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CLASSIFICATION OF THE SUBORDER CAELIFERA FROM NORTH AMERICA INCLUDING HAWAII AND GREATER ANTILLES ISLANDS*

(Insect Orthoptera)

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Abstract: Based on the sensory, sonorific, tympanal and motor organ's characters and the viewpoint of evolutional theory, a taxonomic system of the suborder Caelifera (Acridodea) of North America into 5 superfamilies, 13 families and 40 subfamilies is proposed, among them including 1 new family and 15 new subfamilies: Phrynotettidae, Litoscirtinae, Dracotettinae, Phrynotettinae, Sphenarinae, Ichthyotettinae, Tytthotylinae, Brachystolinae, Spaniacrinae, Caletesinae, Xyphophorinae, Lysacrinae, Heliastinae, Mermirinae, Radinotatinae and Machaerocerinae.

It is a privilege and an honor for me to have been able with the invitation of Arizona State University to research the grasshoppers of North America from January to July in 1987.

During this time, the author have systematized the specimens of grasshoppers at Hasbrouck Insect Collection of Arizona State University and the Insect Collection of the University of Arizona (Tucson). And the specimens of grasshoppers in National Museum of Natural History(Washington D.C.) and Los Angeles County Museum

* I am very grateful to an anonymous donation to the Hasbrouck Insect Collection at Arizona State University which allowed the author the opportunity to come to the United States as a visiting research professor. I'm specially thankful to Liberal Arts and Sciences Dean Samuel A. Kirkpatrick and Chair Ann E. Kammer for giving me the chance of research. I am most thankful to Dr. Robert S. Hoffmann, Director, and Dr. David A. Nickle of the National Museum of Natural History, Smithsonian Institution, Washington D. C.; Dr. Charles Hogue and Dr. Roy Snelling of the Los Angeles County Natural History Museum; Prof. Floyd G. Werner and Mr. Carl Olson of Department of Entomology, University of Arizona for loaning specimens of grasshoppers. I am also thankful to Dr. Michael D. Greenfield and Mr. Wang Guang-Yu of Department of Biology, University of California, Los Angeles, who provided some references. I thank prof. Xia Kailing, Shanghai Institute of Entomology, Academia Sinica, who afforded valuable suggestions. Finally I am particularly grateful to my old friends Dr. Andrew T. Smith of Department of Zoology, Arizona State University and Dr. Robert L. Smith of Department of Entomologty, University of Arizona for their many helps when I worked in United States.

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of Natural History were also examined by the author.

According to the sensory, sonorific, tympanal and motor organ's characters and the viewpoint of evolutional theory, a taxonomic system of Caelifera (Acridodea) of North America including Hawaii and Greater Antilles Islands is given including 5 superfamilies, 13 families, 40 subfamilies and 69 genera. Among them 1 new family and 15 new subfamilies are established.

The pity is that some genera are not included in this paper, because their specimens haven't been examined due to the limit of working time and lack of the material. I look forward to another opportunity for perfecting the taxonomic system in the near future.

Main characters used in classification

Body robust or narrowly cylindrical. Frontal ridge vertical or oblique. Fastigial furrow present or absent. Antennae long or short and its shape. The shape and length of pronotum. The absence or presence of prosternal process and its shape. The comparative length of upper and lower basal lobes of hind femur. The shape of sculpture in the medial area of external side of hind femur. Upper carinula of hind femur serrated or smooth. External apical spine of hind tibia present or absent. The number of joint of tarsi. The absence or presence of sonorific organ and the type of sound-producing mechanism. Tympanum present or absent. Ovipositor developed or reduced. The shape of epiphallus and phallic complex.

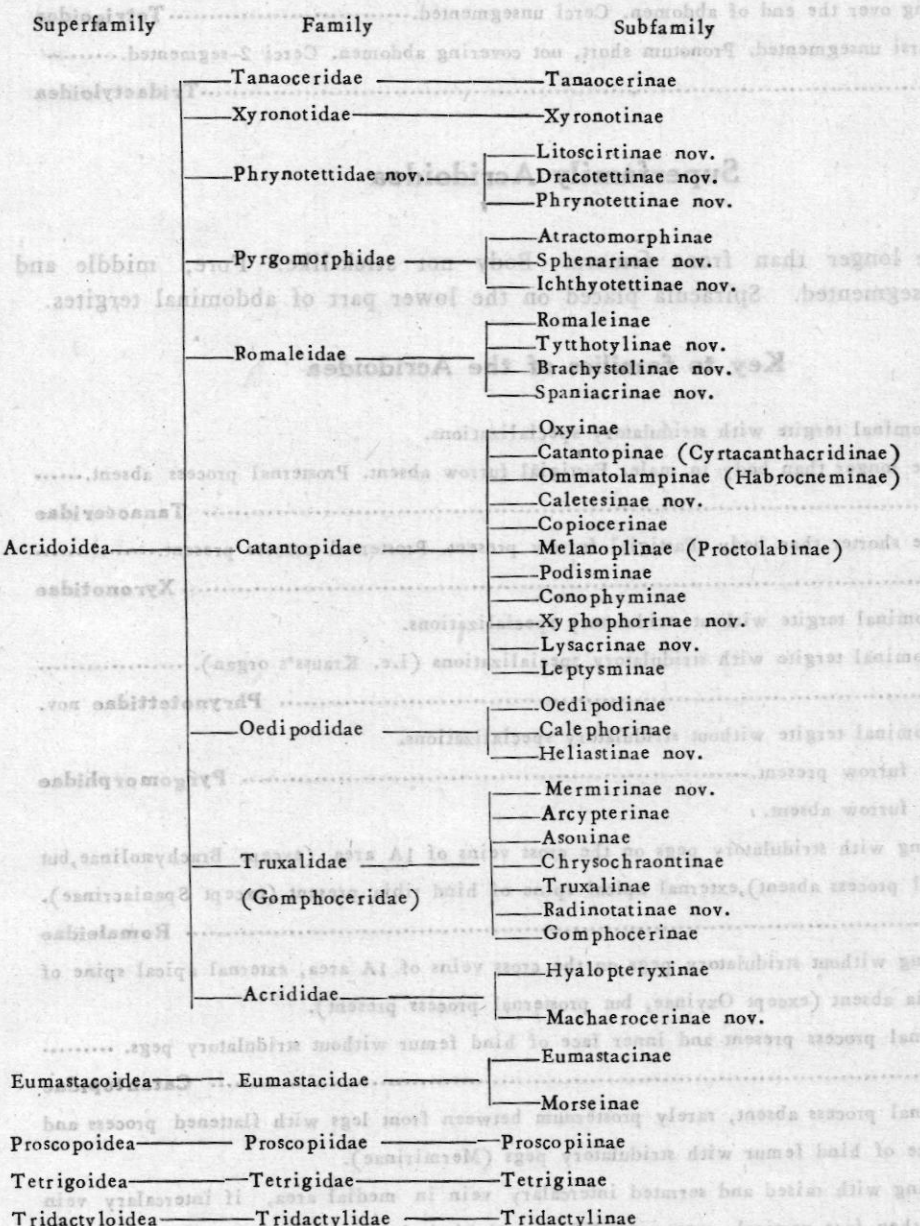
In order to analyse evolutionary process, we must have to recognize the newly derived and the ancestral characters firstly. This taxonomic system of the Caelifera of North America is arranged according to the following rules:

1. antennae long ➡ short;
2. joints of tarsi:fore:mid:hind = 3:3:3 ➡ 2:2:3 ➡ 2:2:1;
3. fastigial furrow present ➡ absent;
4. pronotum short ➡ long;
5. ovipositor developed ➡ reduced;
6. external apical spine of hind tibia present ➡ absent;
7. prosternal process present ➡ absent;
8. tegmina and hindwings developed ➡ shortened ➡ lobiform ➡ vestigial ➡ wanting;
9. sonorific organ developing ➡ degenerating ➡ lacking;
10. tympanum developing ➡ degenerating ➡ lacking;
11. upper carinula of hind femur serrated ➡ smooth;
12. epiphallus and phallic complex uncomplicated ➡ complicated.

In studying taxonomy, we must insist unity of measure, for example, family

Tanaoceridae had been established by the third abdominal tergite with stridulatory specializations, so Phrynotettidae is established as a new family by the second abdominal tergite with stridulatory specializations (Krauss's organ) in this paper.

THE TAXONOMIC SYSTEM OF SUBORDER CAELIFERA (ACRIDODEA)



Key to superfamilies of the Caelifera of North America

1(6) Fore and middle tarsi 3-segmented.

2(3) Antennae longer than front femora. ..... **Acridoidea**

3(2) Antennae shorter than front femora.

4(5) Body stick-like. Prothorax tube-like, longer than front femora..... **Proscopoidea**

5(4) Body not stick-like. Prothorax not tube-like, shorter than front femora.....
.....**Eumastacoidea**

6(1) Fore and middle tarsi 2-segmented.

7(8) Hind tarsi 3-segmented. Pronotum very long, covering all or nearly all of abdomen, still extending over the end of abdomen. Cerci unsegmented..... **Tetrigoidea**

8(7) Hind tarsi unsegmented. Pronotum short, not covering abdomen. Cerci 2-segmented.....
.....**Tridactyloidea**

Superfamily Acridoidea

Antennae longer than front femora. Body not stick-like. Fore, middle and hind tarsi 3-segmented. Spiracula placed on the lower part of abdominal tergites.

