of Philadelphia* 93: 201–246.
- Uvarov B. P. 1943.** The tribe Thrinchini of the subfamily Pamphaginae, and the interrelations of the acridid subfamilies (Orthoptera). *Transactions of the Royal Entomological Society of London* 93: 1–72.
- Ünal M. 2007.** Revision of the genus *Glyphotmethis* Bey-Bienko, 1951 (Orthoptera: Pamphagidae). *Zootaxa* 1581: 1–36.
- Ünal M.** *Turkish Orthoptera Site (TOS)*. < www.orthoptera-tr.org >(April 2014).
- Willemse F. & Willemse L. 2008.** An annotated checklist of the Orthoptera-Saltatoria from Greece an updated bibliography. *Articulata Beiheft* 13: 1–91.

Correspondence: Mustafa Ünal, e-mail: unal@ibu.edu.tr

Received: 12.05.2014 Accepted: 28.05.2014 Published: 20.06.2014

Cite paper: Ünal M. 2014. A new species of *Paranocarodes* Bolivar, 1916 (Orthoptera: Pamphagidae) from Turkey. *Journal of Insect Biodiversity* 2(12): 1–10.

<http://dx.doi.org/10.12976/jib/2014.2.12>

<http://www.insectbiodiversity.org>