

An update list of Pamphagidae Brumster 1840 (Insecta: Orthoptera) of Iran with a key to the genera

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Abstract: The Orthoptera family Pamphagidae is classified differently by various authors. The family recently has been grouped into five subfamilies: Akinerinae, Priotropinae, Tropidauchinae, Nocarodesinae and Pamphaginae. This family has 103 species in Iran. Here, a key to genera is provided which identifies 10 genera with 33 winged species in Trinchini, and 11 genera with a total of 70 wingless species. *Saxetania* Mischenko and *Tropidauchen* Saussure have many characters in common and were combined into a single genus in the past. However, here both genera are considered valid with 16 recorded species for *Saxetania* and 7 recorded species for *Tropidauchen*. The morphological differences between them are described. A list of Pamphagidae species recorded for Iran is provided with a short revision of their taxonomy.

Keywords: Iran, Pamphagidae, Saxetania, Tropidauchen

Introduction

Iran has a high biodiversity of wild plants and animals. Many insects are coexisting with these plants. Climate warming is gradually changing the distribution of these plants and animals to higher regions with more rainfalls. Pamphagidae survive the winter in the nymphal stage (Uvarov, 1966). Most species of Pamphaginae have restricted and well described geographical ranges in Iran. Species of the wingless Pamphagini tribe are more restricted to their local habitats than winged tribe Thrinchini. For example, *Acrostia euphorbiae* Garcia-Becerra & Oromi, 1992. (Pamphagidae) is dependent to *Euphorbia lamarckii* for food and avoiding predation (Lopez *et al.*, 2007). We have no knowledge of the local distribution and habitats of Pamphagidae species in Iran. The first step for species identification is to differentiate various

genera recorded in Iran. The morphological traits and food plant association of various species in Pamphagidae genera require careful phylogenetic and ecological studies.

A list of 291 species and subspecies of Iranian grasshoppers is published by Mirzayans (1959). Many species in Shumakov's (1963) list are not in Mirzayans records. Garai's (2010) list of Orthoptera collected during 2000-2005 in Iran contains 157 species of Orthoptera and 109 species of Acridoidea. Garai (2010) arranged Pamphagidae species in accordance with Zhang *et al.* (2003). A few species mentioned by Myrzayans (1959) and Shumakov (1963) are now synonyms or are in different taxonomic positions. However, some of the species mentioned by Myrzayans (1959) are not in Shumakov's list. Shumakov (1963) did not include subspecies in his list. Mirzayans (1979) followed Dirsh's (1952) proposal and without any explanation produced a new list of Pamphagidae of Iran by changing the Iranian species of *Saxetania* Mischenko, 1951 to *Tropidauchen* Saussure, 1887. Two genera in the tribe Thrinchini, *Tropidauchen* and

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Saxetania are superficially similar and have been frequently confused by taxonomists in the past. In *Tropidauchen* the frontal ridge is rounded in profile and is without a depression under the median ocellus. In *Saxetania* a distinct depression is seen under the median ocellus in profile view of the frontal ridge (Bei-Bienko and Mishchenko, 1951). The list of Acrididae published by Mirzayans (1979, 1998) does not agree with the recent list of species of Orthoptera (Eades *et al.*, 2011). Examination of many species in these two genera proved that *Saxetania* is a valid genus with 16 species in Iran. All 14 species of *Saxetania* in Mirzayans (1959) list have been changed to *Tropidauchen* by Mirzayans (1998).

Table 1 and the key to genera of Pamphagidae explain most of the morphological differences described in this family.

Material and Methods

Garai (2010) collected most Acridoidea from Iran by systematic searching and netting. Species of the genera *Nocarodes*, *Paranothrotres*, *Saxetania* and *Tropidauchen* were generally found at early sunrise. Exact locality and the collection dates or subspecies position which are not given by Shumakov (1963) were given by other authors (Mirzayans 1959, 1998; Bei-Bienko and Mishchenko, 1951; Eades *et al.*, 2011). In

addition specimens stored in the Afshar Museum of the University of Tehran were included in this study which amounted to four boxes of Trinchini and three boxes of Pamphagini with about 20 insects in each box.