Key to families of the Acridoidea

1(4) 3rd abdominal tergite with stridulatory specializations.

2(3) Antennae longer than body in male. Fastigial furrow absent. Prosternal process absent.....
..... **Tanaoceridae**

3(2) Antennae shorter than body. Fastigial furrow present. Prosternal process present.....
..... **Xyronotidae**

4(1) 3rd abdominal tergite without stridulatory specializations.

5(6) 2nd abdominal tergite with stridulatory specializations (i.e. Krauss's organ). .....
..... **Phrynotettidae** nov.

6(5) 2nd abdominal tergite without stridulatory specializations.

7(8) Fastigial furrow present..... **Pyrgomorphidae**

8(7) Fastigial furrow absent.

9(10) Hindwing with stridulatory pegs on the cross veins of 1A area (except Brachystolinae,but prosternal process absent),external apical spine of hind tibia present (except Spaniacrinae).
..... **Romaleidae**

10(9) Hindwing without stridulatory pegs on the cross veins of 1A area, external apical spine of hind tibia absent (except Oxyinae, but prosternal process present).

11(12) Prosternal process present and inner face of hind femur without stridulatory pegs. .....
..... **Catantopidae**

12(11) Prosternal process absent, rarely prosternum between front legs with flattened process and inner face of hind femur with stridulatory pegs (Mermirinae).

13(14) Forewing with raised and serrated intercalary vein in medial area, if intercalary vein lacking, then face vertical, antennae filiform and hind femur without stridulatory pegs on inner face..... **Oedipodidae**

14(13) Forewing without raised and serrated intercalary vein in medial area. Face slanted, if nearly vertical, then hind femur with stridulatory pegs on inner face or antennae ensiform.

15(16) Hind femur with stridulatory pegs on inner face, sometimes stridulatory pegs lacking, forewing and hindwing lobiform, lateral.....**Truxalidae (Gomphoceridae)**

16(15) Hind femur without stridulatory pegs on inner face. Forewing and hindwing developed. ..... **Acrididae**

Family Tanaoceridae

Antennae filiform, very long, extending beyond the end of abdomen in male and slightly shorter than body in female. Fastigial furrow absent. Prosternal process absent. 3rd Abdominal tergite with stridulatory specializations. Epiphallus disc-shaped.

It looks like long-horned grasshopper in antennae but ovipositor caelifera. We think that this family is a transitional form from long-horned grasshopper to grasshopper.

Subfamily Tanaocerinae

Fully apterous. Hind femur slender, lower basal lobe longer than upper, upper carinula of hind femur smooth. External apical spine of hind tibia present. Tympanum absent.

Type-genus: *Tanaocerus* Bruner 1906.

Only two genera *Tanaocerus* Bruner 1906 and *Mohavacris* Rehn 1948 are found in South Part of North America.

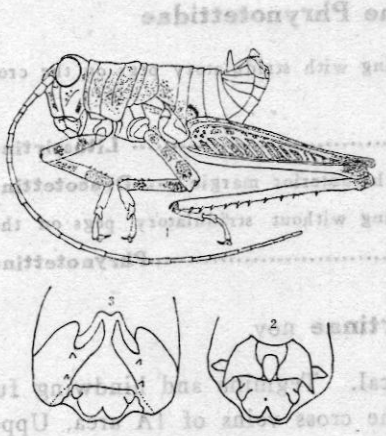


Fig. 1 (图 1) *Tanaocerus koebelei* Bruner 1906
1. male(雄性); 2. phallic complex, but epiphallus removed(阳具复合体,阳茎基背片已摘去); 3. phallic complex, dorsal view (阳具复合体背面观). (after Dirsh 1975)

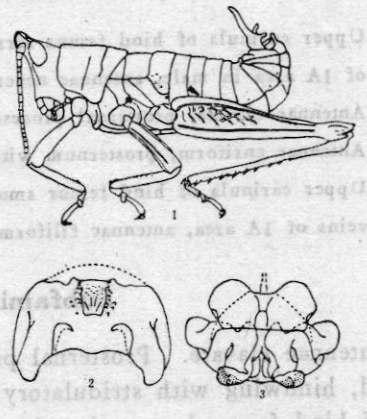


Fig. 2 (图 2) *Xyronotus aztecus* I. Bolivar 1884
1. male (雄性); 2. epiphallus, dorsal view (阳茎基背片背面观); 3. phallic complex from above (阳具复合体背面观). (after Dirsh 1975)

Family Xyronotidae

Antennae slightly ensiform, shorter than body. Fastigial furrow present. Prosternal process present. 3rd abdominal tergite with stridulatory specializations. Epiphallus shield-shaped.

Subfamily Xyronotinae

Tegmina and hindwings absent. Hind femur slender, lower basal lobe slightly shorter than upper, upper carinula of hind femur serrated. External apical spine of hind tibia present. Tympanum absent. Male cercus trifurcate.

Type-genus: *Xyronotus* I. Bolivar 1884.

The subfamily represented by a single genus found in Mexico only.

Family Phrynotettidae nov.

Fastigial furrow absent. Antennae shorter than body. Prosternal process conical or prosternum with collar on the anterior margin. 2nd abdominal tergite with Krauss's organ. Lower basal lobe of hind femur shorter than or as long as upper. The medial area of external side of hind femur with nearly feather-like sculpture. Hind tibia with external apical spine. Epiphallus arched, ancorae short. Phallic complex uncomplicated.

This family with Krauss's organ on the 2nd abdominal tergite is related to Pamphagidae from Europe, Asia and Africa, but fastigial furrow absent and lower basal lobe of hind femur shorter than or as long as upper one.

Obtains 3 subfamilies.

Key to subfamilies of the Phrynotettidae

1(4) Upper carinula of hind femur serrated, hindwing with stridulatory pegs on the cross veins of 1A area in male, antennae never filiform.

2(3) Antennae clavate, prosternal process conical..... **Litoscirtinae** nov.

3(2) Antennae ensiform, prosternum with collar on the anterior margin.....**Dracotettinae** nov.

4(1) Upper carinula of hind femur smooth, hindwing without stridulatory pegs on the cross veins of 1A area, antennae filiform.....**Phrynotettinae** nov.

Subfamily Litoscirtinae nov.

Antennae clavate. Prosternal process conical. Tegmina and hindwing fully developed, hindwing with stridulatory pegs on the cross veins of 1A area. Upper basal lobe of hind femur longer than lower one. Upper carinula of hind femur serrated. Tympanum present.

Type-genus: *Litoscirtus* Bruner 1907.

Only a single genus is found in California of U. S. and Central America.

Subfamily Dracotettinae nov.

Antennae ensiform. Prosternum with collar on the anterior margin. Tegmina and hindwings fully developed or shortened, if shortened, at least the both contiguous on the back in male. Upper basal lobe of hind femur as long as lower one. Upper carinula of hind femur serrated. Hindwing with stridulatory pegs on the cross

veins of 1A area. Tympanum present.

Type-genus: *Dracotettix* Bruner 1889.

Only a single genus is found in California and Nevada of U. S.

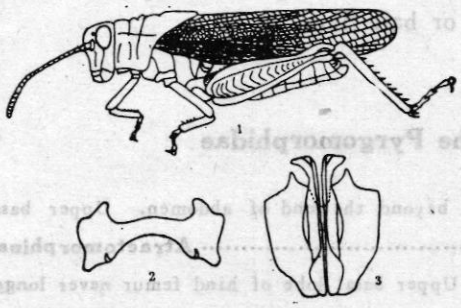


Fig. 3 (图 3) *Litoscirtus insularis* Bruner 1907
1. male (雄性); 2. epiphallus(阳茎基背片); 3. phallic complex (阳具复合体).

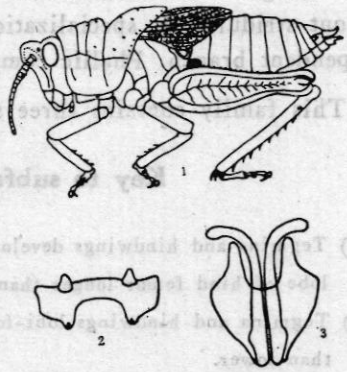


Fig. 4 (图 4) *Dracotettix monstrosus* Bruner 1889
1. female (雌性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Phrynotettinae nov.

Antennae filiform. Prosternum with collar on the anterior margin. Tegmina and hindwings lobiform, lateral. Hindwing without stridulatory pegs on the cross veins of 1A area. Upper basal lobe of hind femur as long as lower one. Upper carinula of hind femur smooth. Tympanum present.

Type-genus: *Phrynotettix* Glover 1872.

The subfamily represented by a single genus found in Southwest Part of U. S. and Mexico only.

