

COMPARATIVE MORPHOLOGY AND EVOLUTION OF
THE HIND WINGS OF THE FAMILY
CHRYSOMELIDAE (Coleoptera)

III. Subfamilies *Megascelinae*, *Clytrinae* and *Cryptocephalinae*

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Introduction

The three subfamilies, *Megascelinae*, *Clytrinae* and *Cryptocephalinae* had long been included, together with the two subfamilies, *Megalopodinae* and *Chlamisinae*, in the Section (or Division) *Camptosomes* (Chapuis, 1874; Jacoby, 1908; and many others). Recently, the subfamily *Megalopodinae* was transferred to the Section *Eupodes* which is the most primitive group of this family (Gressitt, 1942) and was treated together with the subfamily *Megascelinae* as a subfamily of the family "*Sagridae*" (Chen, 1940). Chûjô (1953a) discriminated the fourteen Divisions and seventeen subfamilies for this family, and treated the subfamily *Megascelinae* as his seventh Division. The two subfamilies, *Clytrinae* and *Cryptocephalinae*, are closely allied to each other and are belonging to the Section *Camptosomes* (Chapuis, 1874; Jacoby, 1908; Gressitt, 1942; and many others). Chûjô (1953a) included them in his eighth Division. As shown in the above short historical review, the assumption of the phylogenetic position of these three subfamilies is very difficult.

In the present paper, the author describes the general structures of the hind wing venation of the three subfamilies, *Megascelinae*, *Clytrinae* and *Cryptocephalinae*, supposes the evolutionary processes of the hind wing venation, and discusses the phylogenetic relationships among the members of the latter two subfamilies chiefly basing on the comparative morphology of hind wing venation.

Materials and Methods

The materials examined were collected from various parts of Japan by many collaborators and the author himself.

VII. Subfamily *Megascelinae* Jacoby, 1908

This subfamily distributes in Tropical America only. The author had no opportunity to investigate the hind wings.

VIII. Subfamily *Clytrinae* Jacoby & Clavareau, 1906

Clytra laeviuscula (Ratzeburg, 1837)

2 exs., Kirigamine-kôgen, Nagano Pref., Honshu, 20-VII, 1963, K. Suzuki leg. ;

2 exs., The same locality, 25-VII, 1964, K. Suzuki leg.

Smaragdina quadrimaculata (Jacoby, 1896)

5 exs., Hatsuno, Is. Amami Oshima, LooChoo, 16-IV, 1965, A. Yoshii leg.

Smaragdina aurita (Linnaeus, 1766)

3 exs., Hikawa-Keikoku, Tokyo Pref., Honshu, 14-V, 1961, K. Suzuki leg. ;

2 exs., Kirigamine-kôgen, Nagano Pref., Honshu, 20-VII, 1963, K. Suzuki leg.

Smaragdina garretai (Achard, 1921)

3 exs., Mt. Takao, Tokyo Pref., Honshu, 12-V, 1966, M. Nishikawa leg. ; 2

exs., Mt. Jômine, Saitama Pref., Honshu, 3-V, 1964, E. Hara leg. ; 1 ex.,

Daibosatsu-tôge, Yamanashi Pref., Honshu, 24-V, 1969, K. Suzuki leg.

IX. Subfamily *Cryptocephalinae* Jacoby, 1908*Cryptocephalus approximatus* Baly, 1873

2 exs., Mt. Hiko, Fukuoka Pref., Kyushu, 6-VI, 1966, K. Suzuki leg. ; 2 exs.,

Mt. Ichifusa, Kumamoto Pref., Kyushu, 9-VI, 1966, K. Suzuki leg. ; 2 exs.,

Nidoage, Gumma Pref., Honshu, 6-VII, 1965, K. Yamaoka leg. ; 1 ex., Mt.

Ôgusu, Kanagawa Pref., Honshu, 9-V, 1965, K. Suzuki leg. ; 1 ex., Mizonokuchi,

Kanagawa Pref., Honshu, 3-V, 1965, K. Suzuki leg. ; 1 ex., Eda, Kanagawa

Pref., Honshu, 3-V, 1969, K. Suzuki leg.

