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Comparative Anatomy of Male Genitalia in Some Cerambycid Beetles[1)]

By

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(With 199 Text figures)

Introduction

The male genitalia of insects have been admitted by a number of entomologists as a valuable character from the viewpoint of taxonomy. Sharp and Muir (1912) published a work on a comprehensive survey of the organs in the Coleoptera, and discussed the phylogeny of this order. Recently, Jeannel and Paulian (1944) proposed a new system of classification of the order, basing on not only characters generally used but also on the structure of male genitalia upon which they made a detailed comparative anatomy. On the other hand, Muir (1915, '18), Singh Pruthi (1924a, '24b) and Metcalfe (1932) reported on the development of the organs of some beetles. As regards the male genitalia of the Cerambycidae, except the works above mentioned, there have been published only a few comparative studies by Bugnion (1931) and Zia (1936). The organs of the Cerambycidae have not yet been studied in detail, and have scarcely been used as the taxonomic character. The author studying a comparative anatomy of the male genitalia of 101 Japanese species of Cerambycidae, confirmed that the results are generally coincided with the traditional classification of the group. In the present paper, the author has also discussed upon the systematic relationships among the subfamilies in the family.

Before going further, the author wishes to express his cordial thanks to Professor Tohru Uchida under whose helpful guidance this work has been carried out, and by whom the draft of this paper has been revised. The author is also indebted to Mr. Shôichi F. Sakagami, Dr. Takahisa Sawamoto, Prof. Michio Chûjô, Mr. Shizuo Kato and Mr. Kôzô Kosugi for their much help and valuable advice rendered during the course of the present study. Furthermore, his hearty thanks are due to Mr. Masayasu Konishi for his kindness in identifying some of specimens used in this study.

1) Contribution No. 321 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

Material and method

Specimens here used were mostly dried ones, but some were those preserved in 75 % alcohol. Apical part of abdomen was cut off from body and boiled in about 10 % KOH-solution. After somewhat macerated, the connections between the tergites and sternites were cut off. It was boiled further in the KOH-solution, and finally the genitalia were separated completely from sternites, tergites, muscles, other miscellaneous tissues and sclerites. After having washed in water, the genitalia were examined. Affected by the treatment of the KOH-solution, the ejacultory duct was made slender.

The specimens examined in the present study were all collected in Japan. Most of them were collected by the author, however, some[1] of them were delivered to him by several gentlemen. The species studied are 101 in number, covering six subfamilies, as listed below. The specific name of the majority of specimens was determined by the author himself, while some specimens were kindly identified by Mr. M. Konishi. The latter species, in this list, are marked with an asterisk.

List of species under study[2]

1) Subfam. SPONDYLINAE

1. *Spondylis buprestoides* (Linné)
[Subfam. Aseminae, Tribe Spondylini]

2) Subfam. PRIONINAE

2. *Megopis* (*Aegosoma*) *sinica sinica* (White)
[Tribe Megopidini]
3. *Prionus insularis* Motschulsky

3) Subfam. DISTENIINAE

4. *Distenia gracilis* (Blessig)
[Subfam. Aseminae, Tribe Disteniini]

4) Subfam. LEPTURINAE

5. *Rhagium* (*Hargium*) *inquisitor japonicum* Bates
[Stenocorus (Stenocorus) inquisitor japonicus (Bates)]
6. *Stenocorus coeruleipennis* (Bates)
[Toxotus (Toxotus) coeruleipennis Bates]
7. *Gaurotes* (*Paragaurotes*) *doris* Bates
8. *Pidonia* (*Pidonia*) *maculithorax* Pic
9. *Pidonia* (*Pseudopidonia*) *grallatrix* (Bates)
10. *Pidonia* (*Pseudopidonia*) *amentata* (Bates)
11. *Pidonia* (*Pseudopidonia*) *debilis* (Kraatz)
12. *Pidonia* (*Pseudopidonia*) *insuturata* Pic
13. *Pidonia* (*Pseudopidonia*) *signifera* (Bates)
*14. *Grammoptera elegantula* Kraatz
[Alosterna elegantula (Kraatz)]
*15. *Alosterna tabacicolor* (De Geer)
16. *Judolia* (*Judolia*) *cometes* Bates
[Anoplodera (Pachytodes) cometes (Bates)]
17. *Leptura* (*Anoploderomorpha*) *cyanea* Gebler
[Anoplodera (Anoploderomorpha) cyanea (Gebler)]
*18. *Leptura* (*Kanekoa*) *azumensis* Matsushita et Tamanuki
[Anoplodera (? Kanekoa) azumensis (Matsushita et Tamanuki)]

1) The collection of the late Mr. Tsuruo Mizuno was highly available for this study. Messrs. Kazuo Ohbayashi, Toyohi Okada, Shôichi F. Sakagami, Masayasu Konishi, Haruo Kurokawa, Hiroshi Nakahara, Ken-ya Kawamura, Masafumi Takeshita, Kôdô Maeki, Meiyo Munakata, Toshihiro Homma and Hisabumi Kikuchi furnished kindly with some valuable specimens to the author for study. On this occasion he wishes to express his warm thanks to the above-mentioned gentlemen.

2) The system of classification adopted in this paper is that of Mitono's catalogue (1940), except the arrangement of species in each genus. Consequently, the specific names accord to those of the catalogue. Scientific names written in Roman, in parentheses, show those which were recently proposed by Gressitt (1951, '53). (After personal suggestion by Mr. M. Konishi).

19. *Leptura* (*Leptura*) *scotodes* Bates
[Anoplodera (Anoplodera) scotodes (Bates)]
20. *Leptura* (*Leptura*) *sequensi* Reitter
[Anoplodera (Anoplodera) sequensi (Reitter)]
21. *Leptura* (*Leptura*) *succedanea* (Lewis)
[Anoplodera (Anoplodera) rubra dichroa (Blanchard)]
22. *Leptura* (*Leptura*) *variicornis* Darman
[Anoplodera (Anoplodera) variicornis (Darman)]
*23. *Strangalomorpha tenuis* Solsky
[Strangalia (Strangalomorpha) tenuis Solsky]
24. *Eustrangalis distenioides* Bates
25. *Oedecnema dubia* (Fabricius)
26. *Strangalia* (*Pedostrangalia*) *xanthoma* (Bates)
[Leptura (Paranaspia) xanthoma Bates]
27. *Strangalia* (*Strangalia*) *arcuata* f. *mimica* (Bates)
[Leptura (Leptura) arcuata f. mimica Bates]
28. *Strangalia* (*Strangalia*) *aethiops* (Poda)
[Leptura (Leptura) aethiops Poda]
29. *Strangalia* (*Strangalia*) *latipennis* Matsushita
[Leptura (Leptura) latipennis (Matsushita)]
30. *Strangalia* (*Strangalia*) *ochraceofasciata* (Motschulsky)
[Leptura (Leptura) ochraceofasciata (Motschulsky)]
31. *Strangalia* (*Strangalia*) *vicaria* (Bates)
[Leptura (Leptura) obliterata vicaria Bates]
32. *Strangalia* (*Strangalia*) *regalis* Bates
[Leptura (Leptura) regalis (Bates)]

5) Subfam. CERAMBYCINAE

33. *Criocephalus* (*Megasemum*) *quadricostulatum* Kraatz
[Subfam. Aseminae, Arhopalus (Megasemum) quadricostulatus (Kraatz)]
34. *Mallambyx raddei* (Blessig)
35. *Aromia* (*Aromia*) *moschata* var. *orientalis* Plavilstshikov
36. *Chloridolum* (*Parachloridorum*) *thaliodes* Bates
37. *Leontium viride* Thomson
38. *Rosalia* (*Rosalia*) *batesi* Harold
39. *Rhopalopus* (*Prorrhopalopus*) *signaticollis* Solsky
40. *Semanotus rufipennis* (Motschulsky)
41. *Callidium* (*Callidium*) *violaceum* (Linné)
42. *Phymatodes* (*Paraphymatodes*) *albicinctus* Bates
43. *Phymatodes* (*Poecilium*) *maaki* (Kraatz)
44. *Xylotrechus chinensis* (Chevrolat)
45. *Xylotrechus clarinus* Bates
46. *Xylotrechus cuneipennis* (Kraatz)
47. *Xylotrechus pyrrhoderus* Bates
48. *Clytus auripilis* Bates
49. *Clytus melaenus* Bates
50. *Cyrtoclytus caproides* Bates
51. *Brachyclytus singularis* Kraatz
52. *Plagionotus pulcher* (Blessig)
*53. *Chlorophorus japonicus* (Chevrolat)
*54. *Chlorophorus diadema* var. *inhirsutus* Matsushita
55. *Chlorophorus notabilis* (Pascoe)
56. *Chlorophorus quinquefasciatus* (Castelnau et Gory)
57. *Chlorophorus annularis* (Fabricius)
*58. *Raphuma xenisca* (Bates)
*59. *Demodex transilis* Bates
60. *Anaglyptus niponensis* Bates
61. *Paraclytus excultus* Bates
62. *Aglaophis colobotheoides* Bates
63. *Dere thoracica* White
64. *Purpuricenus spectabilis* Motschulsky