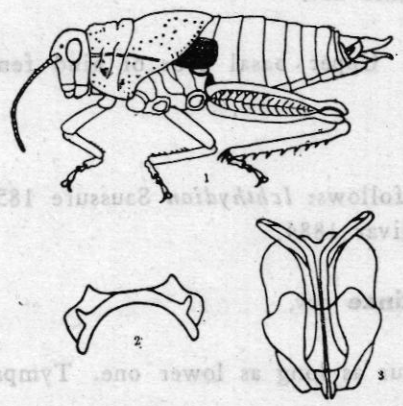


Fig. 5 (图 5) *Phrynotettix magnus* (Thomas) 1875
1. female (雌性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

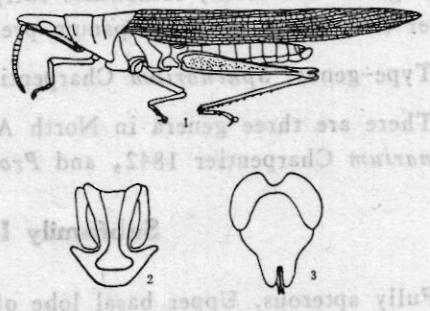


Fig. 6 (图 6) *Atractomorpha sinensis* Bolivar 1905
1. male (雄性); 2. epiphallus(阳茎基背片); 3. phallic complex (阳具复合体).

Family Pyrgomorphidae

Fastigial furrow present. Antennae ensiform. Prosternum with collar on the anterior margin. Hind tibia with external apical spine. 2nd and 3rd abdominal tergite without stridulatory specializations. Epiphallus with long lateral plates, formed independent branch. Phallic complex capsule or ball-like.

This family contains three subfamilies.

Key to subfamilies of the Pyrgomorphidae

1(2) Tegmina and hindwings developed, extending beyond the end of abdomen. Upper basal lobe of hind femur longer than lower..... **Atractomorphinae**

2(1) Tegmina and hindwings lobi-form or absent. Upper basal lobe of hind femur never longer than lower.

3(4) Tegmina lobi-form, sometimes fully apterous. Tympanum present..... **Sphenarinae** nov.

4(3) Tegmina absent. Tympanum absent. ..... **Ichthyotettinae** nov.

Subfamily Atractomorphinae

Tegmina and hindwings developed, extending beyond the end of abdomen. Upper basal lobe of hind femur longer than lower one. Tympanum developed. Epiphallus vase-like.

Type-genus: *Atractomorpha* Saussure 1861.

There is a genus *Atractomorpha* Saussure 1861 found in Hawaii Islands only. This genus is an Asian grasshopper, but we don't know that how long is the genus imported to Hawaii Islands from Asia.

Subfamily Sphenarinae nov.

Tegmina lobiform, sometimes fully apterous. Upper basal lobe of hind femur shorter than lower one. Tympanum present.

Type-genus: *Sphenarium* Charpentier 1842.

There are three genera in North America as follows: *Ichthydion* Saussure 1859, *Sphenarium* Charpentier 1842, and *Prosphena* Bolivar 1884.

Subfamily Ichthyotettinae nov.

Fully apterous. Upper basal lobe of hind femur as long as lower one. Tympanum absent.

Type-genus: *Ichthyotettix* Rehn 1901.

There are two genera in North America as follows: *Ichthyotettix* Rehn 1901 and *Calamacris* Rehn 1904.

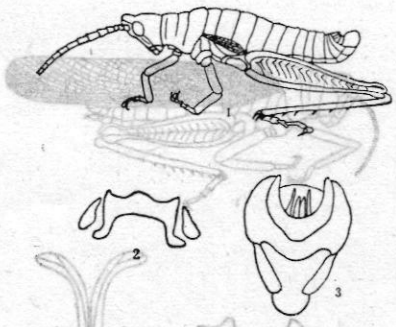


Fig. 7 (图 7) *Sphenarium purpurascens* Charpentier 1842
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

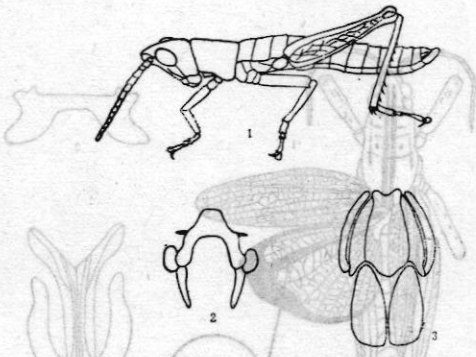


Fig. 8 (图 8) *Ichthyotettix mexicanum* (Saussure) 1859
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Family Romaleidae

Frontal ridge vertical. Fastigial furrow absent. Antennae filiform. Prosternal process usually absent, rarely present. External apical spine of hind tibia usually present, rarely absent. Hindwing usually with stridulatory pegs on the cross veins of 1A area, rarely the stridulatory pegs lacking. Epiphallus bridge-shaped, ancorae short. Phallic complex often uncomplicated.

This family includes four subfamilies.

Key to subfamilies of the Romaleidae

1(6) External apical spine of hind tibia present.

2(3) Prosternal process present..... **Romaleinae**

3(2) Prosternal process absent.

4(5) Tegmina and hindwings developed, hindwing with stridulatory pegs on the cross veins of 1A area..... **Tytthotylinae** nov.

5(4) Tegmina and hindwings lobi-form, hindwing without stridulatory pegs. ..... **Brachystolinae** nov.

6(1) External apical spine of hind tibia absent..... **Spaniacrinae** nov.

Subfamily Romaleinae

Tegmina and hindwings developed. Hindwing with stridulatory pegs on the cross veins of 1A area. Prosternal process present, conical. Upper carinula of hind femur smooth. Hind tibia with external apical spine. Tympanum present.

Type-genus: *Romalea* Serville 1831.

Three genera are distributed in North America: *Romalea* Serville 1831, *Taeniopoda* Stål 1873 and *Tropidacris* Scudder 1869.

Subfamily Tytthotylinae nov.

Tegmina and hindwings developed. Hindwing with stridulatory pegs on the cross

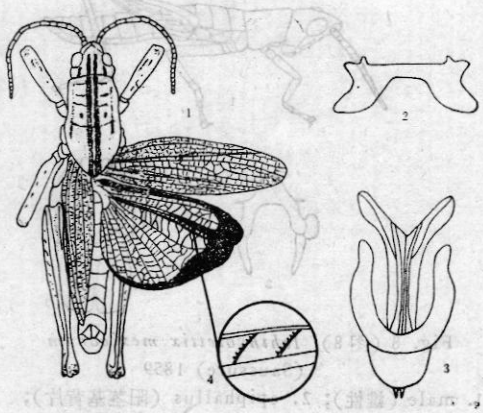


Fig. 9 (图 9) *Romalea microptera* (Beauvois) 1805
1. male(雄性); 2. epiphallus(阳茎基背片);
3. phallic complex(阳具复合体); 4. stridulatory pegs (发音齿).

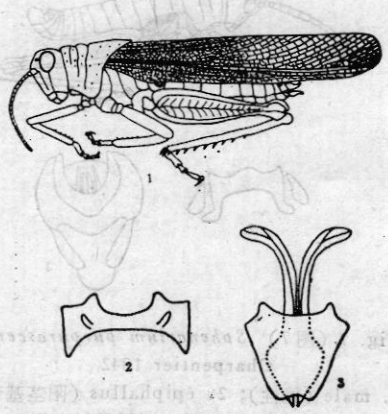


Fig. 10 (图 10) *Tytthotyle maculata* (Bruner) 1889
1. female(雌性); 2. epiphallus(阳茎基背片); 3. phallic complex(阳具复合体).

veins of 1A area. Prosternal process absent. Upper carinula of hind femur smooth. Hind tibia with external apical spine. Tympanum present.

Type-genus: *Tytthotyle* Scudder 1897.

Obtains a single genus *Tytthotyle* Scudder 1897 in North America only.

Subfamily Brachystolinae nov.

Tegmina and hindwings lobiform. Hindwing without stridulatory pegs. Prosternal process absent. Upper carinula of hind femur smooth. Hind tibia with external apical spine. Tympanum present.

Type-genus: *Brachystola* Scudder 1876.

There is a single genus *Brachystola* Scudder 1876 found in North America only.

Subfamily Spaniacrinae nov.

Tegmina and hindwings developed. Hindwing with stridulatory pegs on the cross veins of 1A area. Prosternal process absent. Upper carinula of hind femur smooth. Hind tibia without external apical spine. Tympanum present.

Type-genus: *Spaniacris* Hebard 1937.

There is a single genus *Spaniacris* Hebard 1937 found in California of U. S. only.

Family Catantopidae

Frontal ridge vertical or nearly vertical. Fastigial furrow absent. Prosternal process present. Antennae filiform or ensiform. Sound-producing mechanism absent or not detected. External apical spine of hind tibia usually absent, rarely present. Epiphallus bridge-shaped, ancorae short. Phallic complex usually complicated.

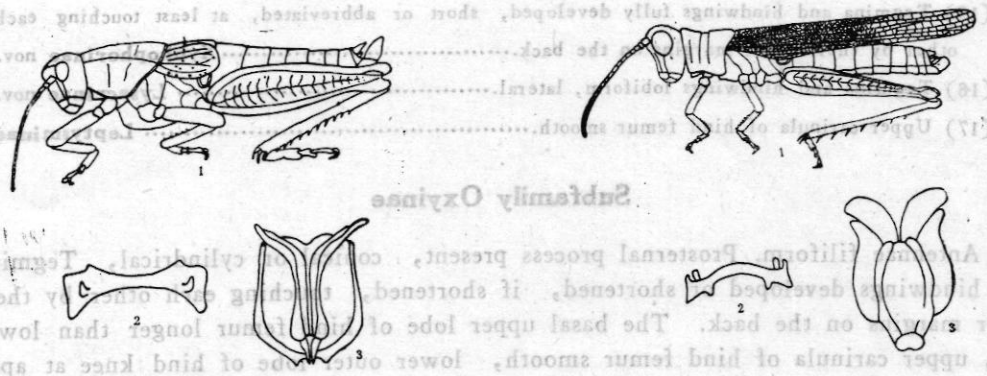


Fig. 11 (图 11) *Brachystola magna* (Girard) 1853

1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Fig. 12 (图 12) *Spaniacris deserticola* (Bruner) 1906

1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

This family contains 11 subfamilies.