Classification of Pamphagidae

Pamphaginae was first divided to two tribes: Thrinchini and Pamphagini (Bei-Bienko and Mishchenko, 1951). However, Shumakov (1963) divided Pamphaginae into three tribes: Thrinchini, Pamphagini and Uvaroviini. Uvarov (1966), Dirsh (1952) and Storzhenko and Paik (2011) divided Pamphagidae into the subfamilies Pamphaginae and Akinerinae. In all these attempts of classification the major division was made between winged and wingless forms of Pamphagidae.

Detail classification of Storzhenko and Paik (2011) divided Pamphaginae into Euryparaphini, Finotiini, Haplotropiini, Nocarodeini and Pamphagini. The division of Pamphagidae into Akinerinae, Prionotropisinae, Tropidaucheninae, Nocarodesinae and Pamphaginae is used by Eades *et al.* (2012) in the Orthoptera species file. The taxonomy of Pamphagidae is also revised and explained with further comments in Zhang *et al.* (2003) and Storzhenko and Paik (2011).

Table 1 The diagnostic characters of *Tropidauchen* from *Saxetania*.

Morphological Characters	<i>Tropidauchen</i>	<i>Saxetania</i>
Presternal process between fore coxa	Cylindrical or sharp apices	Dome or wedge shaped
Shape of the hind femur	Do not narrow to the apex	Narrowing to the apex
The dorsal or the upper lobe of the hind femur	Extends up to the apex	Not reaching the apex
Profile view of the head	Vertex vertical	Frons and vertex slightly sloping
Hind femur	Less narrowed towards the distal end	More narrowed towards the distal end.
Width of hind femur before the genu	1/2 - 2/3 greater	1/4 - 1/3 greater than the greatest width of the ventral genicular lobe
Frontal ridge	Rounded	With a distinct notch
Frontal ridge at median ocellus	Without depression	With a depression

Results

Taxonomic characters of Pamphagidae

- Vertex is completely horizontal projecting anteriorly between eyes.
- Hind femora between longitudinal carinae only with tubercles and small ridges and without regular feather shaped areas.
- Vertex sometimes inclined and forming an obtuse widely rounded angle bringing frons and foveolae very close together.
- Pronotum often projecting in a point in front above the occiput; anterior margin either raised like a plate or with a process or conical tubercles, or only slightly convex in the anterior part.
- Transverse groove of mesosternum in the middle often extending posteriorly between the lateral lobes.
- Tegmina developed with an open median field and without a median spurious vein.
- **Pamphagini**
- No flight organ or they are strongly abbreviated.
- Median carina of pronotum never intersected by the transverse groove, straight or arcuate.
- Middle tibiae of the male without tubercles along the dorsal margin.
- Fastigium always edged with ridge.

Trinchini

- Flight organs completely developed.
- Median carina of pronotum distinctly incised by the posterior transverse groove or sharply depressed in the metazona.
- Middle tibia of the male usually with a row of tubercles along the dorsal margin.
- Fastigium often broad and frequently without ridge along the margin; if with ridge, then with well marked preocellar foveolae.

The following key is adopted from Bei-Bienko and Mishchenko (1951).

Key to subfamilies and genera of Pamphagidae

- 1-Median carina of pronotum distinctly incised by the posterior transverse groove or sharply depressed in the metazona; organs of flight present but may be reduced; middle tibia of the

male usually with a row of tubercles along the dorsal margin; fastigium often broadened and without a marginal ridge; if bordered by a ridge then with a preocellar foveolae (TRINCHINI)2