6) Subfam. LAMIINAE

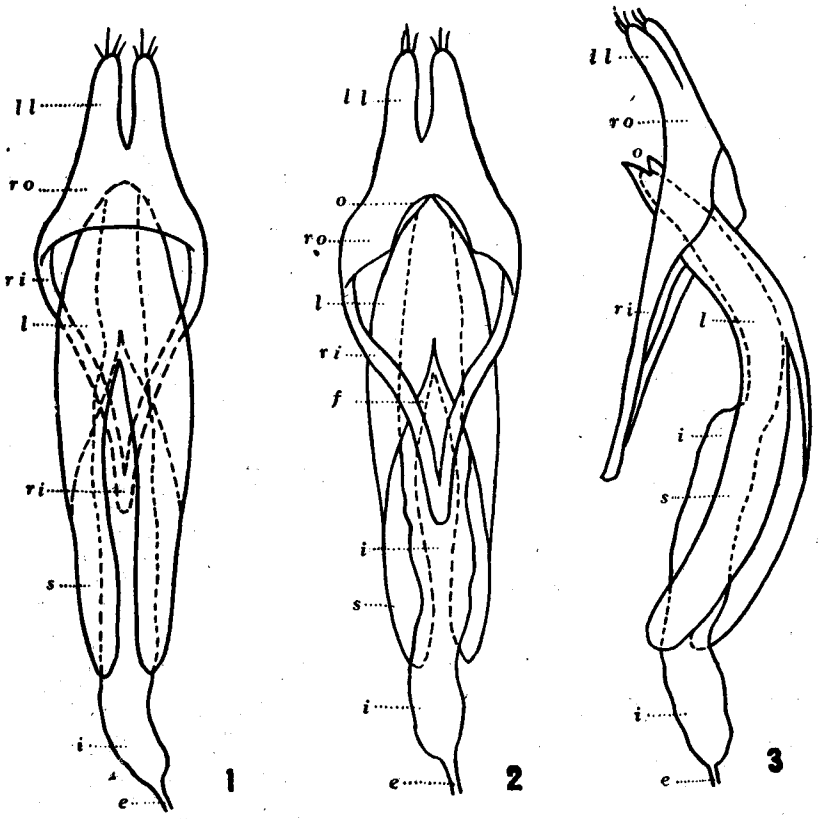
65. *Plectrura* (*Phlyctidola*) *metallica* (Bates)
66. *Psacothea hilaris* (Pascoe)
67. *Monochamus rosenmülleri* (Cederhjelm)
68. *Monochamus grandis* Waterhouse
69. *Monochamus tesserula* White
*70. *Monochamus saltuarius* Gebler
*71. *Monochamus beloni* Pic
72. *Dihammus luxuriosus* (Bates)
73. *Dihammus fraudator* (Bates)
74. *Melanauster chinensis* var. *macularius* (Thomson)
[Anoplophora (Anoplophora) chinensis macularia (Thomson)]
75. *Eupromus ruber* (Dalman)
76. *Batocera* (*Batocera*) *lineolata* Chevrolat
77. *Apriona germari* (Hope)
78. *Mesosa myops* var. *japonica* Bates
79. *Mesosa hirsuta* Bates
80. *Mesosa longipennis* Bates
81. *Apalimna liturata* Bates
82. *Jezohammus nubilus* Matsushita
[Xenolea nubilia (Matsushita)]
83. *Pterolophia jugosa* (Bates)
84. *Pterolophia rigida* (Bates)
85. *Asaperda agapanthina* Bates
86. *Rhopaloscelis unifasciatus* Blessig
87. *Terinaea atrofusca* Bates
*88. *Sydonia divaricata* Bates
89. *Pogonocherus* (*Pogonocherus*) *seminiveus* Bates
[Pogoncherus (Pogonocherus) dimidiatus Blessig]
90. *Acanthocinus* (*Acanthocinus*) *griseus* (Fabricius)
*91. *Exocentrus guttulatus* Bates

*92. *Exocentrus fasciolatus* Bates
93. *Agapanthia daurica* Ganglbauer
*94. *Saperda octomaculata* Blessig
95. *Eutetrapha ocelota* (Bates)
96. *Eutetrapha sedecimpunctata* (Motschulsky)
97. *Cagosima sanguinolenta* (Motschulsky)
98. *Glenea* (*Glenea*) *relicta* Pascoe
99. *Paraglenea fortunei* (Saunders)
100. *Paraglenea chrysochloris* (Bates)
101. *Chreonema fortunei japonica* Gahan

General structure

The technical terms adopted in this paper are mainly those of Sharp and Muir, which have been nearly followed by Zia, Jeannel and Paulian, and others. The male genitalia consist of the following three elements : 1. an internal sac, 2. a median lobe with a pair of median struts, 3. a tegmen.

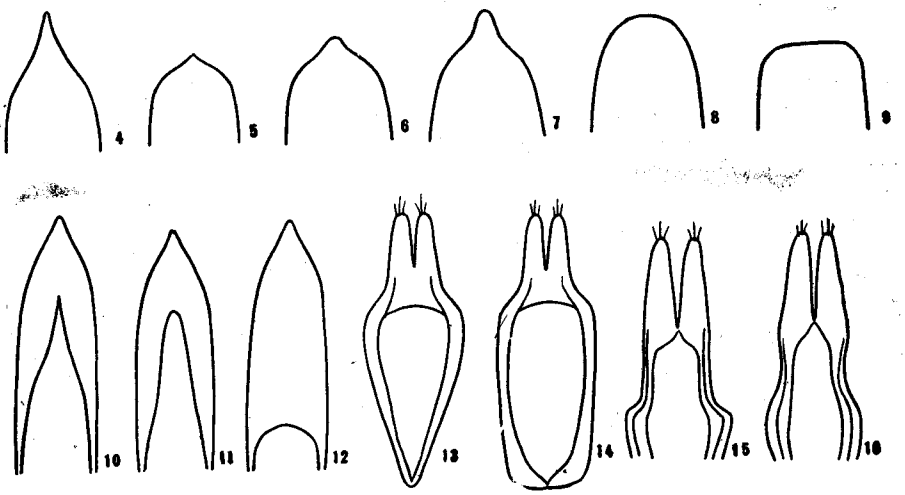
The vasa deferentia leading from testes are united into a median, sledern



Figs. 1-3. A type of male genitalia of cerambycid beetles, showing the technical terms (Schematic). Fig. 1. Dorsal view. Fig. 2. Ventral view. Fig. 3. Lateral view. e. Ejaculatory duct. f. Median foramen. i. Internal sac. l. Median lobe. ll. Lateral lobes. o. Median orifice. ri. Ringed part. ro. Roof. s. Median struts.

ejaculatory duct. The enlarged distal part of the duct forms an internal sac, which, at copulation, becomes more or less evaginated and inserted into the vagina of female. The internal sac is frequently furnished, within the variable areas, remarkably with the divers internal chitinous armatures ; sclerites, flagellum, rods, etc. These armatures are perhaps, more or less, something functional respectively at copulation. Among them, the seemingly attractive armatures only are considered in the present study. The armatures of internal sac which are concealed within the median lobe, in the figures of this paper, are drawn so far as the outline be considerably clearly perceived. The sac is sometimes provided with a diverticulum at the base.

Generally, the median lobe is represented by a strongly chitinized tube. The median struts are known as paired lamellae proceeding from the basal portion of the former. The median lobe with the median struts is, in variable degree, curved down in arc-form. An apical opening of the median lobe is situated dorsally in position, and is called as the median orifice[1] through which the internal sac is protruded from body during coitus, while a basal aperture is ventral in position and termed as the median foramen through which the ejaculatory duct passes. In general, the apical part of median lobe is



Figs. 4–9. Types of apical part of median lobe (Schematic). All ventral view. Fig. 4. Sharply pointed. Fig. 5. Bluntly pointed. Fig. 6. Weakly projected. Fig. 7. Strongly projected. Fig. 8. Rounded. Fig. 9. Truncated. Figs. 10–12. Types of median foramen. All ventral view. Figs. 10–11. Elongated. Fig. 12. Not elongated. Figs. 13–14. Types of ringed part. Both ventral view. Fig. 13. Converging. Fig. 14. Nearly parallel. Figs. 15–16. Geniculation and constriction of ringed part. Both ventral view. Fig. 15. Geniculated. Fig. 16. Constricted.

1) As regards the function of internal sac, the present author (1952) erroneously described as follows : "The spermatozoa are thought to be ejected from the median orifice into the copulatory sac of the female during coitus." It must be corrected as follows : The internal sac is evaginated and inserted into the vagina of female through the median orifice during coitus.

divided laterally into two lobes, separated by a membrane running along each side, from median orifice to the base of median struts. The ventral edge of median orifice is variable in shape among species, as shown in Figs. 4–9. The median lobe generally differs in ventral view interspecifically.

It is difficult to observe in detail the form of the median foramen, because it is sometimes obscure in contour, or it is sometimes covered with a semi-transparent membrane near the blind extremity. Such being the case, the form of the median foramen is described from its external appearance. The median foramen is usually more or less elongated, with the blind end, pointed or rounded. The foramen is not elongated in a few species.