Key to subfamilies of the Catantopidae

1(2) External apical spine of hind tibia present. Lower outer lobe of hind knee at apex spine-like. ..... **Oxyinae**

2(1) External apical spine of hind tibia absent. Lower outer lobe of hind knee at apex not spine-like.

3(16) Antennae filiform.

4(9) Upper carinula of hind femur serrated.

5(8) Tegmina and hindwings present. Tympanum present.

6(7) Tegmina and hindwings developed, usually extending over the end of abdomen, sometimes short or abbreviated, if abbreviated, at least touching each other by their inner margins on the back..... **Catantopinae (Cyrtacanthacridinae)**

7(6) Tegmina and hindwings lobiform, lateral. ..... **Ommatolampinae (Habrocneminae)**

8(5) Tegmina and hindwings absent. Tympanum absent..... **Caletesinae** nov.

9(4) Upper carinula of hind femur smooth.

10(15) Tegmina and hindwings present. Tympanum present.

11(12) Face strongly oblique. Hind femur slender. Hind tibia with 6 outer spines. ..... **Copiocerinae**

12(11) Face nearly vertical. Hind femur robust. Hind tibia with 7 outer spines or more in number.

13(14) Tegmina and hindwings developed, usually extending to or beyond the end of abdomen, sometimes short or abbreviated, if abbreviated, at least touching each other by their inner margins on the back. ..... **Melanoplinae (Proctolabinae)**

14(13) Tegmina and hindwings lobiform, lateral..... **Podisminae**

15(10) Tegmina and hindwings absent. Tympanum absent..... **Conophyminae**

16(3) Antennae ensiform.

17(20) Upper carinula of hind femur serrated.

18(19) Tegmina and hindwings fully developed, short or abbreviated, at least touching each other by their inner margins on the back.....**Xyphophorinae** nov.

19(18) Tegmina and hindwings lobiform, lateral.....**Lysacrinae** nov.

20(17) Upper carinula of hind femur smooth.....**Leptysminae**

Subfamily Oxyinae

Antennae filiform. Prosternal process present, conical or cylindrical, Tegmina and hindwings developed or shortened, if shortened, touching each other by their inner margins on the back. The basal upper lobe of hind femur longer than lower one, upper carinula of hind femur smooth, lower outer lobe of hind knee at apex spine-like. Sound producing mechanism not detected. Tympanum present. External apical spine of hind tibia present.

Type-genus: *Oxya* Serville 1831.

There is a genus *Oxya* Serville 1831 found in Hawaii Islands only. It is a common knowledge that the genus *Oxya* Serville 1831 is an Asian genus which is imported to Hawaii Islands about 80—90 years ago (Willemse, 1956).

Subfamily Catantopinae (Cyrtacanthacridinae)

Antennae filiform. Prosternal process present, conical or cylindrical. Tegmina and hindwings developed. Upper carinula of hind femur serrated. External apical spine of hind tibia absent. Tympanum present.

Type-genus: *Catantops* Schaum 1853.

There is only one genus *Schistocerca* Stål 1873 in North America, but numerous genera and large amount of species belong to this subfamily in Asia, Europe and Africa.

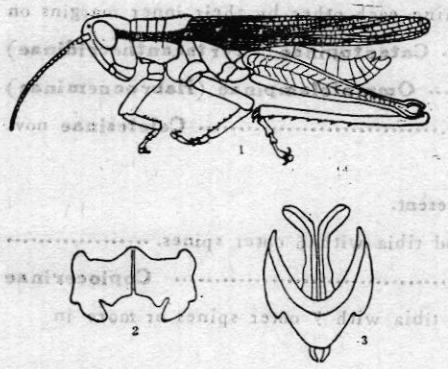


Fig. 13 (图 13) *Oxya chinensis* (Thunberg) 1815
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

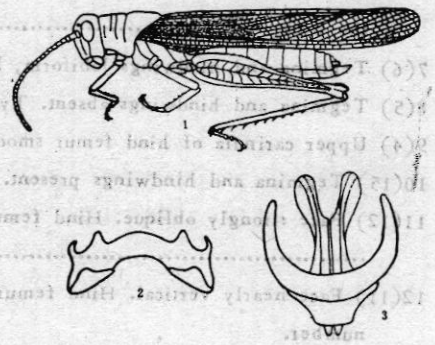


Fig. 14 (图 14) *Schistocerca vaga* (Scudder) 1876
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Ommatolampinae (Habrocneminae)

Antennae filiform. Prosternal process present, conical or cylindrical. Tegmina

and hindwings lobiform, lateral, rarely wanting. Upper carinula of hind femur serrated. External apical spine of hind tibia absent. Tympanum present.

Type-genus: *Ommatolampis* Burmeister 1838

Three genera of this subfamily are known in North America: *Galidacris* Desc. et Amedeg. 1972, *Psiloscirtus* Bruner 1911 and *Rhachicreagra* Rehn 1905.

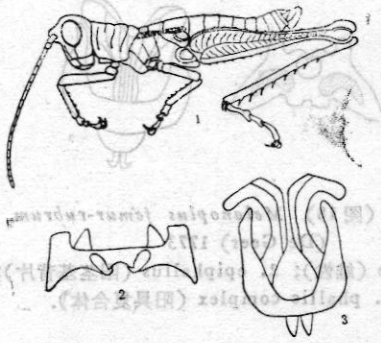


Fig. 15 (图 15) *Ommatolampis flavipes* Giglio-Tos 1898
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

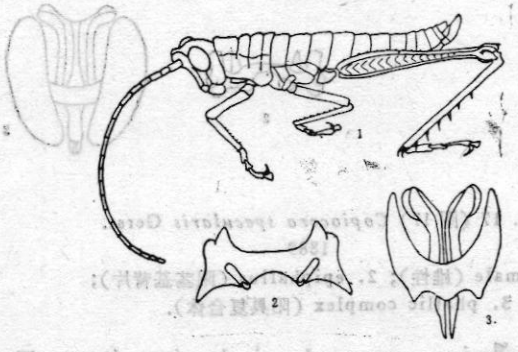


Fig. 16 (图 16) *Caletes apterus* Redtenbacher 1892
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Caletesinae nov.

Antennae filiform. Prosternal process conical. Tegmina and hindwings absent. Upper carinula of hind femur serrated. External apical spine of hind tibia absent. Tympanum absent.

Type-genus: *Caletes* Redtenbacher 1892.

Obtains a single genus from Greater Antilles Islands only. We think that the genus *Caletes* Redtenbacher 1892 is representative of island apterous form and its wings were reduced by strong breeze.

Subfamily Copiocerinae

Antennae filiform. Prosternal process spathulate. Face slanted. Hind femur slender, upper carinula of hind femur smooth. Hind tibia with 6 outer spines, external apical spine absent. Tegmina and hindwings developed, extending beyond the end of abdomen. Tympanum present.

Type-genus: *Copiocera* Burmeister 1838.

Only type-genus is known in North America at present.

Subfamily Melanoplinae (Proctolabinae)

Antennae filiform. Face nearly vertical. Prosternal process present, conical or cylindrical, rarely spathulate. Tegmina and hindwings developed, sometimes shortened, if shortened, touching each other by their inner margins on the back. Hind femur robust, upper carinula of hind femur smooth, hind tibia with more than 7

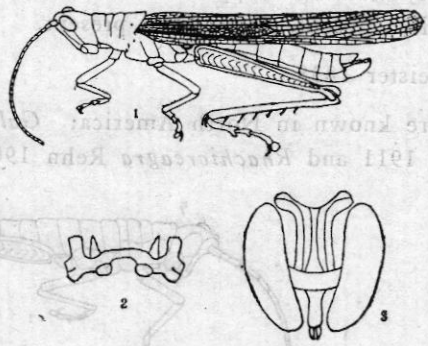


Fig. 17 (图 17) *Copiocera specularis* Gerst. 1889
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

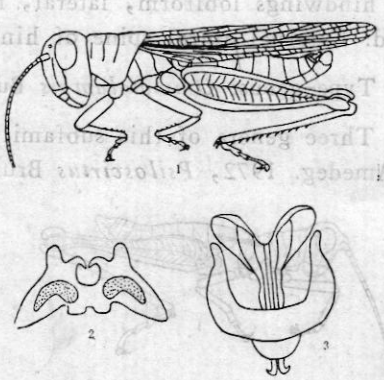


Fig. 18 (图 18) *Melanoplus femur-rubrum* (De Geer) 1773
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

outer spines, external apical spine absent. Tympanum present.

Type-genus: *Melanoplus* Stål 1873.