- Median carina of pronotum never intersected by a transverse groove straight or arcuate; no flight organs; middle tibiae of the males are without tubercles along the dorsal margin; fastigium edged with a ridge; no preocellar pit (PAMPHAGINI)13
- 2-Pronotum roof-like; median carina when examined from the side, at least slightly arcuate; narrowly cut into by the posterior transverse groove, metazona always convex in cross section; median carina of pronotum is raised high up...3
- Pronotum saddle shaped; in the prozona the median carina in profile always raised; median carina is depressed posterior of transverse groove; median carina is always low at the beginning of the metazona but it may be raised posteriorly5
- 3-Prosternum without a strong lamellate process on the anterior margin; fastigium roundly projecting forward4
- Prosternum with strongly raised anterior margin, in the form of a plate or a bi-dentate process; fastigium narrowly cut into by a groove of the frontal ridge.....9
- 4-Tegmina are long reaching the middle of the hind tibiae, or far beyond the posterior knee....5
- Tegmina are not very long, in the female not reaching the posterior knee; hind femur is usually wide and flat, their dorsal carina high, plate-like, straight in profile, reaching to the end of the knee; wings blue with a wide dark band..... ***Iranotmethis* Uvarov, 1943**
- 5- Posterior lateral border of pronotum with rounded margin and is turned caudad; empodium between the claws of the tarsus is very small and narrow, shorter than half the claw; wings with a dark spot or with darkened veins on the apex; the dark band begins in the middle of the anterior margin of the wing, or the wings are dark for the greater part; hind tibia brightly colored red, yellow or dark.....***Eremopeza* Saussure, 1888**

- Posterior lateral border of pronotum narrow, pointed, and at least partly turned caudad; empodium between the claws of front and middle tarsi in the male wide, triangular, narrowly reaching the middle of the claws; wings transparent on the apex; the dark band narrow, weak and sometimes incomplete, situated closer to the apex of the wing than to the base; hind tibiae are sulfur-yellow. ***Eremotmethis* Uvarov, 1943**
- 6-Median carina of pronotum with a low thin longitudinal groove, straight in profile; metazona flat, acute angled, with straight thickened margins; frontal ridge narrow below the ocellus and strongly narrowed towards the clypeus; fastigium is projecting forward at an angle. ***Eremocharis* Saussure, 1884**
- Median carina of pronotum without a thin longitudinal groove, distinctly raised in the prozona, sharply lowered behind the posterior transverse groove. 7
- 7- Body covered by dense long hairs; metazona without thickened margin; hind femur greatly widened at the base, dorsal carina distinctly depresses in the pre-genicular part; vertex depressed, greatly roughened; foveolae with distinct margins. ***Asiotmethis* Uvarov, 1943**
- Body not covered by long dense hair 8
- 8-Wings black with a light apex; metazona of pronotum posteriorly acute angled, with thickened margin; tympanal lobe transversely quadrangular; tegmina of the female abbreviated and not reaching posterior genu. ***Melanotmethis* Uvarov, 1943**
- Wings often red; vertex nearly smooth, without tubercles or small ridges, anteriorly narrowly cut into by the frontal ridge; lateral margin raised a little with blunt edge; tympanal lobe very large, covering half of the opening of the tympanal organ ***Tmethis* Fieber, 1853**
- 9- Anterior margin of pronotum without acute angled process in the middle of the anterior margin; prosternum not swollen, only slightly convex in the anterior part, anterior margin only slightly raised ***Thrinchus* Fischer von Waldheim, 1833**
- Anterior margin of pronotum with a strong sharp process in the middle; margin of lateral lobes acute; prosternum swollen; anterior margin strongly raised in the form of a plate and covering the mouth from below. ***Strumiger* Zubovski, 1896**
- 10- Tympanal organ present on first abdominal segment; median carina of pronotum is high and arcuate. 11
- Tympanal organs are absent from the first abdominal segments; median carina of pronotum not very high. 14
- 11-Antennae with 14 segments; tergites of abdomen with paired rounded distinct tubercles or darker spots ***Neoparanthrotes* Mirzayans, 1990**
- Antennae 12 segmented; abdominal tergites without paired dark spots or distinct tubercles. 12
- 12- Median carina of pronotum with a median groove; the basal part of coxae of first legs with a distinct lamellate projection ***Paranotrotes* Mishchenko, 1951**
- Median carina of pronotum without a groove and in profile low or straight; mesosternum with wide transverse lateral lobes, the greatest width of the lobe greater than its length. ***Ananotrodes* Mishchenko, 1951**
- 13- Vertex in profile nearly vertical; ridges of fastigium meet at occiput (Fig. 1); prosternal process cylindrical with pointed apex (Fig. 2); median carina of pronotum perfectly arcuate and without basal projection (Fig. 3); mesosternal lophi are separated by arc shaped ridges; a balloon shaped ridge with a median nipple is seen between the two lophi (Fig. 4); hind femur is gradually narrowing towards apex (Fig. 5) ***Tropidauchen* Saussure, 1887**
- Vertex in profile slopes moderately. Ridges of fastigium of two edges cross on occiput (Fig. 6); prosternal process with flat or wedge shaped apex (Fig. 7); pronotum with straight median carina, if arcuate then with basal process (Fig. 8); mesosternal lophi are separated by rectangular ridge and without upper balloon shaped ridges (Fig. 9); hind femur is not gradually narrowing towards the apex (Fig. 10). ***Saxetania* Mishchenkov, 1951**