Cryptocephalus signaticeps Baly, 1873

2 exs., Mizonokuchi, Kanagawa Pref., Honshu, 3-V, 1965, K. Suzuki leg. ; 1

ex., Mt. Ôgusu, Kanagawa Pref., Honshu, 5-V, 1965, K. Suzuki leg. ; 2 exs.,

The same locality, 9-V, 1965, K. Suzuki leg. ; 1 ex., Kamakura, Kanagawa

Pref., Honshu, 28-IV, 1969, K. Suzuki leg. ; 1 ex., Eda, Kanagawa Pref., Hon-

shu, 3-V, 1969, K. Suzuki leg.

Cryptocephalus japanus Baly, 1873

1 ex., Nidoage, Gumma Pref., Honshu, 6-VII, 1965, K. Yamaoka leg. ; 1 ex.,

Eda, Kanagawa Pref., Honshu, 8-V, 1969, K. Suzuki leg.

Cryptocephalus fortunatus Baly, 1873

1 ex., Nidoage, Gumma Pref., Honshu, 6-VII, 1965, K. Yamaoka leg.

Cryptocephalus discretus Baly, 1873

3 exs., Mizonokuchi, Kanagawa Pref., Honshu, 5-V, 1959, K. Suzuki leg.

Cryptocephalus amicus Baly, 1873

1 ex., Kirigamine-kôgen, Nagano Pref., Honshu, 18-VII, 1963, K. Suzuki leg. ;

1 ex., The same locality, 25-VII, 1964, K. Suzuki leg.

Cryptocephalus perelegans perelegans Baly, 1873

3 exs., Mt. Hiko, Fukuoka Pref., Kyushu, 6-VI, 1966, K. Suzuki leg. ; 2 exs.,

Cape Sata, Pen. Ohsumi, Kagoshima Pref., Kyushu, 13-VI, 1966, K. Suzuki

leg.

Pachybrachys eruditus Baly, 1873

6 exs., Kirigamine-kôgen, Nagano Pref., Honshu, 22-VII, 1963, K. Suzuki leg. ;
3 exs., Mt. Daisen, Tottori Pref., Honshu, 20-VII, 1967, K. Sakai leg.

Adiscus lewisi (Baly, 1873)

2 exs., Mizonokuchi, Kanagawa Pref., Honshu, 14-VI, 1959, K. Suzuki leg.

Coenobius obscuripennis Chûjô, 1935

2 exs., Yona Forest, Is. Okinawa, LooChoo, 4-VII, 1965, K. Mizusawa leg.

Coenobius piceus Baly, 1874

2 exs., Cape Sata, Pen. Ôsumi, Kagoshima Pref., Kyushu, 13-VI, 1966, K. Suzuki leg.

The methods of this study are treated as the previous paper (Suzuki, 1969b).

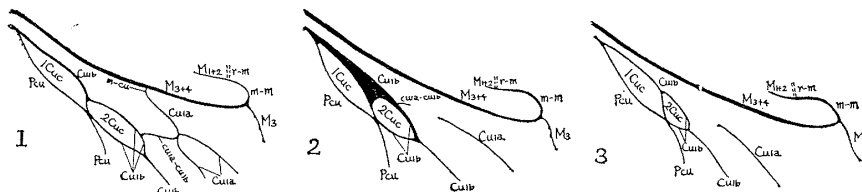
Observations and Discussions

A. General structures.

VII. Subfamily *Megascelinae* (Fig. 1)

The following description is based on the three species studied by Jolivet (1957: *Megascelis unicolor*, *M. flaviceps*) and Chûjô (1953b: *Megascelis* sp.).

The visible basal extremity of Cu_{1a} fuses with M_{3+4} by $m-cu$ at the position about 3/5 from the base of the latter. Cu_{1a} forks into two subbranches at about the middle. The $cu_{1a}-cu_{1b}$ is well developed, the anterior extremity is associated with the basal part of posterior subbranch of Cu_{1a} , and the posterior one associated with the anterior arch of $2Cuc$ (the anterior subbranch of Cu_{1b}). Cu_{1b} forks into two subbranches which associate again with each other at the apical part, and therefore, a very large Cuc ($2Cuc$) is formed there. Pcu fuses with Cu_{1b} by a short $cu_{1b}-pcu$ at about the middle.



Figs. 1-3. Schematic right hind wing venation of: 1. *Megascelinae*,
2. *Clytrinae* (primitive type), 3. *Cryptocephalinae* (primitive type)
(*Vannal* region).