About 16 genera of this subfamily are distributed in North America: *Aeoloplus* Scudder 1897, *Aidemona* Bruner 1893, *Campylacantha* Scudder 1897, *Chloroplus* Hebard 1918, *Dendrotettix* Riley 1893, *Eotettix* Scudder 1897, *Hesperotettix* Scudder 1876, *Hypochlora* Bruner 1893, *Leioscapheus* Bruner 1907, *Melanoplus* Stål 1873, *Oedaleonotus* Scudder 1897, *Paratylotropidia* Scudder 1897, *Paroxya* Scudder 1877, *Phoetaliotes* Scudder 1897, *Poecilotettix* Scudder 1897 and *Proctolabus* Saussure 1859.

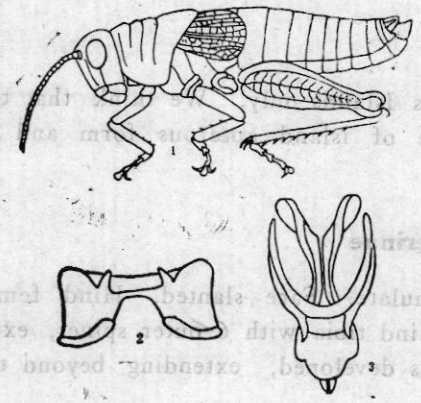


Fig. 19 (图 19) *Dactylotum variegatum* (Scudder) 1879
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

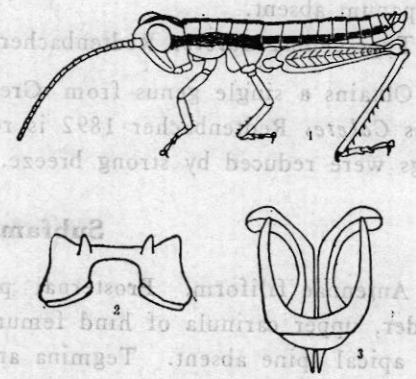


Fig. 20 (图 20) *Gymnoscirtetes pusillus* Scudder 1898
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Podisminae

Antennae filiform. Face nearly vertical. Prosternal process present, conical or cylindrical. Tegmina and hindwings lobiform, lateral, rarely wanting. Hind femur robust, upper carinula of hind femur smooth. Hind tibia with more than 7 outer

spines, external apical spine absent. Tympanum present.

Type-genus: *Podisma* Berth. 1827.

About 20 genera of this subfamily are known in North America: *Agnostokasia* Gurney et Rentz 1964, *Agroecotettix* Bruner 1907, *Appalachia* Rehn et Rehn 1936, *Aptenopedes* Scudder 1877, *Argiacris* Hebard 1918, *Asemoplus* Scudder 1897, *Aztecacris* Roberts 1947, *Barytettix* Scudder, 1897, *Boonacris* Rehn et Randell 1962, *Bradynotes* Scudder 1880, *Buckellacris* Rehn et Rehn 1944, *Conalcea* Scudder 1897, *Dactylotum* Charpentier 1843, *Lithoscirtus* Bruner 1908, *Perixerus* Gerstaecker 1873, *Phaedrotettix* Scudder 1897, *Phaulotettix* Scudder 1897, *Podisma* Berth. 1827, *Prumnacris* Rehn et Rehn 1944 and *Zubovskya* Dov.-Zap. 1933.

Subfamily Conophyminae

Antennae filiform. Face nearly vertical. Prosternal process present, conical or cylindrical. Tegmina and hindwings absent. Upper carinula of hind femur smooth. External apical spine of hind tibia usually absent, rarely present (in Eurasia). Tympanum absent.

Type-genus: *Conophyma* Zub. 1898.

Five genera of this subfamily are distributed in North America: *Gymnoscirtetes* Scudder 1897, *Hebardacris* Rehn 1952, *Paraidemona* Brunner 1893, *Philocleon* Scudder 1897 and *Netrosoma* Scudder 1897.

Subfamily Xyphophorinae nov.

Antennae ensiform. Prosternal process present. Tegmina and hindwings developed. Upper carinula of hind femur serrated. External apical spine of hind tibia absent. Sound-producing mechanism not detected. Tympanum present.

Type-genus: *Xyphophora* Saussure 1859.

Two genera of this subfamily are found in North America: *Locheuma* Scudder 1896 and *Xyphophora* Saussure 1859.

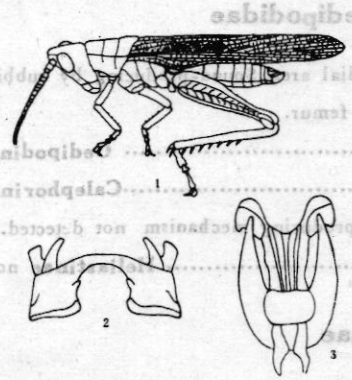


Fig. 21 (图 21) *Xyphophora cyanoptera* (Gerst.) 1888
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

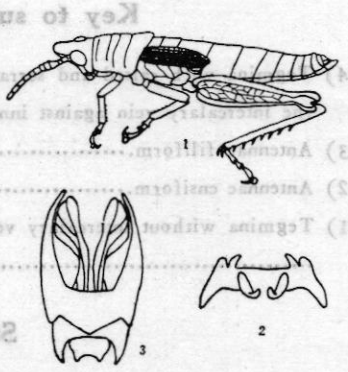


Fig. 22 (图 22) *Lysacris festa* (Giglio-Tos) 1898
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Lysacrinae nov.

Antennae ensiform. Prosternal process present. Tegmina and hindwings lobiform, lateral. Upper carinula of hind femur serrated. External apical spine of hind tibia absent. Sound-producing mechanism not found. Tympanum present.

Type-genus: *Lysacris* Desc. et Amedeg 1972.

Two genera of this subfamily are known in North America: *Clematodes* Scudder 1900 and *Lysacris* Desc. et Amedeg 1972.

Subfamily Leptysminae

Antennae ensiform. Prosternal process present. Tegmina developed, extending beyond the end of abdomen, apex pointed. Sound-producing mechanism not detected. Upper carinula of hind femur smooth. External apical spine of hind tibia absent. Tympanum developed.

Type-genus: *Leptysma* Stål 1873.

Two genera of this subfamily are distributed in North America: *Leptysma* Stål 1876 and *Stenacris* Walker 1870.

Family Oedipodidae

Frontal ridge vertical. Fastigial furrow absent. Prosternal process absent. Antennae filiform or ensiform. Tegmina and hindwings fully developed. Tegmina with raised and serrated intercalary vein in the medial area, rarely intercalary vein lacking. Sound-producing by rubbing the intercalary vein against the inner sharp carinula of hind femur. External apical spine of hind tibia absent. Tympanum developed. Epiphallus bridge-shaped, ancorae long. Phallic complex complicated.

This family includes three subfamilies.

Key to subfamilies of the Oedipodidae

1(4) Tegmina with raised and serrated intercalary vein in medial area. Sound-producing by rubbing the intercalary vein against inner sharp carinula of hind femur.

2(3) Antennae filiform..... **Oedipodinae**

3(2) Antennae ensiform..... **Calephorinae**

4(1) Tegmina without intercalary vein in medial area. Sound-producing mechanism not detected.
..... **Heliastinae** nov.

Subfamily Oedipodinae

Antennae filiform. Tegmina and hindwings developed. Tegmen with raised and serrated intercalary vein in medial area. Sound producing by rubbing intercalary vein against inner sharp carinula of hind femur. Upper carinula of hind femur smooth. Tympanum developed.

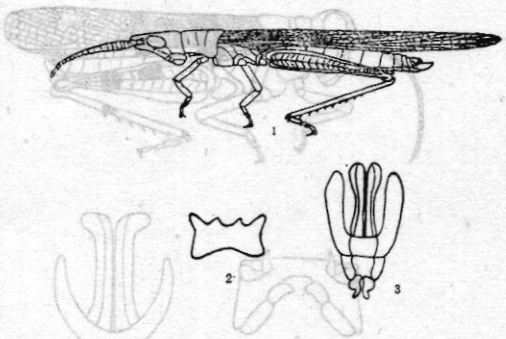


Fig. 23 (图 23) *Leptysma hebardi* Rehn et Eades 1961
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

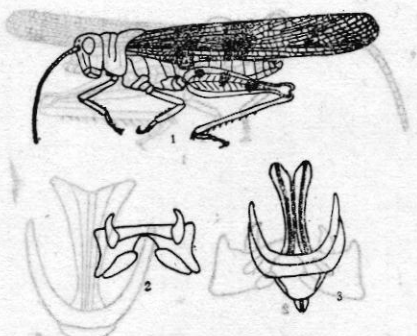


Fig. 24 (图 24) *Trimerotropis pallidipennis* (Burmeister) 1838
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Type-genus: *Oedipoda* Latreille 1829.