- 14- Dorsal lobe of hind femur with strongly developed carina; the femoral carina with finely sinuous dorsal margin and with a preapical notch which can be very low.....15
- Dorsal lobe of hind femur with slightly developed carina; the femoral carina is uniformly raised and without a preapical notch; meso and meta sternae in the male with small scattered dots.....16
- 15- The median process of metasternum strongly depressed in the region of mesosternum; pronotum strongly widened in the median part, greatest width considerably greater than its length; its anterior part without lateral carina; median carina of pronotum without a longitudinal median groove or the groove is indistinct. **Bufanocarodes Mishchenko**
- The median process of metasternum is strongly projecting into the region of mesosternum; pronotum slightly widened in the middle part; greatest width is equal to or distinctly less than its length; pronotum with lateral carinae on its anterior parts; frontal ridge slightly projecting forward; median carina of pronotum with an indistinct or without a longitudinal median groove **Nocarodes Fischer von Waldheim, 1846**
- 16- Body slender; frons, in profile, slightly sloping; frontal ridge in the dorsal half nearly parallel-sided, below the median ocellus sharply diverging toward the clypeus; metasternum narrow; its greatest width less than the length of the meso- and metasternum together.....**Araxiana Mishchenko, 1951**
- Body stout; frons in profile not sloping; frontal ridge gradually diverging towards the clypeus; metasternum wide, greatest width equal to or greater than the length of the meso and metathorax together17
- 17- Median carina of pronotum without median longitudinal groove; fastigium bordered by small ridge; pronotum with two lateral carinae on each side; hind femur has small teeth on the dorsal margins of their femoral carina; dorsal lobe of femur slightly and uniformly developed.....**Savalania Mishchenko, 1951**
- Median carina of pronotum with a median longitudinal groove18
18. Median groove is sharply narrowed towards the posterior margin
.....**Paranocaracris Mishchenko, 1951**
- Median carina of pronotum with a median groove throughout its length.....19
19. Frontal ridge in profile dorsally strongly projecting; median carina of pronotum with a sharp longitudinal groove reaching its length; prothorax with a strongly developed anterior margin; anterior margin of prothorax in the form of a semicircular collar...
.....**Iranacris Mishchenko 1951**
- Frontal ridge in profile strongly sloping; median carina of pronotum not intersected by a transverse groove**Nocaracris Uvarov, 1928**
- Taxonomic characters of *Tropidauchen Saussure, 1887***
- Frontal ridge in profile rounded and without a notch under the median ocellus.
 - Vertex in profile nearly vertical, fastigium is bordered by a ridge.
 - No preocellar foveolae.
 - Median carina of pronotum arcuate, not intersected by a transverse groove.
 - Tegmina and wings reduced or completely absent.
 - Middle tibiae in the male without tubercles along the dorsal margin.
 - Hind femora slightly narrowed toward the distal end.
 - Dorsal lobe of femur reaching its dorsal end without narrowing.
 - Dorsal margin of hind femur with large pointed spines, ventral lobe slightly narrowed toward the distal end.
 - The width of hind femur before the genu is $\frac{1}{2}$ - $\frac{2}{3}$ the greatest width of the ventral genicular lobe.
 - Prosternum with sharp median process.
 - First abdominal tergite with a large tympanal organ.
- List of *Tropidauchen Saussure, 1887* species of Iran**
- Tropidauchen cristatum* Mishchenko, 1951
- T. flavipes* Mishchenko, 1951

T. iranicum Werner, 1939
T. marginatum Bolívar, 1912
T. predtetshenkii Mishchenko, 1951
T. serratum Mishchenko, 1951
T. viridis Bei-Bienko, 1950

Saxetania Mishchenko, 1951

Shumakov (1963) described the localities for 13 species. His list does not include the following species recorded by Mirzayans (1959): *S. parmonovi* (Dirsh), *S. onerosa* Mishchenko, *S. muricana*, two subspecies recorded from Khorassan, and *S. nizvai* (Dirsh) which is now a synonym of *S. spinosa* (Mishchenko, 1951).