According to Sharp and Muir, the term tegmen was generally applicated to the lateral lobes and basal-piece together. For the convenience of description, in this paper, the tegmen is divided by the author into the four parts ; a pair of lateral lobes, a roof, a basal-piece and a ringed part. The cases of combination of the four components in tegmen are as follows :

1. Lateral lobes + ringed part
2. Lateral lobes + roof + ringed part
3. Lateral lobes + basal-piece + ringed part
4. Lateral lobes + roof + basal-piece + ringed part

The lateral lobes are the distal part of tegmen and are provided with setae at the apex. They are situated on the upper side of the apical part of median lobe and connected with the ringed part or roof at their base. Lateral lobes are highly variable in shape in species, and is enumerated as a valuable character in the present study. When the roof is absent, the lateral lobes, consequently, are separated from each other at the base. The roof shapes the upper part of the tegmen with both the lateral lobes and basal-piece together. Sometimes, a pair of accessory pieces which are interspecifically variable in shape, are differentiated in the upper part of tegmen, viz. when the roof is absent, each accessory piece is respectively connected with the base of each lateral lobe, and when the roof is present, a pair of accessory pieces arise from the base of roof. The accessory pieces are sometimes reduced to be rather membranous.

In the Cerambycidae, the basal-piece is usually not differentiated, but sometimes present. It is the most weak chitinized component of the genitalia and frequently indistinguishable from the second connecting membrane. The basal portion of lateral lobes

Table 1. A comparison of some main terms used by several authors

Authors	Terms		
Verhoeff (1893)	Penis	Parameren	—
Hopkins (1911)	body	—	ring
Sharp & Muir (1912), Zia (1936), The present author (Jeannel & Paulian, 1944, Jeannel, 1949)	median lobe (lobe médian)	lateral lobes (lobe latéraux)	tegmen (tegmen)
Snodgrass (1935)	aedeagus	parameres	phallobase

or roof are transitionally connected, on either side, with the arms of ringed part. The ringed part, and the base of lateral lobes or roof form a ring which is passed through by the median lobe. The ringed part gradually narrows from the widest portion to the distal portion, while it is sometimes nearly equal in width (Figs. 13–14). The part is individually variable in a single species. The ringed part is sometimes geniculated at the widest portion on either side, and sometimes weakly constricted between the base and the widest portion. In some species, it is hemmed, on either side, with a rather weak chitinized accessory along the inner side of the nearly whole length. The hem at the basal portion of ringed part is connected transitionally with the basal-piece.

The genitalia are brown in colour, though variable interspecifically, except the internal sac which is generally white. In general, the lateral lobes and the apical part of median lobe are darker in colour than other components. Generally, the degree of darkness of colour, pigmentization, corresponds with that of chitinization.

So far as the author is aware, Muir (1915, '18), Singh Pruthi (1924a, '24b) and Metcalfe (1932) are the only authors who studied the development of male genitalia in Coleoptera. Muir asserted that the male genitalia arise as a median, unpaired structure, while Singh Pruthi is of the opinion that the genitalia are paired in origin. Metcalfe who supported the theory of Singh Pruthi concluded as follows: "The mode of development of the intromittent organ in the Colepotera is similar to that in other orders of the insects, viz. it develops from a pair of appendages of the ninth segment." According to Sharp and Muir, the membrane connecting the median lobe to the tegmen and that connecting the tegmen to the termination of the abdomen were termed as the first connecting membrane and second connecting membrane respectively. A bifurcated chitinous rod, "Spiculum gastrale" of Verhoeff (1893), is embedded in the second connecting membrane, being situated near the lateral lobes. After Hopkins (1911), Snodgrass (1935) and others, the spiculum gastrale was considered to belong to the ninth sternite. The first and second connecting membrane, and the spiculum gastrale, as well as the ninth abdominal segment, the genital segment, are not included in the scope of the study.

Description

Subfamily SPONDYLINAE

Tribe Spondylini

Genus *Spondylis*

1. *Spondylis buprestoides* (Linné, 1785)[1]

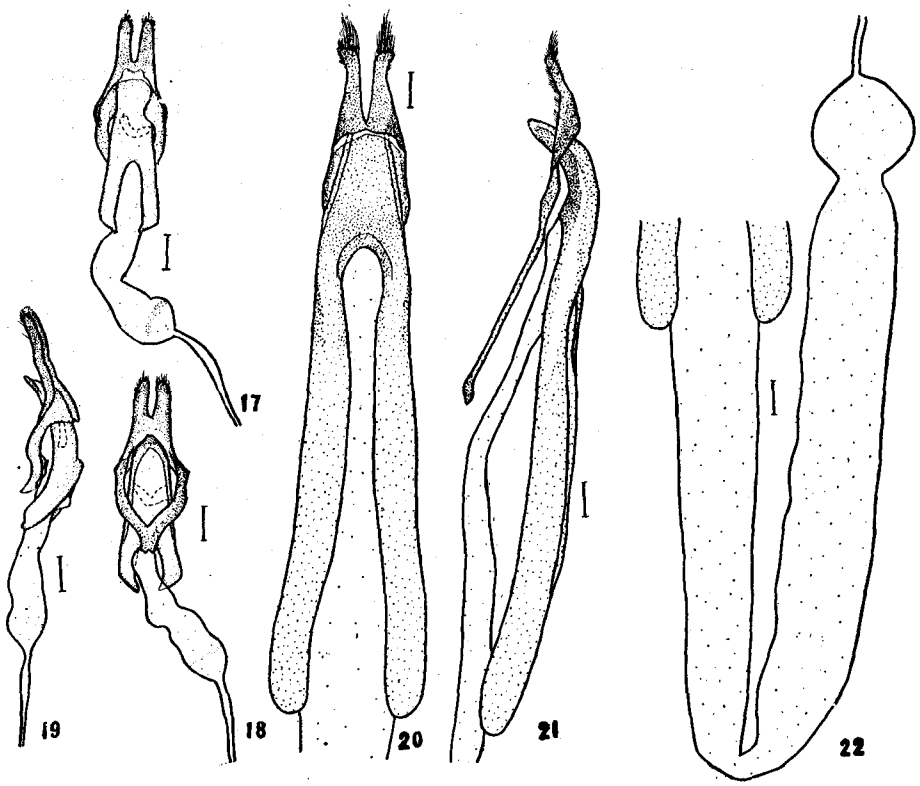
Specimens examined: 4 ♂♂, Fukuoka, Kyushu.

Robust and stout, 2 8–3.0 mm long. Median lobe with median struts moderately curved; the former being longer than the latter which is comparatively broad in width; the ventral edge of median orifice is bluntly pointed; median foramen elongated. Tegmen without basal-piece; roof slightly differentiated;

1) The male genitalia of this species were already described by Nakajima and Shimizu (1951).

N. B. In all figures, the scale of magnification is indicated by a line placed near the figure. The length of the line is 0.5 mm, and indicates the magnification of the figure. The ejaculatory duct is drawn more slenderly in the figures of this paper than that in the natural state. For, affected by the treatment of KOH-solution, the duct was made slender.

lateral lobes long, densely covered with setae at the apex; ringed part composed of the broad arms, nearly heptagon-shaped, furnished with a large fin-like accessory along the inner side of the proximal portion. Ejaculatory duct single.



Figs. 17–19. *Spondylis buprestoides*. Fig. 17. Dorsal view. Fig. 18. Ventral view. Fig. 19. Lateral view. Figs. 20–22. *Megopis* (*Aegosoma*) *sinica sinica*. Fig. 20. Dorsal view. Fig. 21. Lateral view. Fig. 22. Internal sac.

Subfamily PRIONINAE

Tribe Callipogonini

Genus *Megopis*

2. *Megopis* (*Aegosoma*) *sinica sinica* (White, 1853)[1]

Specimens examined: 3 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

Extremely long, 9–10 mm long. Median lobe tongue-shaped, strongly curved down at the apical portion, median struts nearly straight, exceedingly long

1) The male genitalia of *M. sinica* were formerly illustrated by Zia (1936).

compared with the former ; the ventral edge of median orifice is rounded ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes long, enlarged outside at the apex wihch is furnished abundantly with long setae ; ringed part converging. Ejaculatory duct single.