About 33 genera of this subfamily are distributed in North America: *Agymnastus* Scudder 1897, *Anconia* Scudder 1876, *Arphia* Stål 1873, *Camnula* Stål 1873, *Chimarocephala* Scudder 1876, *Chortophaga* Saussure 1884, *Circotettix* Scudder 1876, *Conozoa* Saussure 1884, *Cratypedes* Thomas 1876, *Derotmema* Scudder 1876, *Dissosteira* Scudder 1876, *Encoptolophus* Scudder 1875, *Eximacris* Otte 1984, *Hadrotettix* Scudder 1876, *Hippiscus* Saussure 1861, *Hippopedon* Saussure 1861, *Lactista* Saussure 1884, *Leprus* Saussure 1861, *Leuronotina* Hebard 1932, *Mestobregma* Scudder 1876, *Metator* McNeill 1901, *Microtes* Scudder 1900, *Pardalophora* Saussure 1884, *Shotwellia* Gurney 1940, *Spharagemon* Scudder 1875, *Sphingonotus* Fieber 1852, *Stictippus* Scudder 1892, *Stethophyma* Fisher 1853, *Trachyrhachys* Scudder 1876, *Trepidulus* McNeill 1901, *Trimerotropis* Stål 1873, *Tropidolophus* Thomas 1873, and *Xanthippus* Saussure 1884.

The Asian species *Oedaleus abruptus* (Thunberg) 1815 is found in Hawaii Islands only, but we don't know that how long is the species imported here from Asia.

Subfamily Calephorinae

Antennae ensiform. Tegmina and hindwings developed. Tegmen with raised and serrated intercalary vein in medial area. Sound producing by rubbing intercalary vein against inner sharp carinula of hind femur. Upper carinula of hind femur smooth. Tympanum developed.

Type-genus: *Calephorus* Fieber 1853.

Two genera of this subfamily are distributed in North America: *Psinidia* Stål 1873 and *Tomonotus* Saussure 1861.

Subfamily Heliastinae nov.

Antennae filiform. Tegmina and hindwings developed. Tegmen without intercalary vein in medial area. Sound producing mechanism not detected. Upper carinula of hind femur smooth. Tympanum developed.

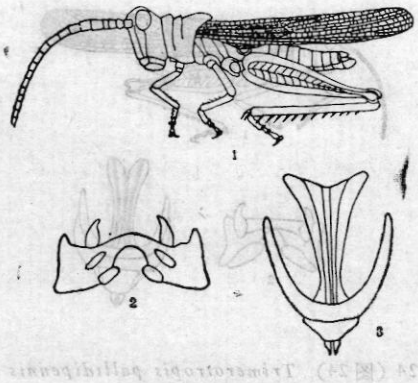


Fig. 25 (图 25) *Psinidia amplicornis* Caudell 1903
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

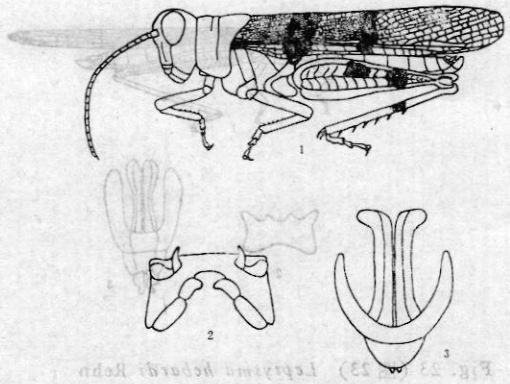


Fig. 26 (图 26) *Heliastus benjamini* Caudell 1905
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Type-genus: *Heliastus* Saussure 1884.

The subfamily represented by a single genus found in Southwest Part of U. S. and Mexico only.

This genus *Heliastus* Saussure without intercalary vein in medial area of tegmen, we can't put it into any subfamily, so a new subfamily is established.

Family Truxalidae (Gomphoceridae)

Fastigial furrow absent. Antennae filiform, ensiform, or clavate. Prosternal process usually absent, rarely prosternum between front legs with flattened process. Tegmina and hindwings developed, shortened or lobiform. Hind femur with stridulatory pegs on inner face, rarely stridulatory pegs lacking. External apical spine of hind tibia absent. Tympanum present. Epiphallus bridge-shaped, ancorae long. Phallic complex complicated.

Includes 7 subfamilies. The subfamily Dysaneminae of this family from Xizang (Tibet) Plateau of China is not found in North America at present, we think that lower altitude here may be one of the reasons.

Key to subfamilies of the Truxalidae

1(2) Prosternum between front legs with flattened process. ..... **Mermirinae** nov.

2(1) Prosternal process absent.

3(6) Antennae filiform.

4(5) Hind femur with stridulatory pegs on inner face. Tegmina and hindwings developed, sometimes shortened. ..... **Arcypterinae**

5(4) Hind femur without stridulatory pegs on inner face. Tegmina and hindwings lobiform, lateral. ..... **Asoninae**

6(3) Antennae not filiform.

7(12) Antennae ensifrom.

8(11) Hind femur with stridulatory pegs on inner face. Tegmina and hindwings developed.

9(10) Body not cylindrical. The end of tegmen rounded. ..... **Chrysochraontinae**

10(9) Body cylindrical. The end of tegmen pointed. ..... **Truxalinae**

11(8) Hind femur without stridulatory pegs on inner face. Tegmina and hindwings lobiform, lateral. ..... **Radinotatinae** nov.

12(7) Antennae clavate. ..... **Gomphocerinae**

Subfamily Mermirinae nov.

Antennae ensiform. Prosternal process present. Tegmina and hindwings not extending beyond the end of abdomen, sometimes shortened, apex rounded. Hind femur with stridulatory pegs on inner face. Tympanum present.

Type-genus: *Mermiria* Stål 1873.

Four genera of this subfamily are distributed in North America: *Mermiria* Stål 1873, *Paropomala* Scudder 1899, *Prorocorypha* Rehn 1911 and *Pseudopomala* Morse 1896.

Subfamily Arcypterinae

Antennae filiform. Prosternal process absent. Tegmina and hindwings developed, sometimes shortened. Hind. femur with stridulatory pegs on inner face. Tympanum present.

Type-genus: *Arcyptera* Serville 1839.

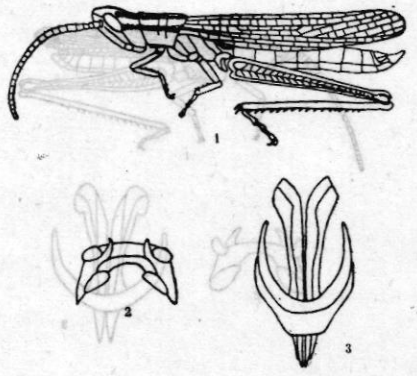


Fig. 27 (图 27) *Mermiria picta* (Walker) 1870
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

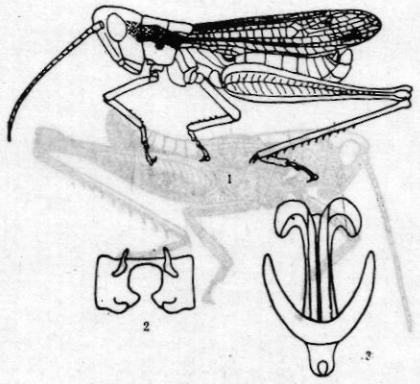


Fig. 28 (图 28) *Chorthippus curtipennis* (Harris) 1835
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

About 29 genera of this subfamily are distributed in North America: *Acrolophitus* Thomas 1871, *Ageneotettix* McNeill 1897, *Amblytropidia* Stål 1873, *Amphitornus* McNeill 1897, *Aulocara* Scudder 1876, *Boopedon* Thomas 1870, *Bootettix* Bruner 1890, *Chiapacris* Otte 1979, *Chloealtis* Harris 1841, *Chorthippus* Fieber 1852, *Cibolacris* Hebard 1937, *Compsacrella* Rehn et Hebard 1938, *Dichromorpha* Morse 1896, *Eritettix* Bruner 1890, *Esselenia* Hebard 1920, *Eupnigodes* McNeill 1897, *Heliaula* Caudell 1915, *Leurohippus* Uvarov 1940, *Ligurotettix* McNeill

1897, *Orphulella* Giglio-Tos 1894, *Orphulina* Giglio-Tos 1894, *Phaneroturis* Bruner 1904, *Phlibostroma* Scudder 1875, *Psoloessa* Scudder 1875, *Rhammatocerus* Saussure 1861, *Silvitettix* Bruner 1904 (part), *Stenobothrus* Fisher 1853, *Syrbula* Stål 1873 (part) and *Xeracris* Caudell 1915.

Subfamily Asoninae

Antennae filiform. Prosternal process absent. Tegmina and hindwings lobiform, lateral. Hind femur without stridulatory pegs on inner face. Tympanum present.

Type-genus: *Asonus* Yin 1982.

There is a genus *Melanotettix* Bruner 1904 in Mexico only.

Subfamily Chrysochraontinae

Antennae ensiform. Body not cylindrical. Prosternal process absent. Tegmina and hindwings developed, sometimes shortened, if shortened at least tegmina overlapping on the back in male, the end of tegmen rounded. Hind femur with stridulatory pegs on inner face. Tympanum present.

Type-genus: *Chrysochraon* Fisher 1853.

About 7 genera of this subfamily are distributed in North America: *Acantherus* Scudder et Cockerell 1902, *Chrysochraon* Fisher 1853, *Cordillacris* Rehn 1901, *Horesidotes* Scudder 1899, *Opeia* McNeill 1897, *Silvitettix* Bruner 1904 (part) and *Syrbula* Stål 1873 (part).