Diagnostic characters of *Saxetania* Mishchenko, 1951

- Frontal ridge in profile with a distinct notch right under the median ocellus.
- The dorsal part of the frontal ridge projecting forward.
- Vertex in profile moderately sloping, fastigium bordered by a ridge.
- No preocellar foveolae.
- Median carina of pronotum arcuate, not intersected by transverse groove.
- Median tibiae of the male without tubercles along the dorsal margin.
- Hind femur strongly narrowed apicad, dorsal lobe not reaching the distal end but strongly narrowed towards it. Dorsal margin with large pointed spines.
- Ventral lobe of hind femur narrowed towards the distal end, width near the genu 1/4-1/3 the greatest width of the ventral genicular lobe.
- Prosternum with a sharp median process. First abdominal tergite with a large tympanal organ.
- 16 species described and all recorded in Iran.

List of *Saxetania* Mishchenko, 1951 species of Iran

S. alexandrovi (Bei-Bienko, 1950): the type species of the genus.
S. aelleni (Dirsh, 1952)
S. cultricolis (Saussure, 1887)
S. decumana Mishchenko, 1951
S. dehbidi (Dirsh, 1952)
S. edentulum (Uvarov, 1923)
S. elbursiana (Ramme, 1929)

S. escalarai (Bolívar, 1912)
S. irrasa Mishchenko, 1951
S. paramonovi Bei-Bienko & Mishchenko, 1951
S. popovi (Dirsh, 1952)
S. sabulosa (Uvarov, 1923)
S. spinosa (Mishchenko, 1951) (synonym: *S. nizvai* Dirsh, 1952)
S. onerosa Mishchenko, 1951
S. muricata muricata Mishchenko, 1951
S. m. femoralis Mishchenko, 1951

Other genera and species of Pamphagidae recorded in Iran

PAMPHAGINI

***Araxiana* Mishchenko, 1951**

A. voronowi (Uvarov, 1918)

***Bufonocarodes* Mishchenko, 1951**

B. intricatus Mishchenko, 1951
B. robustus Mishchenko, 1951
B. sabaalanicus Descamps, 1967
B. mistshenkoi Descamps, 1967
B. m. mistshenkoi Descamps, 1967
B. m. luteipes Descamps, 1967
B. tumulosus Mishchenko, 1951

***Iranacris* Mishchenko 1951**

Iranacris dentatus Mishchenko, 1951

***Neoparanothrotes* Mirzayans, 1990**

N. broumandi Mirzayans, 1998

***Nocaracris* Uvarov, 1928**

N. cyanipes (Fischer von Waldheim, 1846)

***Nocarodes* Fischer von Waldheim, 1846**

N. armenus Ramme, 1951
N. balachowskyi Descamps, 1967
N. corrugatus Mishchenko, 1951
N. crispus Mishchenko, 1951
N. ebneri Ramme, 1951
N. gibbosus Mishchenko, 1951
N. humerosus Mishchenko, 1951
N. keredjensis (Werner, 1939).
N. nanus Mishchenko, 1951
N. scabiosus Mishchenko, 1951 (Descamps, 1967)
N. s. mistshenkoi Descamps, 1967
N. schelkovnikovi Uvarov, 1918 Collected from Maragheh, Iran Berlin zoo. Mus.= *Paranothrotes opacus*
N. serricolis Fischer von Waldheim, 1846
N. specialis Mishchenko, 1951
N. urmianus Ramme, 1939