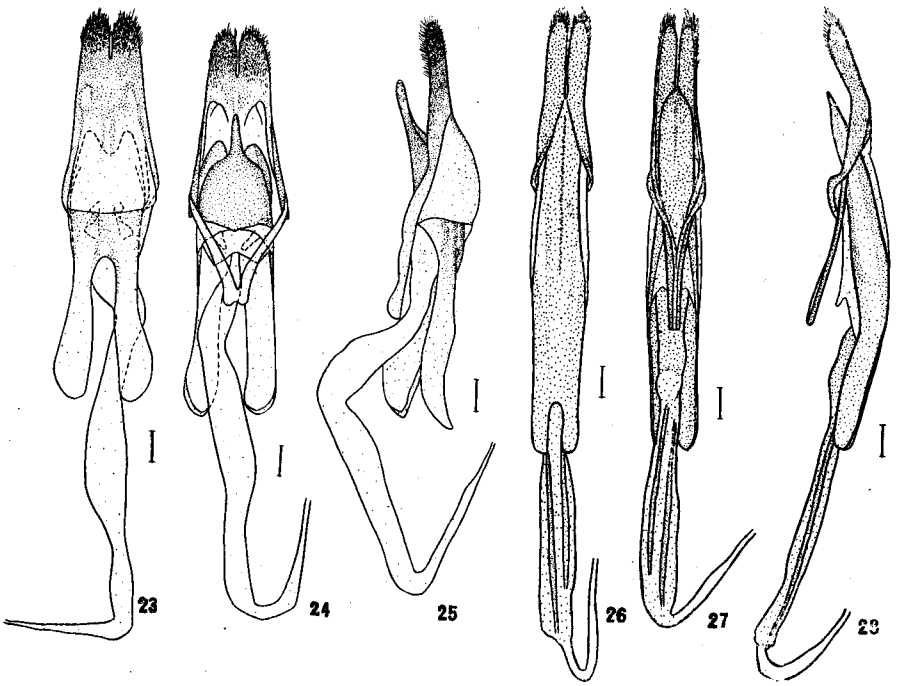
Tribe Prionini

Genus *Prionus*

3. *Prionus insularis* Motschulsky, 1857

Specimens examined : 4 ♂♂, Maruyama near Sapporo, Hokkaido.

Thick, about 6.5 mm long. Median lobe with median struts slightly curved ; the former being subequal in length to the latter ; the dorsal edge of median orifice is divided into the two lobes which are broad in width and which are not pointed at the apex, the ventral edge of the orifice is much projected frontally than the dorsal edge of one ; median foramen elongated. Tegmen without basal-piece ; roof extended ; lateral lobes shorter than the roof, hairy densely at the apical portion, especially ventrally, rounded along the outside of the apical portion ; ringed part converging towards the subdiatal portion, dilated distally. Ejaculatory



Figs. 23-25. *Prionus insularis*. Fig. 23. Dorsal view. Fig. 24. Ventral view. Fig. 25. Lateral view. Figs. 26-28. *Distenia gracilis*. Fig. 26. Dorsal view. Fig. 27. Ventral view. Fig. 28. Lateral view.

duct single.

Subfamily DISTENIINAE

Tribe Disteniini

Genus *Distenia*

4. *Distenia gracilis* (Blessig, 1872)

Specimens examined : 2 ♂♂, Maruyama near Sapporo, Hokkaido.

Long and slender, about 7 mm long. Median lobe with median struts slightly curved ; the former being far longer than the latter, provided with a keel along the dorsal median line of the apical part ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece and roof ; lateral lobes long, abundantly furnished with setae at the apex ; ringed part converging towards the subdistal portion, parallel distally. Internal sac armed with two long chitinous rods ; ejaculatory duct single.

Subfamily LEPTURINAE

Tribe Stenocorini

Genus *Rhagium*

5. *Rhagium* (*Hargium*) *japonicum* Bates, 1884

Specimens examined : 2 ♂♂, Jôzankei near Sapporo, Hokkaido.

About 2.3 mm long. Median lobe with median struts strongly curved ; the former being flat and far longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece and roof ; lateral lobes separated from each other, covered densely with long setae ; ringed part converging, provided with a process at the widest portion on either side. Ejaculatory duct single.

Genus *Stenocorus*

6. *Stenocorus coeruleipennis* (Bates, 1873)

Specimens examined : 2 ♂♂, Yokohama, Honshu.

About 2.7 mm long. Median lobe with median struts strongly curved in arc-form ; the former being cylindrical, longer than the latter ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen without basal-piece, roof scarcely differentiated ; lateral lobes clothed densely with setae at the apex ; ringed part converging, strongly geniculated at two points in profile, provided with a process near the widest portion on either side, and hemmed with a rather weakly chitinized accessory along the distal portion. Ejaculatory duct single.

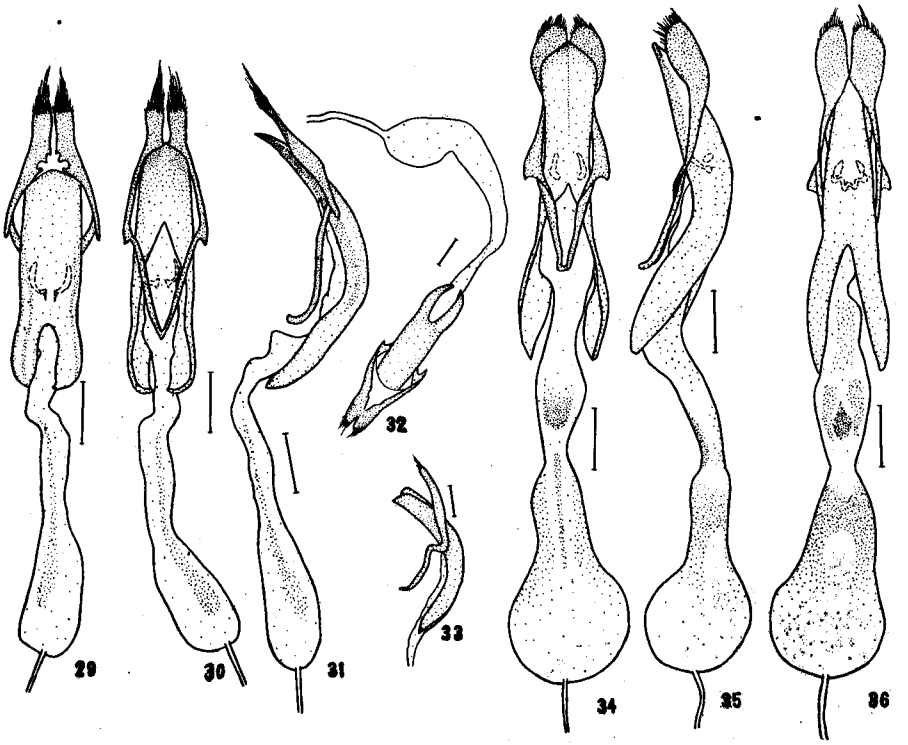
Genus *Gaurotes*

7. *Gaurotes* (*Paragaurotes*) *doris* Bates, 1884

Specimens examined : 2♂♂, Maruyama near Sapporo, 3 ♂♂, Nukabira,

Prov. Tokachi, Hokkaido.

About 2 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter which is broad in width ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without roof and basal-piece ; lateral lobes broad in width, densely bearing setae at the apex ; ringed part converging, provided outwardly with a process at the widest portion on either side. Internal sac enlarged at the base ; ejaculatory duct single.



Figs. 29-31. *Rhagium* (*Hargium*) *inquisitor japonicum*. Fig. 29. Dorsal view. Fig. 30. Ventral view. Fig. 31. Lateral view. Figs. 32-33. *Stenocorus coeruleipennis*. Fig. 32. Dorsal view. Fig. 33. Lateral view. Figs. 34-36. *Gaurotes* (*Paragaurotes*) *doris*. Fig. 34. Ventral view. Fig. 35. Lateral view. Fig. 36. Dorsal view.

Tribe Lepturini

Genus *Pidonia*

8. *Pidonia* (*Pidonia*) *maculithorax* Pic, 1901

Specimens examined : 1 ♂, Manza, Gumma Pref., 1 ♂, Mt. Yatsugatake, Nagano Pref., Honshu.

Robust, about 2 mm long. Median lobe with median struts strongly curved ; the former being subequal in length to the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in roof and basal-piece ; lateral lobes separated from each other, rounded along the outer edge, provided with a weakly chitinized accessory piece at the base, the apical setae of lateral lobes are indistinctly observed ; ringed part converging. Internal sac provided with a diverticulum at the base ; ejaculatory duct single.

9. *Pidonia* (*Pseudopidonia*) *grallatrix* (Bates, 1884)

Specimens examined : 2 ♂♂, Kuridaira, Gumma Pref., Honshu.

About 2 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in roof and basal-piece ; lateral lobes short, broad in width, separated from each other, rounded sharply in the outer edge, densely covered with setae at the apex ; ringed part subparallel except the proximal portion, provided with a tooth at the widest portion on either side. Internal sac provided with a diverticulum ; ejaculatory duct single.

10. *Pidonia* (*Pseudopidonia*) *amentata* (Bates, 1884)

Specimens examined : 3 ♂♂, Jôzankei near Sapporo, Hokkaido.