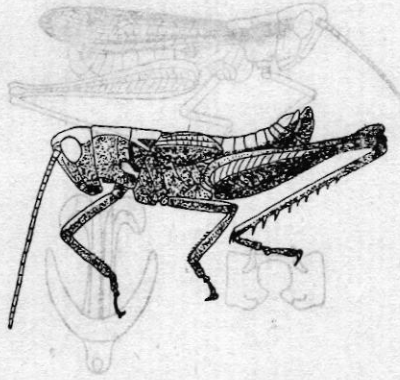


Fig. 29 (图 29) *Melanotettix dibelonius* Bruner 1904, male (雄性). (after Otte, 1981)

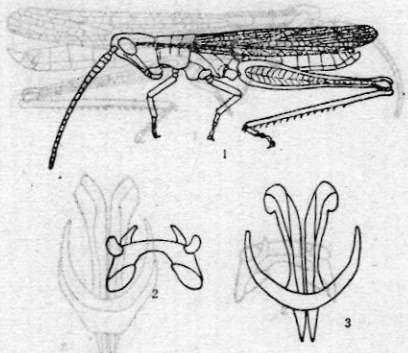


Fig. 30 (图 30) *Acantherus piperatus* Scudder et Cockerell 1902
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Truxalinae

Antennae ensiform. Body cylindrical. Prosternal process absent. Tegmina and hindwings developed, sometimes shortened, rarely lobiform, lateral, the end of tegmen pointed. Hind femur with stridulatory pegs on inner face. Tympanum present.

Type-genus: *Truxalis* Fabricius 1775.

There is a genus *Achurum* Saussure 1861 in North America.

Subfamily Radinotatinae nov.

Antennae ensiform. Body cylindrical. Prosternal process absent. Tegmina and hindwings lobiform, lateral. Hind femur without stridulatory pegs on inner face. Tympanum present.

Type-genus: *Radinotatum* McNeill 1897.

Obtains a single genus in North America only.

This new subfamily is related to Truxalinae. but hind femur without stridulatory pegs on inner face.

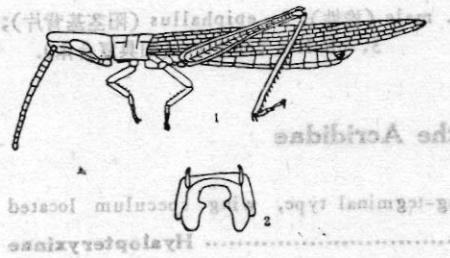


Fig. 31 (图 31) *Achurum sumichrasti* (Saussure) 1861
1. male (雄性); 2. epiphallus (阳茎基背片).

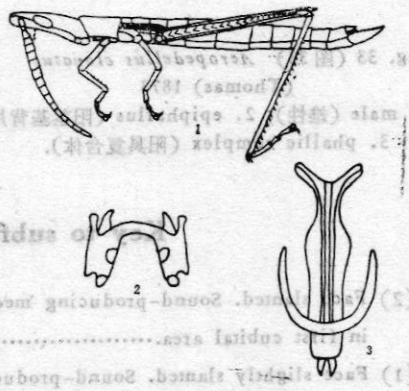


Fig. 32 (图 32) *Radinotatum brevipenne peninsulare* Rehn et Hebard 1912
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Subfamily Gomphocerinae

Antennae clavate. Tegmina and hindwings developed. Hind femur with stridulatory pegs on inner face. Tympanum present.

Type-genus: *Gomphocerus* Thunberg 1815.

There is only one genus *Aeropedellus* Hebard 1935 in North America.

Family Acrididae

Fastigial furrow absent. Antennae ensiform. Prosternal process absent. Tegmina and hindwings fully developed. Sound-producing mechanism of wing-tegminal type or not found. External apical spine of hind tibia absent. Tympanum present. Epiphallus bridge-shaped, bridge narrow, ancorae moderately long. Phallic complex complicated.

This family contains two subfamilies.

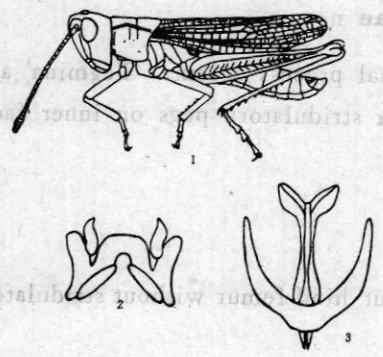


Fig. 33 (图 33) *Aeropedellus clavatus* (Thomas) 1873
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

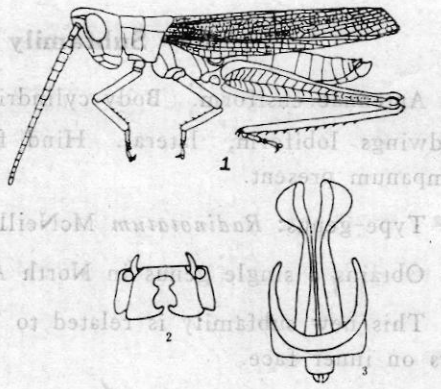


Fig. 34 (图 34) *Orphula azteca* (Saussure) 1861
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

Key to subfamilies of the Acrididae

1(2) Face slanted. Sound-producing mechanism of wing-tegminal type, wing speculum located in first cubital area..... **Hyalopteryxinae**

2(1) Face slightly slanted. Sound-producing mechanism not found, wing speculum absent..... **Machaerocerinae** nov.

Subfamily Hyalopteryxinae

Face slanted. Tegmina and hindwings developed, end of tegmina obliquely cut, hindwing with speculum in first cubital area. Sound-producing mechanism of wing-tegminal type. Upper carinula of hind femur smooth.

Type-genus: *Hyalopteryx* Charpentier 1845.

Two genera of this subfamily are distributed in North America: *Metaleptea* Brunner et Wattenwyl 1893 and *Orphula* Stål 1873.

Subfamily Machaerocerinae nov.

Face slightly slanted. Tegmina and hindwings developed, end of tegmina obliquely cut, hindwing without enlarged cells. Sound-producing mechanism not found. Upper carinula of hind femur smooth.

Type-genus: *Machaerocera* Saussure 1859.

Obtains a single genus found in South Arizona of U. S. and Mexico only.

This new subfamily is related to Phlaeobinae from Asia. but face slightly slanted and upper carinula of hind femur smooth.

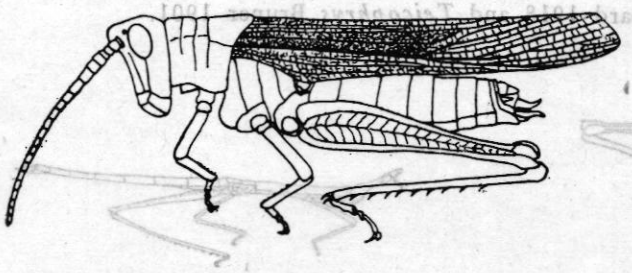


Fig. 35 (图 35) *Machaerocera mexicana* Saussure 1859, female (雌性).

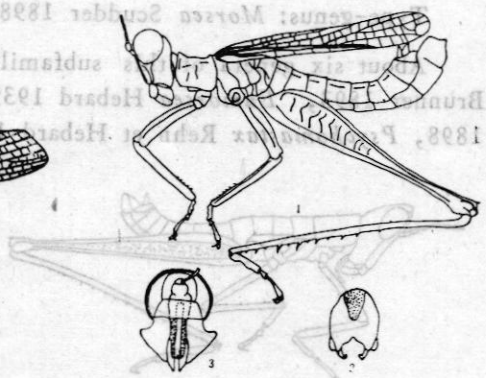


Fig. 36 (图 36)
1. male (雄性) of *Eumastax surda* Burr. 1899 (after Dirsh 1961); 2. epiphallus (阳茎基背片) of *Eumastax bouvieri* C. Bolivar 1918; 3. phallic complex (阳具复合体) of *Eumastax bouvieri* C. Bolivar 1918 (2,3 after Descamps 1971).

Superfamily Eumastacoidea

Antennae shorter than fore femora. Body not Stick-like. Prothorax not tube-like, usually shorter than fore femora. Fore, middle and hind tarsi 3-segmented. Spiracula placed on abdominal latacoria.

Family Eumastacidae

Antennae filiform or slightly clavate. Epiphallus shield-shaped, with distal appendices. Phallic complex complicated.

This family includes two subfamilies.

Key to subfamilies of the Eumastacidae

1(2) Tegmina and hindwings present. ..... **Eumastacinae**

2(1) Tegmina and hindwings absent. ..... **Morseinae**

Subfamily Eumastacinae

Antennae filiform. Tegmina and hindwings present.

Type-genus: *Eumastax* Burr. 1903.

Two genera of this subfamily are found in North America: *Eumastax* Burr. 1903 and *Paramastax* Burr. 1899.

Subfamily Morseinae

Antennae slightly clavate. Tegmina and hindwings absent.

Type-genus: *Morsea* Scudder 1898.

About six genera of this subfamily are distributed in North America: *Episactus* Brunner 1893, *Eumorsea* Hebard 1935, *Gymnotettix* Bruner 1901, *Morsea* Scudder 1898, *Psychomastax* Rehn et Hebard 1918 and *Teicophrys* Bruner 1901.