N. znojkoii Miram, 1938
Paranothrotres Mishchenko, 1951
P. citimus Mishchenko (Reported by Mirzayans from Kordestan)
Paranothrotres demavandi (Ramme, 1951)
P. diamesus Bei-Bienko, 1957
P. elbursianus (Ramme, 1951)
P. gotvendicus (Bolívar, 1912)
P. g. rectus (Mishchenko, 1951)
P. iranicus (Ramme, 1951)
P. margaritae (Miram, 1938)
P. ocellatus Mishchenko, 1951
P. opacus (Brunner von Wattenwyl, 1882)
P. opacus margaritae (Miram, 1938)
P. opacus nigripes (Schelkanovtzev, 1916)
P. opacus ornatus Mishchenkov, 1951
P. opacus apicalis (Bolívar, 1912)
P. opacus nigripes (Stshelkanovtzev, 1916)
P. rammei Ozdikmen, 2010
P. tenuicornis Mishchenkov, 1951
Paranocaracris Mishchenko 1951
P. rubipes (Fischer von Waldheim, 1846) (Unal, 2002)
Savalania Mishchenko, 1951
S. pulla Mishchenko, 1951 (Descamps, 1967)
Thrinchini
Asiotmethis Uvarov, 1943
A. artemisianus Shumakov, 1949
A. turritus (Fischer von Waldheim, 1833)
Eremopeza Saussure, 1888
E. bicoloripes (Moritz, 1928)
E. cinerascens (Stal, 1875)
E. c. cinerascens (Stal, 1875)
E. c. virescens (Uvarov, 1933)
E. festiva (Saussure, 1884)
E. gibbera (Stal, 1876)
E. g. reducta (Uvarov, 1934)
E. g. lata (Uvarov, 1934)
E. gigas (Kirby, 1914)
E. saussurei (Uvarov, 1918)
Tmethis saussurei Uvarov, 1917; Synonym: *E. s. saussurei* (Uvarov, 1917)
E. s. cinerecens (Uvarov,)
E. s. violacea (Uvarov, 1922)
Eremotmethis Uvarov, 1943
E. carinatus (Fabricius, 1775)
Eremocharis Philippi, 1860
E. granulosa (Walker, 1871)

E. g. khorasana Uvarov, 1933
E. g. bampura Uvarov, 1933
E. subsulcata (Stal, 1875)
Iranotmethis Uvarov, 1943
I. cyanipennis (Saussure, 1884)
I. c. kurdus Bei-Bienko & Mishchenko, 1951
I. c. cyanipennis (Saussure, 1884)
I. lutipes Bei-Bienko, 1951
I. persa (Saussure, 1888)
I. persa persa (Saussure, 1888)
I. p. zagrosi (Uvarov, 1933)
Melanotmethis Uvarov, 1943
M. fuscipennis (Redtenbacher, 1889)
Strumiger Zubovskii, 1896
S. desertorum Zubovskii, 1896
Tmethis Fieber, 1853
T. pulchripennis (Serville, 1838)
T. p. asiaticus Uvarov, 1943
Thrinchus Fischer von Waldheim, 1833
T. arenosus Bei-Bienko, 1948
T. arenosus arenosus Bei-Bienko, 1948