VIII. Subfamily *Clytrinae* (Fig. 2)

Cu_{1a} is always single and is completely isolated from the other veins. Cu_{1b} is well developed and forms a $2Cuc$ by the branching of itself at about the middle part but it incidentally disappears. Pcu is always fuses with Cu_{1b} directly or by the short $cu_{1b}-pcu$ at about the middle.

IX. Subfamily *Cryptocephalinae* (Fig. 3)

Cu_{1a} is always single, completely isolated from the other veins, and frequently

degenerates partially or disappears completely. Cu_{1b} forms a $2Cuc$ by the branching of itself at about the middle part but it incidentally disappears. Pcu is very variable. Cu_{1b} and Pcu often fuse with each other and incidentally degenerate completely.

B. Evolutionary processes of the hind wing venation and phylogeny

VIII. Subfamily *Clytrinae*

According to Clavareau (1913), this subfamily is divided into the following four tribes.

1. Tribe *Clytrini*
2. Tribe *Megalostomini*
3. Tribe *Babiini*
4. Tribe *Ischiopachini*

The hind wing venation of this subfamily is considerably stable as compared with the abundant genera and can be divided into the following two main types:

- 1) *Clytrini*-type: Cu_{1b} forks into two subbranches and forms $2Cuc$...
..... *Clytrini*, *Megalostomini*
- 2) *Babiini*-type: Cu_{1b} does not fork and does not form $2Cuc$
..... *Babiini*, *Ischiopachini*

This division seems to well correspond to the taxonomic division into tribes of this subfamily. Among above four tribes, *Clytrini* relates to the fauna of all over the world but all of the other three are distributed in the New World only, especially in the Tropical America (Clavareau, 1913; Chûjô, 1952). Basing on their distribution, the author supposes that the tribe *Clytrini* is the most primitive group of this subfamily and that the wing venation of this subfamily may have been evolved from a complex type to a simple one. The tribe *Megalostomini* may have been derived from the ancestor of *Clytrini* and the other two may have been differentiated independently on the way of differentiation of the *Megalostomini*.

Above mentioned discussions may be arranged as in the Figs. 4 and 5.

IX. Subfamily *Cryptocephalinae*

According to Clavareau (1913), this subfamily is divided into following five tribes.

1. Tribe *Cryptocephalini*
2. Tribe *Stylosomini*
3. Tribe *Pachybrachini*
4. Tribe *Monachini*
5. Tribe *Achaeopsini*

The hind wing venations of this subfamily are somewhat variable. The typical types have the two *Cuc* ($1Cuc$ and $2Cuc$) and the other types seem to have been degenerated secondarily according to the following observation: all of these tribes except *Achaeopsini* which was not examined by the author include the typical type. The fact on the hind wing venation suggests that this subfamily is

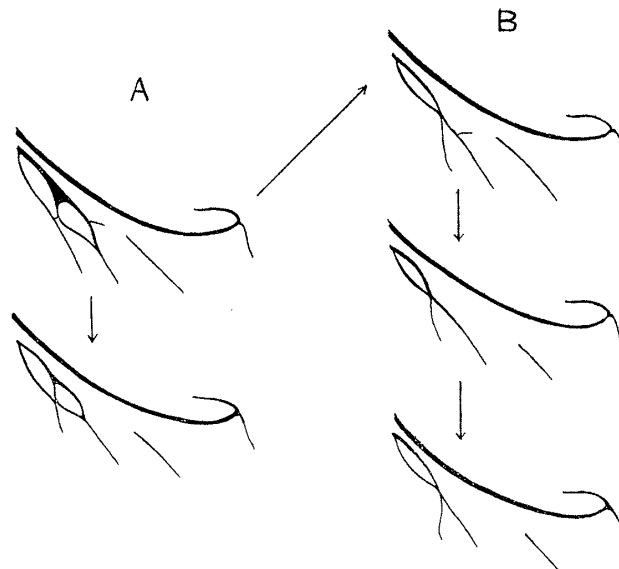


Fig. 4. Supposed evolutionary processes of hind wing venation of *Clytrinae*. (*Vannal region*). A. *Clytrini*+*Megalostomini*, B. *Babiini*+*Ischiopachini*.