About 1.5 mm long. The genitalia of this species are similar to those of

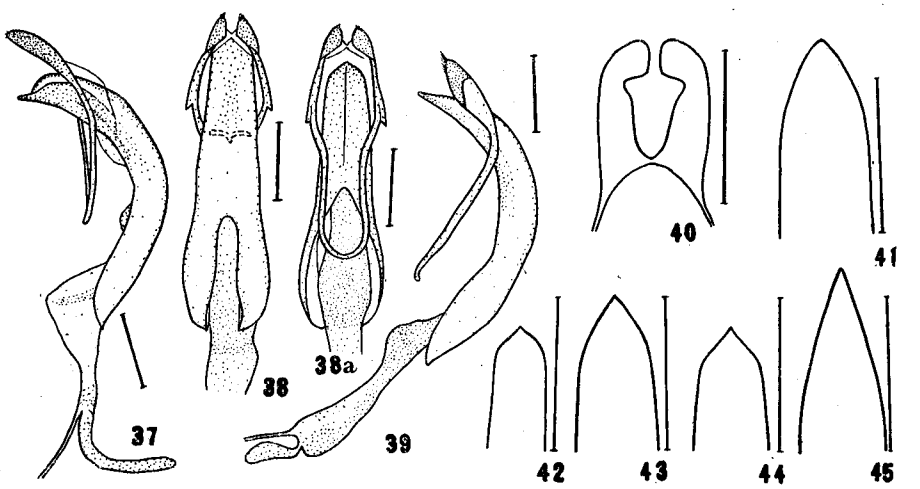


Fig. 37. *Pidonia* (*Pidonia*) *maculithorax*. Lateral view. Figs. 38–39. *Pidonia* (*Pseudopidonia*) *grallatrix*. Fig. 38. Dorsal view. Fig. 38a. Ventral view. Fig. 39. Lateral view. Fig. 40. Lateral lobes of *Pidonia* (*Pseudopidonia*) *debilis*. Dorsal view. Figs. 41–45. Apical part of median lobe of the subgenus *Pseudopidonia*. All ventral view. Fig. 41. *Pidonia* (*Pseudopidonia*) *grallatrix*. Fig. 42. *P.* (*Ps.*) *amentata*. Fig. 43. *P.* (*Ps.*) *debilis*. Fig. 44. *P.* (*Ps.*) *insuturata*. Fig. 45. *P.* (*Ps.*) *signifera*.

Pidonia (*Pseudopidonia*) *grallatrix*, but differ from the latter in the ventral structure of median lobe, the weak curvature of the outer edge of lateral lobes, and the longer diverticulum of internal sac.

11. *Pidonia* (*Pseudopidonia*) *debilis* (Kraatz, 1879)

Specimens examined : 7 ♂♂, Chûzenji, Tochigi Pref., Honshu.

2–2.3 mm long. The genitalia of this species are similar to those of *Pidonia* (*Pseudopidonia*) *grallatrix* and *P.* (*Pseudopidonia*) *amentata*, but differ from them in the ventral structure of median lobe, the peculiar structure of lateral lobes, and the converging of ringed part.

12. *Pidonia* (*Pseudopidonia*) *insuturata* Pic, 1901

Specimens examined : 2 ♂♂, Yumoto, Tochigi Pref., Honshu.

About 1.5 mm long. The genitalia of this species resemble those of *Pidonia* (*Pseudopidonia*) *grallatrix*, *P.* (*Pseudopidonia*) *amentata*, and *P.* (*Pseudopidonia*) *debilis*, but differ from the former two in the ventral structures of median lobe, and from the latter in the longer diverticulum.

13. *Pidonia* (*Pseudopidonia*) *signifera* (Bates, 1884)

Specimens examined : 2 ♂♂, Manza, Gumma Pref., Honshu.

About 1.5 mm long. The genitalia of this species resemble those of the other species of the subgenus *Pseudopidonia*, but differ from them in the shorter diverticulum.

Remarks of Pidonia : The genitalia of the six studied species belonging to the genus *Pidonia* are characteristically furnished with a diverticulum at the base of internal sac.

Genus *Grammoptera*

14. *Grammoptera elegantula* Kraatz, 1879

Specimens examined : 1 ♂, Akkeshi near Kushiro, 1 ♂, Maruyama near Sapporo, Hokkaido.

About 1.3 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter ; the ventral edge of median orifice is sharply pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes separated from each other, densely covered with setae at the apex, provided with a weakly chitinized accessory piece ; ringed part subparallel. Ejaculatory duct single.

Genus *Alosterna*

15. *Alosterna tabacicolor* (De Geer, 1775)

Specimens examined : 3 ♂♂, Maruyama near Sapporo, Hokkaido.

About 1.5 mm long. Median lobe with median struts moderately curved ; the former being subequal in length to the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes slender, separated from each other, abundantly

furnished with long setae at the apex, a weakly chitinized accessory piece differentiated ; ringed part converging. Ejaculatory duct single.

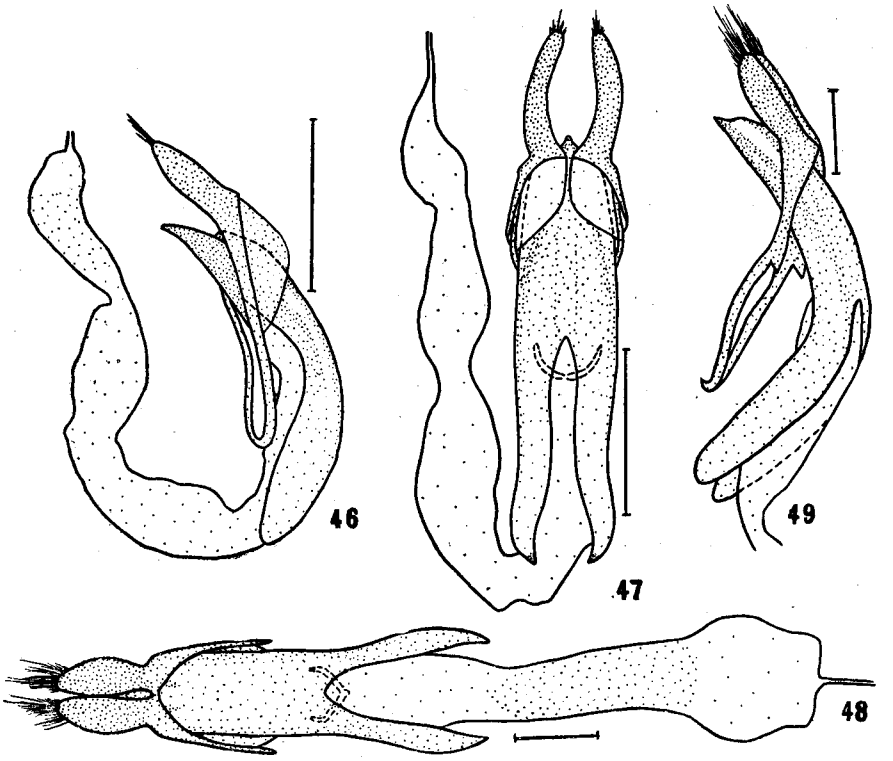


Fig. 46. *Grammoptera elegantula*. Lateral view. Fig. 47. *Alosterna tabacicolor*. Dorsal view. Figs. 48–49. *Judolia* (*Judolia*) *cometes*. Fig. 48. Dorsal view. Fig. 49. Lateral view.

Genus *Judolia*

16. *Judolia* (*Judolia*) *cometes* (Bates, 1884)[1)]

Specimens examined : 5 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

About 2.5 mm long. Median lobe with median struts strongly curved ; the former being flat, subequal in length to the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes nearly semicircular, clothed with long setae at the apex ; ringed part converging, provided with a process at the widest portion on either side. Internal sac enlarged at the base : ejaculatory duct single.

1) The male genitalia of this species were briefly described by Tamanuki (1939).

Genus *Leptura*

17. *Leptura* (*Anoploderomorpha*) *cyanea* (Gebler, 1832)

Specimens examined : 3 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

About 2.5 mm long. Median lobe with median struts strongly curved ; the former being flat, longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece : roof scarcely differentiated ; lateral lobes elongatedly semi-circular, sparsely covered with setae at the apex ; ringed part converging. Internal sac enlarged at the base ; ejaculatory duct single.

18. *Leptura* (*Kanekoa*) *azumensis* Matsushita et Tamanuki, 1942

Specimens examined : 3 ♂♂, Maruyama near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts moderately curved ; the former being flat, longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in basal-piece ; roof slightly differentiated ; lateral lobes nearly semi-circular, clothed with long setae at the apex ; ringed part converging. Internal sac enlarged at the base ; ejaculatory duct single.

19. *Leptura* (*Leptura*) *scotodes* Bates, 1873

Specimens examined : 5 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

2.3–2.5 mm long. Median lobe with median struts moderately curved in arc-form ; the former being flat, longer than the latter ; the ventral edge of median orifice is pointed, median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes slender, gradually converging each other towards the apex of which the setae are obscure ; ringed part converging, provided with an enlarged fin-like accessory near the middle portion on either side. Ejaculatory duct single.

20. *Leptura* (*Leptura*) *sequensi* Reitter, 1898

Specimens examined : 2 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

2.3–2.5 mm long. The genitalia of this species closely resemble those of *Leptura* (*Leptura*) *scotodes*, but differ from the latter in the ventral structure of median lobe.

21. *Leptura* (*Leptura*) *succedanea* Lewis, 1879

Specimens examined : 6 ♂♂, Maruyama near Sapporo, Hokkaido.

Slender, about 4 mm long. Median lobe with median struts moderately curved ; the former being flat, longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes rather long, rounded along the outside of apical portion, their apical setae are obscure ; ringed part converging. Ejaculatory duct single.

22. *Leptura* (*Leptura*) *variicornis* Darman, 1879

Specimens examined : 5 ♂♂, Akan, Prov. Kushiro, Hokkaido.