Discussion

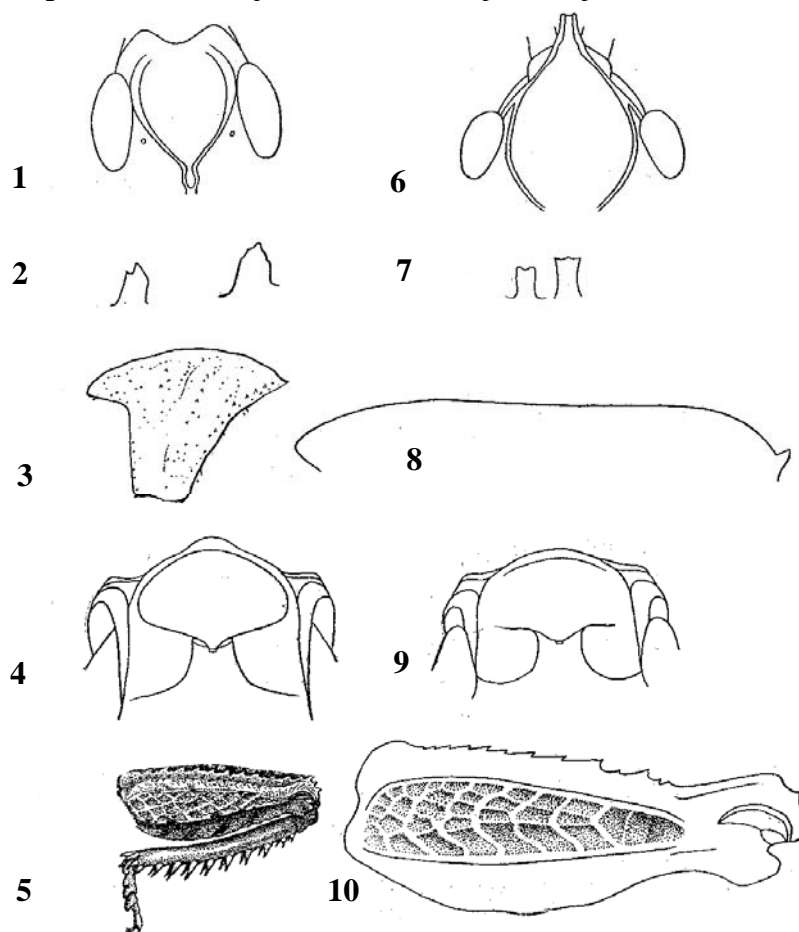
Shumakov (1963) is the best reference for the Acridoidea of Iran. Many morphological traits for local forms forced Orthopterists to describe subspecies with overlapping characters. Perhaps this is the reason why Shumakov (1963) has omitted the subspecies of Iranian records from his list. The number of Acridoidea species recorded by Mirzayans (1959) shows a change from 291 to 157 records by Garai (2010). Garai might have missed to record many known species but the reduction in rain fall and climate change might have resulted in the loss of some species as well. A complete biodiversity check is required to measure the species loss in Iran.

Saxetania is morphologically distinct but the characters of some species overlap with *Tropidauchen*. Some of the main differences between the two taxa are as follows:

In *Tropidauchen viridis* *T. cristatum* *T. serratum* and *T. flavipes muricata muricata* the ridges on border of eyes cross in occiput (Fig. 1). In *Saxetania enoda*, *S. cultricolis tumulus* and *S. cultricolis cultricolis* ridges on the border of fastigium do not cross in occiput (Fig. 6). The

prosternal process in *Tropidauchen* is sharp with a median process (Fig. 2). In *Saxetania* it is conical or pyramidal with compressed sharp lateral apex or wedge shape with notch apex, in *S. cultricollis* (Sauss.) and *S. scutata* Mishchenko. (Fig. 7). Pronotum is arcuate in *Tropidauchen* (Fig. 3), but in *Saxetania* less arcuate or with a process in distal end (Fig. 8). In *Tropidauchen viridis* Bei Bienko, *T. serratum* Mishchenko, *T. cristatum* Mishchenko, *T. flavipes* Mishchenko, and *T. predtetschenskii* Mish. mesosternum is with balloon shaped ridge between the lophi with the

nipple in between (Fig. 4). In *Saxetania* these balloon shaped ridges are not seen in *S. escalerae* (Bolivar), *S. alexandrovi* (Bei Bienko), *S. cultricollis gibbosa* Mishchenko, *S. miramae* (Mishchenko), and *S. muricata femoralis* Mishchenko (Fig 9). In *Tropidauchen* hind femora is slightly narrowed toward the distal end. In *Saxetania* the ventral lobe of hind femur is suddenly and much narrowed at apex (Figs. 9, 10). Prevailing data proves that *Saxetania* is morphologically quite distinct and the Iranian species reported in this article are valid.