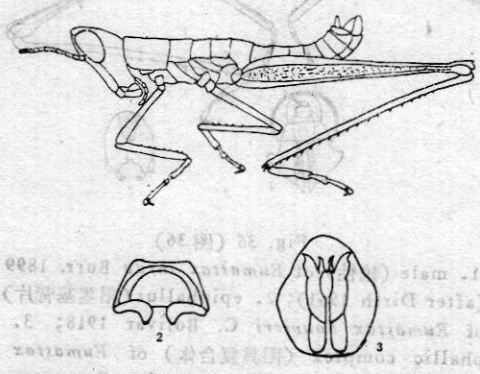


Fig. 37 (图 37) *Eumorsea balli* Hebard 1935
1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

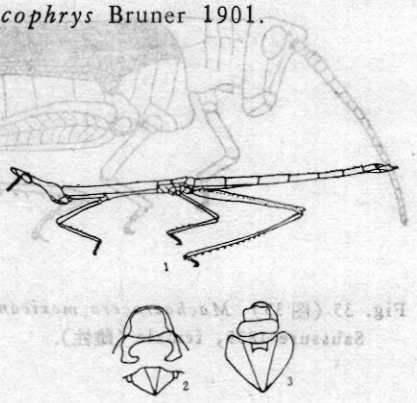


Fig. 38 (图 38) *Proscopia scabra* Klug 1820
1. female (雌性); 2. epiphallus and phallic complex (阳茎基背片和阳具复合体); 3. phallic complex (阳具复合体) (after Dirsh 1975).

Superfamily Proscopoidea

Antennae shorter than fore femora. Body stick-like. Prothorax tube-like, longer than fore femora. Fore, middle and hind tarsi 3-seg-mented.

Family Proscopiidae

Antennae filiform. Epiphallus strongly sclerotized bridge-shaped. Phallic complex complicated.

Subfamily Proscopiinae

Tegmina and hindwings absent.

Type-geuns: *Proscopia* Klug 1820.

There is a geuns *Taxiarchus* Brunner 1890 found in Costa Rica only.

Superfamily Tetrigoidea

Pronotum very long, covering all or nearly all of abdomen, still extending beyond the end of abdomen. Fore and middle tarsi 2-segmented, hind tarsius 3-segmented. Cerci unsegmented.

Family Tetrigidae

Antennae filiform. Epiphallus sclerotized, upsidedown V-like, with two spines. Phallic complex complicated.

Subfamily Tetriginae

Tegmina and hindwings present, hindwings developed.

Type-genus: *Tetrix* Latreille 1802.

About 6 genera of this subfamily are distributed in North America: *Neotettix* Hancock 1898, *Nomotettix* Morse 1894, *Paratettix* Bolivar 1887, *Paxilla* Bolivar 1887, *Tetrix* Latreille 1802 and *Tettigidea* Scudder 1862.

Superfamily Tridactyloidea

Pronotum short, covering mesonotum only. Fore legs weakly fossorial. Fore and middle tarsi 2-segmented, hind tarsus unsegmented. Cerci 2-segmented.

Family Tridactylidae

Antennae filiform. Ovipositor valves of female reduced.

Subfamily Tridactylinae

Tegmina and hindwings present, hindwings developed.

Type-genus: *Tridactylus* Olivier 1789.

There is only one genus in North America.

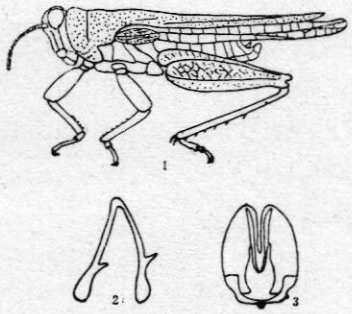


Fig. 39 (图 39) *Paratettix aztecus* (Saussure) 1861

1. male (雄性); 2. epiphallus (阳茎基背片); 3. phallic complex (阳具复合体).

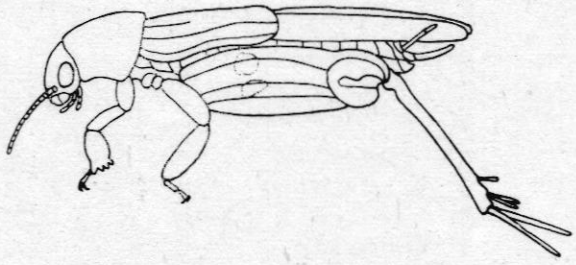


Fig. 40 (图 40) *Tridactylus minutus* Scudder 1862, male (雄性).

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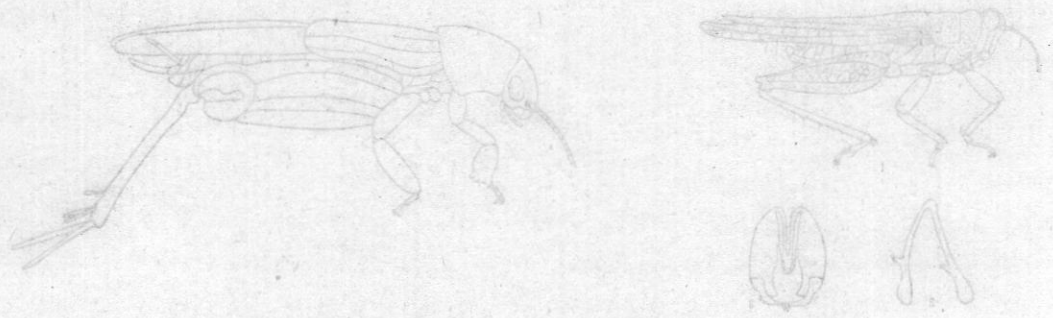

北美洲(包括大安的列斯和夏威夷群岛)镌瓣亚目 Caelifera(蝗亚目 Acridodea)的分类(直翅目 Orthoptera)

印 象 初*

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1987 年 1—7 月,作者荣幸地应邀赴美任亚利桑那州立大学动物系客座研究教授。在美工作期间,除对该大学动物系 Hasbrouck 昆虫标本馆和亚利桑那大学昆虫系昆虫标本馆收藏的蝗虫标本进行分类研究外,还查看了洛杉矶自然历史博物馆和美国国家自然历史博物馆(华盛顿特区)收藏的蝗虫标本。对北美洲的蝗虫进行了系统分类研究,按感觉、发音、听觉和运动等器官的主要特征,拟就了一个分类系统,供参考试用。

本文包括 5 总科、13 科、40 亚科和 169 属。其中有 1 新科、15 新亚科,并列出总科、科和亚科的检索表。

遗憾的是由于工作时间有限和上述单位收藏的标本不全,一些属的标本未能查看,它们的分类地位未能确定,因而未能列入本文。我将期待新的机会完善这个分类系统。

本分类系统按下列原则排列:(1)触角由长到短;(2)前、中、后足跗节数由 3:3:3 到 2:2:3 到 2:2:1;(3)头顶细纵沟从有到无;(4)前胸背板由短到长;(5)雌性产卵瓣由发达到退化;(6)后足胫节外端刺从有到无;(7)前胸腹板突从有到无;(8)翅从发达到退化,直至消失;(9)发音器从发达到退化,直至消失;(10)鼓膜器从发达到退化,直至消失;(11)后足股节上隆线从齿状到平滑;(12)阳茎基背片和阳具复合体从简单到复杂。

蠓蝗科 (Tanaoceridae) 雄性的触角长于体长,说明其为蠓蟌和蝗虫间的过渡类型,依据产卵瓣当属蝗类。

新科 (Phrynotettidae nov.) 所包括的属,以往列入 Romaleidae 科中,但腹部第 2 节具摩擦板 (Krauss's Organ) 因而另建新科。该新科同广布于欧亚非 3 洲的癞蝗科 (Pamphagidae) 接近,但头顶缺细纵沟,后足股节下基叶不长于上基叶也显然有别。

依据发音器的消失建立新亚科:Brachystolinae nov., Heliastinae nov., Radinotatinae nov. 和 Machaerocerinae nov.。

依据鼓膜器的消失建立新亚科:Ichthyotattinae nov. 和 Caletesinae nov.。

依据前胸腹板突的消失建立新亚科:Tytthotylinae nov.。

依据前胸腹板突的存在建立新亚科:Mermirinae nov.。

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本文1988年 9 月12日收到。

依据后足胫节外端刺的消失建立新亚科：Spaniacrinae nov.。

依据触角形状不同和后足股节上隆线齿状建立新亚科： Litoscirtinae nov., Dracotettinae nov. 和 Xyphophorinae nov.。

依据前翅退化呈鳞片状、侧置及后足股节上隆线具齿或平滑建立新亚科：Phrynotettinae nov., Sphenarinae nov. 和 Lysacrinae nov.。

上述的新科、新亚科包括的属、种较少，但依据的特征均为常用的分科和亚科的特征。本文不论属、种多少，而以特征为依据进行分类。

本文将 Cyrtacanthacridinae 亚科并入 Catantopinae 亚科， Proctolabinae 并入 Melanoplinae 亚科，因依据的特征常用以分属或族 Tribe。

中国西藏高原特有的 Dysaneminae 亚科在北美洲至今尚未发现，这可能是北美洲的高原海拔较低是原因之一。

负蝗亚科（Atractomorphinae）和稻蝗亚科（Oxyinae)分布于亚洲及大洋洲，这 2 个亚科现均已扩散至夏威夷群岛，它们已越过了大半个太平洋。