About 3.7 mm long. The genitalia of this species are similar to those of

Leptura (*Leptura*) *succedanea*, but differ from the latter in the ventral structure of median lobe.

Remarks of Leptura : So far as the present study is concerned, the genitalia of *Leptura* (*Anoploderomorpha*) *cyanea* and *Leptura* (*Kanekoa*) *azumensis* differ from those of the species belonging to the subgenus *Leptura* in the nearly semi-circular lateral lobes.

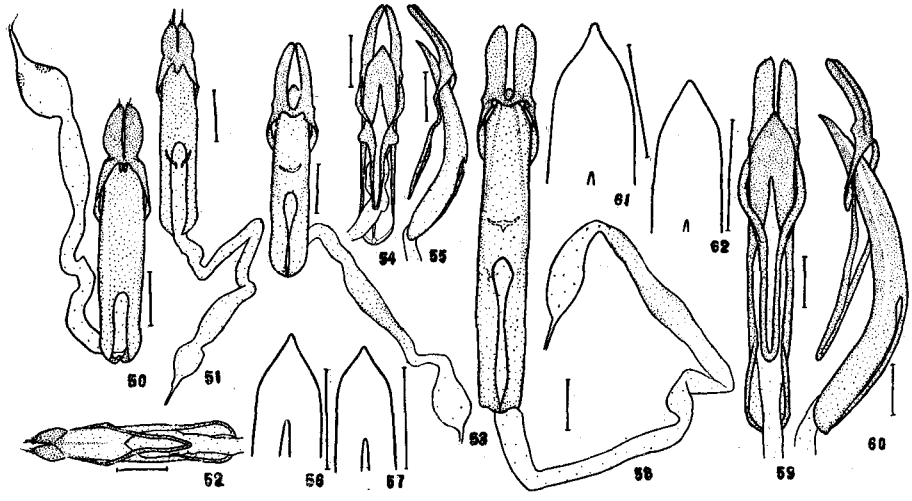


Fig. 50. *Leptura* (*Anoploderomorpha*) *cyanea*. Dorsal view. Figs. 51–52. *Leptura* (*Kanekoa*) *azumensis*. Fig. 51. Dorsal view. Fig. 52. Ventral view. Figs. 53–56. *Leptura* (*Leptura*) *scotodes*. Fig. 53. Dorsal view. Fig. 54. Ventral view. Fig. 55. Lateral view. Fig. 56. Ventral view of apical part of median lobe. Fig. 57. Apical part of median lobe of *Leptura* (*Leptura*) sequensi. Ventral view. Figs. 58–61. *Leptura* (*Leptura*) *succedanea*. Fig. 58. Dorsal view. Fig. 59. Ventral view. Fig. 60. Lateral view. Fig. 61. Ventral view of apical part of median lobe. Fig. 62. Apical part of median lobe of *Leptura* (*Leptura*) *variicornis*. Ventral view.

Genus *Strangalomorpha*

23. *Strangalomorpha tenuis* Solsky, 1873

Specimen examined : 1 ♂, Mt. Yatsugatake, Nagano Pref., Honshu.

About 2.3 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes furnished densely with long setae at the apex ; ringed part converging. Ejaculatory duct single.

Genus *Eustrangalis*

24. *Eustrangalis distenioides* Bates, 1884

Specimens examined : 3 ♂♂, Maruyama near Sapporo, Hokkaido.

About 2.8 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter which is broad in width ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes slender, densely covered with setae along the outer edge of apical portion ; ringed part converging. Ejaculatory duct single.

Genus *Oedecnema*

25. *Oedecnema dubia* (Fabricius, 1781)

Specimens examined : 4 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

About 4 mm long. Median lobe with median struts strongly curved ; the former being flat, slightly curved up at the apex, longer than the latter which is broad in width ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen without basal-piece and roof, its upper part is seemingly X-shaped in dorsal view ; lateral lobes broad in width, separated from each other, truncated at the apex which is abundantly furnished with setae ; ringed part converging. Ejaculatory duct single.

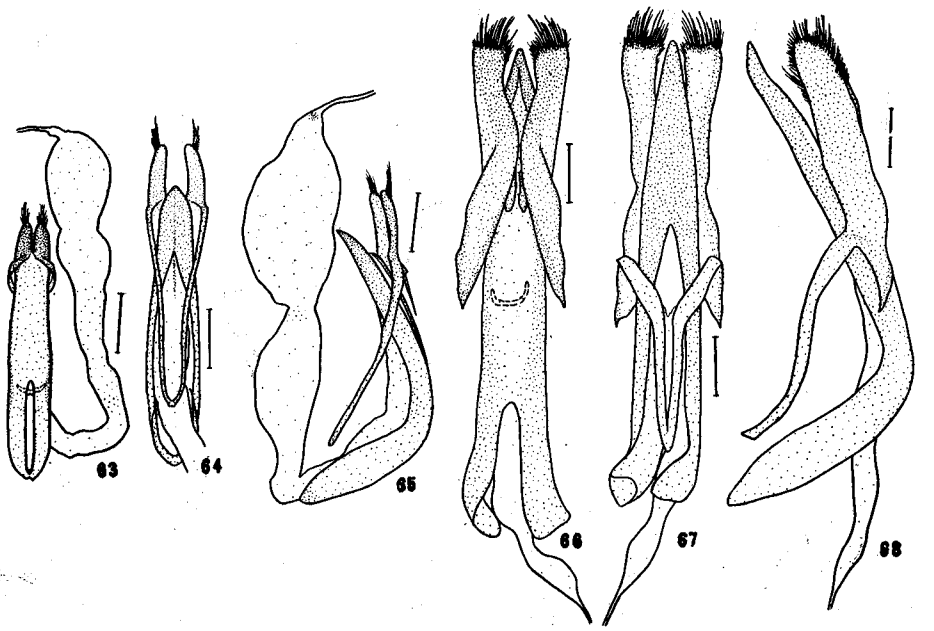


Fig. 63. *Strangalomorpha tenuis*. Dorsal view. Figs. 64–65. *Eustrangalis distenioides*. Fig. 64. Ventral view. Fig. 65. Lateral view. Figs. 66–68. *Oedecnema dubia*. Fig. 66. Dorsal view. Fig. 67. Ventral view. Fig. 68. Lateral view.

Genus *Strangalia*

26. *Strangalia* (*Pedostrangalia*) *xanthoma* (Bates, 1873)

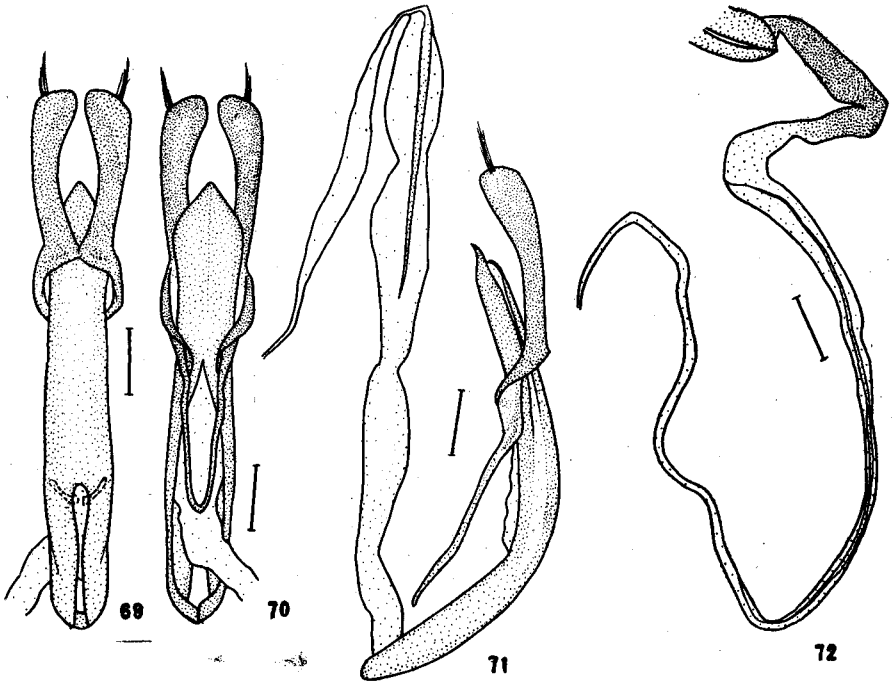
Specimens examined : 4 ♂♂, Maruyama near Sapporo, Hokkaido.

Median lobe with median struts strongly curved ; the former being broad in width, longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in basal-piece ; roof slightly differentiated, connected with a pair of slender accessory pieces ; lateral lobes gradually narrowing in width from base to apex, with long setae at the apex ; ringed part converging towards the subdistal part, subparallel in the distal part. Internal sac deficient in flagellum ; ejaculatory duct single.

27. *Strangalia* (*Strangalia*) *arcuata* f. *mimica* (Bates, 1884)

Specimens examined : 8 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

About 4 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter ; the ventaral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen deficient in roof and basal-piece ; lateral lobes clavate, with long setae at the apex ; ringed part converging. Internal



Figs. 69–72. *Strangalia* (*Strangalia*) *arcuata* f. *mimica*. Fig. 69. Dorsal view. Fig. 70. Ventral view. Fig. 71. Lateral view. Fig. 72. Internal sac of *Strangalia* (*Strangalia*) *aethiops*.

sac armed with a chitinous flagellum within the proximal part ; ejaculatory duct single.