Figures 1-10 Distinguishing characters of *Tropidauchen* and *Saxetania*: 1-*Tropidauchen serratum* Mishchenko (male), 2-*T. serratum* Mish. (male) and *T. cristatum*, 3- *T. viridis* Bei-Bienko (male), 4- *T. cristatum* Mish. (male), 5- *T. cristatum* Mish (male), 6- *Saxetania muricata muricata* Mish. (male), 7- *S. cultricollis cultricollis* (Sauss.) (male) and *S. scutata* Mish. 8- *S. onerosa* (female), 9- *S. escalerae* (I. Bol.) (male), 10- *S. elbursiana* (Rme.) (female). (Figures rearranged from Bei-Bienko and Mishchenko, 1951)

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References

- Bei-Bienko G. J. and Mishchenko, L. L. 1951. Orthoptera fauna of the USSR and the adjacent countries. Academy of Sciences of the USSR.
- Descamps, M. 1967. Revue et diagnose preliminaire de quelques Pamphagidae et Acrididae d'Iran. (Orth. Acrididae). Entomologie Systematique, 72: 27-37.
- Dirsh, V. M. 1952. Study of the genus *Tropidauchen* Saussure (Orthoptera: Acrididae). Proceedings of the Royal Entomological Society of London (B), 21 (7-8): 84-109.
- Eades D. C., Otte, D., Cigliano, M. M. and Braun, H. 2011. Orthoptera Species File Online. Version 2.0/4.0. Available in: <http://Orthoptera.speciesfile.org>
- Garai, G. A. 2010. Contribution to the knowledge of the Iranian Orthopteroid insects. Esperiana, 15: 393-417.
- Lopez, H., M. Nogales, E. Morales, and Oromei P. 2007. Habitat use and phenology of the large insular endemic grasshopper *Acrostira euphorbiae* (Orthoptera; Pamphagidae). Bulletin of Entomological Research, 97: 117-127.
- Mirzayans, H. 1959. Liste des Orthopters et leurs distribution en Iran. Entomologie et phytopathologie appliques, 18: 10 – 28.
- Mirzayans 1998. The list of Orthoptera in the Insect Collection of Plant Pests & Diseases Research Institute. Pamphagidae and Pyrgomorphidae. 39 Pages.
- Shumakov, E. M. 1963. Acridoidea of Afghanistan and Iran. Academie des Science de L' URSS. 284 pp.
- Storozhenko, S. Y. and Paik, J. C. 2011. Review of the genus *Haplotropis* Saussure, 1888 (Orthoptera; Pamphagidae), with notes on classification of the subfamilies Pamphaginae and Trinchinae. Zootaxa, 2897: 27-34.
- Unal, M. 2002. Key to subspecies of *Paranocaracris rubripes* (Fischer von Waldheim, 1846). Entomological News, 113(4): 285.
- Uvarov, B. P. 1966. Grasshoppers and locusts, a handbook of general acridology. Vol. 1, Cambridge University Press. 481 P.
- Zhang, D. C., Yin, H. and Yin, X. C. 2003. On the taxonomic system of Eurasian Pamphagidae (Orthoptera: Caelifera). Acta Entomologica Sinica, 46 (2): 218-221.

فهرست جدید ملخ‌های Pamphagidae Brumster 1840 (Insecta: Orthoptera) در ایران به همراه کلید شناسایی جنس‌ها

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چکیده: کارشناسان مختلف ملخ‌شناسی خانواده Pamphagidae را به روش‌های متفاوتی رده‌بندی نموده‌اند. این خانواده در تقسیم‌بندی جدید به پنج زیر خانواده Akinerinae, Priotropinae, Tropidauchinae, Nocarodesinae و Pamphaginae تقسیم شده است. این مجموعه حاوی یازده جنس با هفتاد گونه ملخ‌های Pamphagini و ده جنس حاوی سی و سه گونه و زیرگونه از ملخ‌های Trinchini است. کلید شناسایی جنس‌های Pamphagidae ایران تهیه شده است. دو جنس *Saxetania* و *Mishchenko* دارای خصوصیات ریخت‌شناسی مشترکی هستند و به‌رغم اینکه در گذشته هر دو در یک جنس ادغام شده بودند، ولی در این پژوهش هر دو جنس معتبر شناخته شده و نام شانزده گونه از جنس *Saxetania* و هفت گونه از جنس *Tropidauchen* و تفاوت شکلی آنها با مروری بر رده‌بندی خانواده Pamphagidae شرح داده شده است.

واژگان کلیدی: Pamphagidae، تاکسونومی، ایران