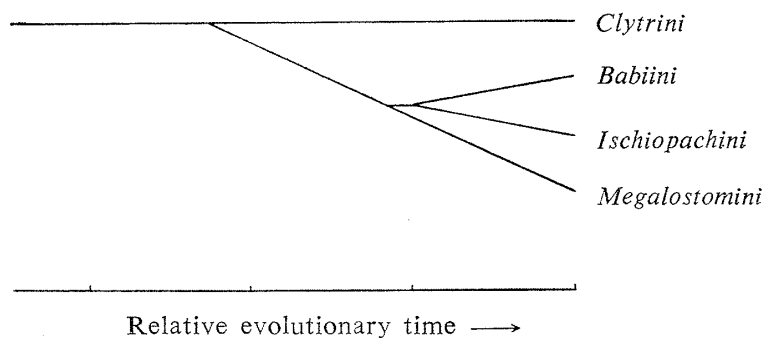


Fig. 5. Cladogram of *Clytrinae* (at tribe level).

polyphyletic at tribe level. But the author supposes that the tribe *Cryptocephalini* is the most primitive group and that from its ancestral type, a branch was produced, from which the other tribes were differentiated independently with each other within comparatively short time. This supposition is made after the knowledge of their distribution, that is to say; the tribe *Cryptocephalini* has the world wide distribution while most of the others prosper in Australian or Neo-Tropical Region (Clavareau, 1913; Chûjô, 1954). The wing venation of this subfamily may also be differentiated from a complex type to a simple one.

Above mentioned discussions may be arranged as in the Figs. 6 and 7.



Fig. 6. Supposed evolutionary processes of hind wing venation of *Cryptocephalinae*. (Vannal region).

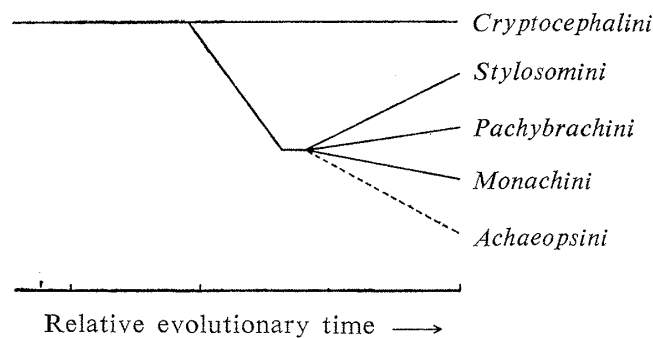


Fig. 7. Cladogram of *Cryptocephalinae* (at tribe level).

Summary

1) In the present paper, the comparative morphology of the hind wing venation of the three subfamilies, *Megascelinae*, *Clytrinae* and *Cryptocephalinae*, were dealt.

2) General structures of the hind wing venation of the three subfamilies, *Megascelinae* (Fig. 1), *Clytrinae* (Fig. 2) and *Cryptocephalinae* (Fig. 3), were described and illustrated.

3) Evolutionary processes of the hind wing venation of the two subfamilies, *Clytrinae* (Fig. 4) and *Cryptocephalinae* (Fig. 6), were supposed and illustrated.

4) Phylogeny at the tribe level of these two subfamilies, *Clytrinae* (Fig. 5) and *Cryptocephalinae* (Fig. 7), chiefly based on the comparative morphology of the hind wing venation was discussed and expressed in the cladogram.

5) In the two subfamilies, *Clytrinae* and *Cryptocephalinae*, the hind wing venation seems to have been evolved from a complex type to a simple one as in the case of the more primitive four subfamilies (*Sagrinae*, *Megalopodinae*,

Donaciinae and *Criocerinae*) previously reported by the present author (Suzuki, 1969b), and the author's phylogenetic consideration was authenticated in the conclusion.

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Abbreviations used in the text and figures

Cu. Cubitus; *Cuc.* Cubital cell; *M.* Media; *Pcu.* Postcubitus; cu_{1a} - cu_{1b} , cu_{1b} - pcu , m - cu , m - m , r - m . crossveins.

For details, see Suzuki (1969a).

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新 著 紹 介

Pacific Insects Monograph 22

Gerhard Scherer, 1969: Die Alticinae des indischen Subkontinentes (Coleoptera-Chrysomelidae). 251 pp., 1 map.

この論文は現在ノミハムシの分類に関して世界の最高権威者とみられている西ドイツの Scherer 博士の労作である。アフガニスタン・インド・パキスタン・ビルマ・タイ・印度支那・マラヤなど、東洋区の大陸地区に分布するノミハムシのレビジョナル・ワークであり、7新属・61新種・1新亜種の記載が含まれている。また、124におよぶ附図、属・種の完全な検索表がつけられており、巻末の地理的分布についての考察も興味深い。

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(木元新作)