28. *Strangalia* (*Strangalia*) *aethiops* (Poda, 1761)

Specimens examined : 5 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

About 3. 5 mm long. The genitalia of this species are similar to those of *Strangalia* (*Strangalia*) *arcuata* f. *mimica*, but differ from the latter in the ventral structure of median lobe, the shape of lateral lobes, and the partially black-coloured internal sac.

29. *Strangalia* (*Strangalia*) *latipennis* Matsushita, 1933

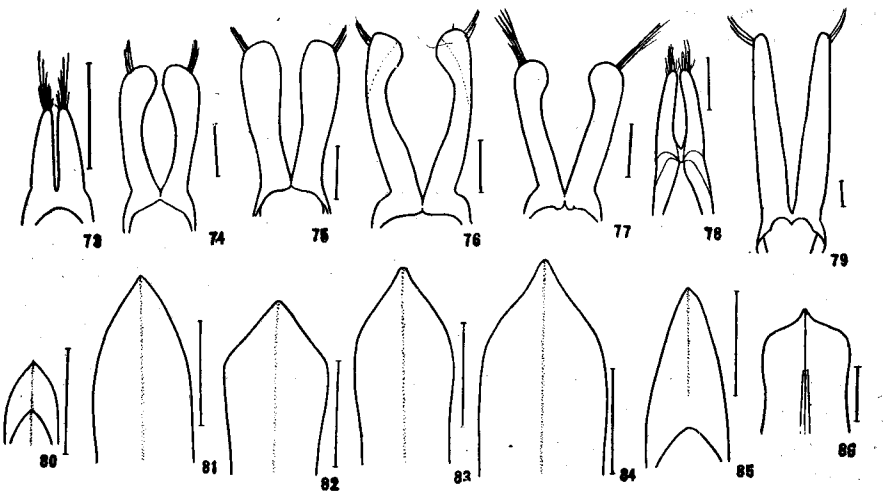
Specimens examined : 4 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

5–6 mm long. The genitalia of this species are similar to those of *Strangalia* (*Strangalia*) *arcuata* f. *mimica* and *S.* (*S.*) *aethiops*, but differ from them in the ventral structure of median lobe, the shape of lateral lobes, and the longer flagellum of internal sac.

30. *Strangalia* (*Strangalia*) *ochraceofasciata* (Motschulsky, 1861)

Specimens examined : 5 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

5–6 mm long. The genitalia of this species are similar to those of *Strangalia* (*Strangalia*) *arcuata* f. *mimica*, *S.* (*S.*) *aethiops* and *S.* (*S.*) *latipennis*, but differ from them in the ventral structure of median lobe, the shape of lateral



Figs. 73–79. Lateral lobes of *Strangalia*. All dorsal view. Fig. 73. *Strangalia* (*Pedostrangalia*) *xanthoma*. Fig. 74. *Strangalia* (*Strangalia*) *arcuata* f. *mimica*. Fig. 75. *S.* (*S.*) *aethiops*. Fig. 76. *S.* (*S.*) *latipennis*. Fig. 77. *S.* (*S.*) *ochraceofasciata*. Fig. 78. *S.* (*S.*) *vicaria*. Fig. 79. *S.* (*S.*) *regalis*. Figs. 80–86. Apical part of median lobe of *Strangalia*. All ventral view. Fig. 80. *Strangalia* (*Pedostrangalia*) *xanthoma*. Fig. 81. *Strangalia* (*Strangalia*) *arcuata* f. *mimica*. Fig. 82. *S.* (*S.*) *aethiops*. Fig. 83. *S.* (*S.*) *latipennis*. Fig. 84. *S.* (*S.*) *ochraceofasciata*. Fig. 85. *S.* (*S.*) *vicaria*. Fig. 86. *S.* (*S.*) *regalis*.

lobes, and the longer flagellum through the internal sac and ejaculatory duct.

31. *Strangalia* (*Strangalia*) *vicaria* (Bates, 1884)

Specimens examined : 4 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

About 3.5 mm long. The genitalia of this species resemble those of *Strangalia* (*Strangalia*) *arcuata* f. *mimica*, *S.* (*S.*) *aethiops*, *S.* (*S.*) *latipennis*, and *S.* (*S.*) *ochraceofasciata*, but differ from them in the ventral structure of medien lobe, the shape of lateral lobes, the presence of a pair of accessory pieces, and the deficiency of the chitinous flagellum of internal sac.

32. *Strangalia* (*Strangalia*) *regalis* Bates, 1884

Specimens examined : 1 ♂, Tomuraushi, 1 ♂, Nukabira, Prov. Tokachi, Hokkaido.

About 10 mm long. The genitalia of this species differ from the above five species belonging to the subgenus *Strangalia* in the structure of median and lateral lobes.

Remarks of Strangalia : The internal sac and ejaculatory duct of the studied species belonging to the subgenus *Strangalia*, except *S.* (*S.*) *vicaria* and *S.* (*S.*) *regalis*, are armed with a flagellum, though different in length. The genitalia of the subgenus *Strangalia* are characteristically distinguishable among species by the form of lateral lobes and the ventral structure of median lobe.

Subfamily Cerambycinae

Tribe Asemini

Genus *Criocephalus*

33. *Criocephalus* (*Megasemum*) *quadricostulatum* Kraatz, 1879

Specimens examined : 2 ♂♂, Jôzankei near Sapporo, Hokkaido.

About 4 mm long ; second connecting membrane well developed. Median lobe with median struts moderately curved ; the former being longer than the latter which is broad in width, the slit between the latter is extended ; the ventral edge of median orifice is projected ; median foramen elongated. Tegmen without basal-piece ; roof slightly differentiated ; lateral lobes hairy, broad in width ; ringed part furnished with a large fin-like accessory along the proximal portion, converging towards the subdistal portion, projected as a rod in the distal portion. Ejaculatory duct single.

Tribe Cerambycini

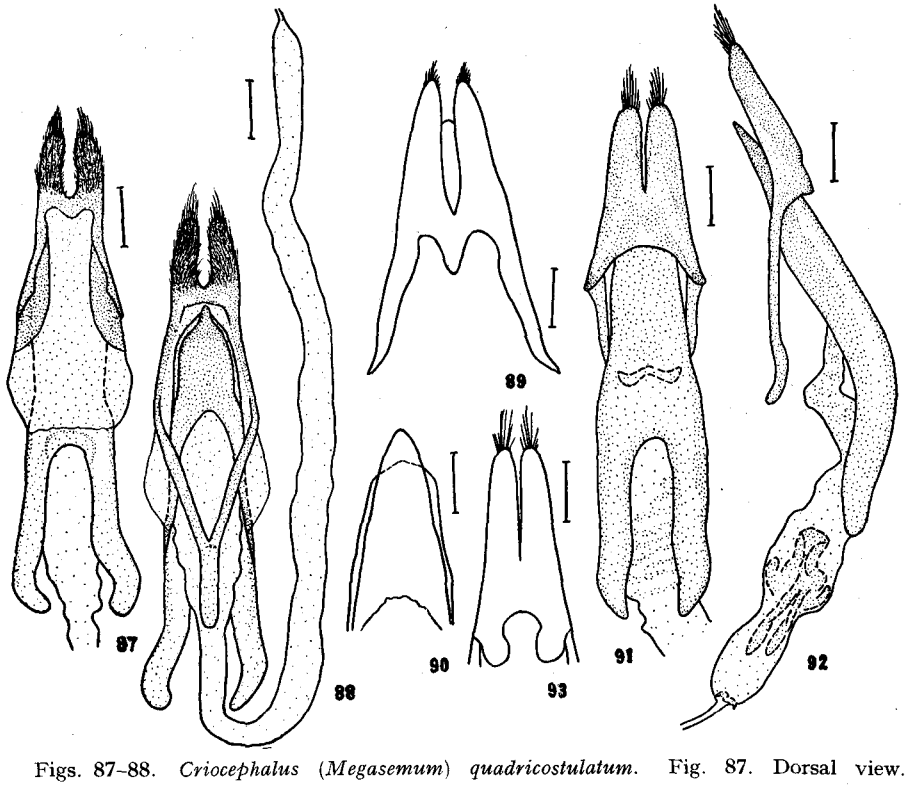
Genus *Mallambyx*

34. *Mallambyx raddei* (Blessig, 1872)

Specimens examined : 2 ♂♂, Tokyo.

About 6 mm long. Median lobe with median struts slightly curved ; the former being subequal in length to the latter which is slender ; the ventral edge of median orifice is rounded ; median foramen elongated. Tegmen without basal-piece ; roof slightly differentiated ; lateral lobes far longer than the roof, gradually

narrowing in width towards the apex which is furnished with short setae ; ringed part converging. Ejaculatory duct single.



Figs. 87–88. *Criocephalus* (*Megasemum*) *quadricostulatum*. Fig. 87. Dorsal view. Fig. 88. Ventral view. Figs. 89–90. *Mallambyx raddei*. Fig. 89. Dorsal view of lateral lobes. Fig. 90. Ventral view of median lobe. Figs. 91–92. *Aromia* (*Aromia*) *moschata* var. *orientalis*. Fig. 91. Dorsal view. Fig. 92. Lateral view. Fig. 93. Lateral lobes of *Chloridolum* (*Parachloridolum*) *thaliodes*. Dorsal view.

Tribe Callichromini

Genus *Aromia*

35. *Aromia* (*Aromia*) *moschata* var. *orientalis* Plavilstshikov, 1932[1)]

Specimen examined : 1 ♂, Sapporo, Hokkaido.

4.3 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter, the slit between the latter is extended ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof nearly equal in length to the lateral lobes, which are abundantly

1) The male genitalia of *A. moschata* were already described by Sharp and Muir (1912).

furnished with setae at the apex ; ringed part converging. Internal sac highly armed ; ejaculatory duct single.

Genus *Chloridolum*

36. *Chloridolum* (*Parachloridolum*) *thaliodes* Bates, 1884

Specimens examined : 2 ♂♂, Jôzankei near Sapporo, Hokkaido.

About 4.8 mm long. Median lobe with median struts slightly curved ; the former being subequal in length to the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof extended ; lateral lobes longer than the roof, with setae at the apex ; ringed part converging. The armatures of internal sac are well developed ; ejaculatory duct single.

Genus *Leontium*

37. *Leontium viride* Thomson, 1864

Specimens examined : 7 ♂♂, Nukabira, Prov. Tokachi, Hokkaido.

2.2–2.5 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in basal-piece ; roof subequal in length to lateral lobes, though considerably variable interspecifically ; the lateral lobes are gradually narrowing in width towards the apex which is furnished with setae ; ringed part converging. Internal sac attractively armed ; ejaculatory duct single.

Tribe Compsocerini

Genus *Rosalia*

38. *Rosalia* (*Rosalia*) *batesi* Harold, 1877

Specimens examined : 4 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

4.0–4.5 mm long. Median lobe with median struts slightly curved ; the former being far shorter than the latter which is subequal in width from base to apex, the slit between the latter is extended ; the ventral edge of median orifice is rounded but slightly notched at the apical point, the dorsal edge of median orifice, frequently, is more frontally situated than the ventral edge ; median foramen elongated. Tegmen without basal-piece ; roof large in extent ; lateral lobes extremely short compared with the roof, with setae at the apex ; ringed part short, converging. Ejaculatory duct single.

Tribe Callidiini

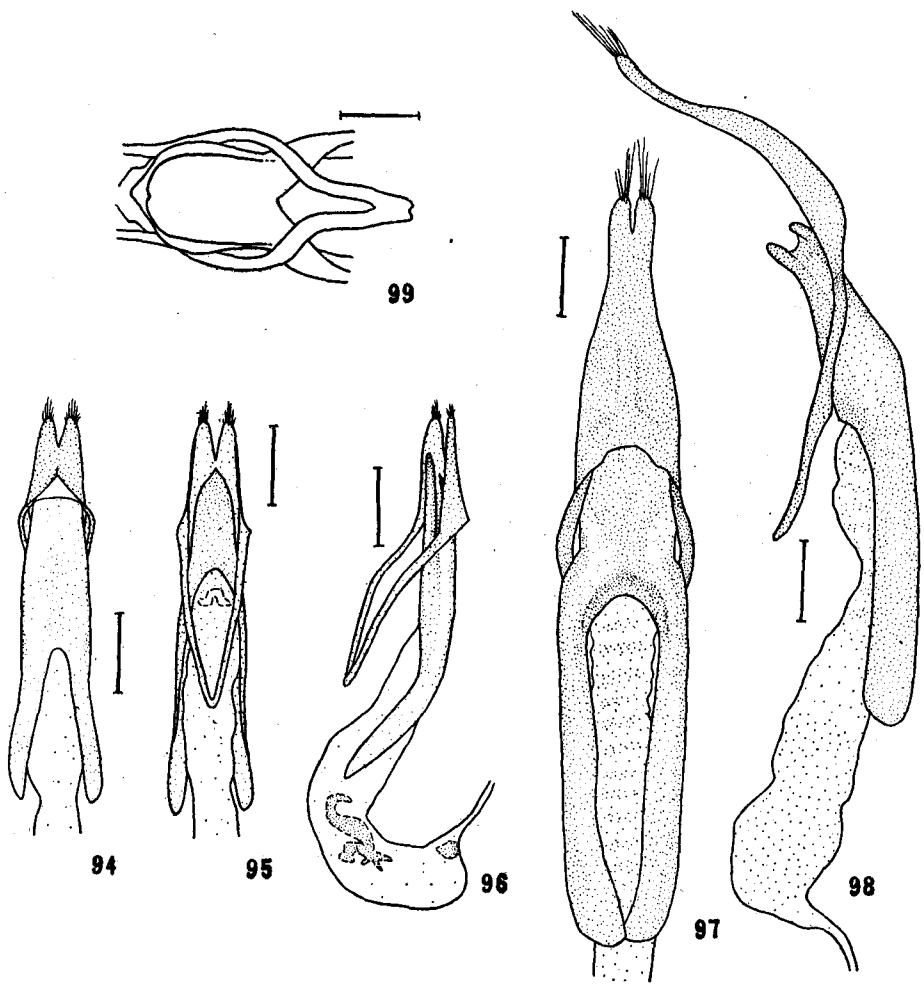
Genus *Rhopalopus*

39. *Rhopalopus* (*Prorrhopalopus*) *signaticollis* Solsky, 1872

Specimens examined : 6 ♂♂, Bankei near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts moderately curved ;

the former being much shorter than the latter which is subparallel, the slit between the latter is extended ovally at the blind end ; the ventral edge of median orifice is rounded ; median foramen elongated. Tegmen without basal-piece ; roof rather extended ; lateral lobes slender, longer than the roof, densely bearing setae at the apex ; ringed part short, converging towards the subdistal portion, enlarged peculiarly at the distal portion.



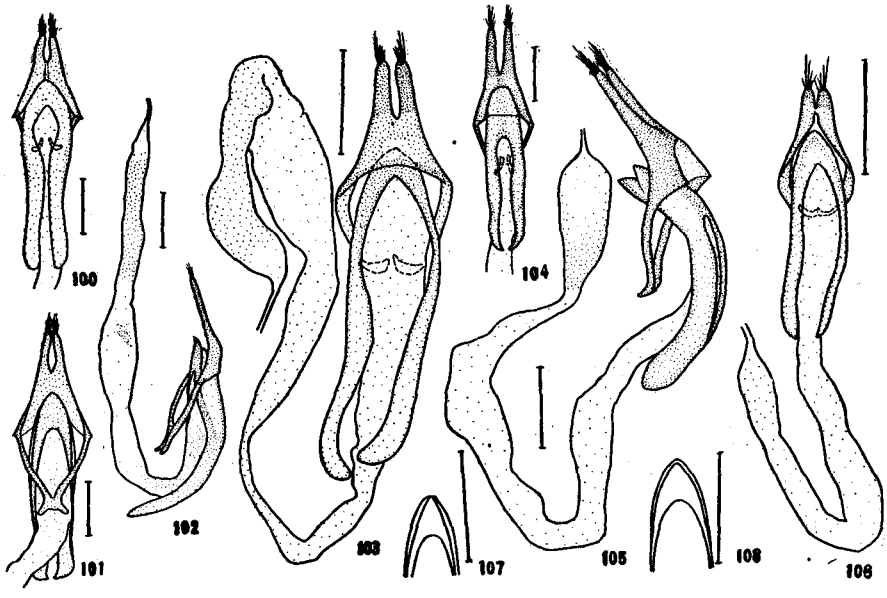
Figs. 94–96. *Leontium viride*. Fig. 94. Dorsal view. Fig. 95. Ventral view. Fig. 96. Lateral view. Figs. 97–99. *Rosalia* (*Rosalia*) *batesi*. Fig. 97. Dorsal view. Fig. 98. Lateral view. Fig. 99. Ventral view of median lobe and ringed part.

Genus *Semanotus*

40. *Semanotus rufipennis* (Motschulsky, 1860)

Specimens examined : 3 ♂♂, Fukuoka, Kyushu.

About 2 mm long. Median lobe with median struts slightly curved ; the former being extremely shorter than the latter, the slit between the latter is extended ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen without basal-piece ; roof extended ; lateral lobes slender, subequal in length to the roof, with setae at the apex ; ringed part short, converging. Ejaculatory duct single.



Figs. 100–102. *Rhopalopus* (*Prorrhopalopus*) *signaticollis*. Fig. 100. Dorsal view. Fig. 101. Ventral view. Fig. 102. Lateral view. Fig. 103. *Semanotus rufipennis*. Dorasl view. Figs. 104–105. *Callidium* (*Callidium*) *violaceum*. Fig. 104. Dorsal view. Fig. 105. Lateral view. Figs. 106–107. *Phymatodes* (*Paraphymatodes*) *albicinctus*. Fig. 106. Dorsal view. Fig. 107. Ventral view of median lobe. Fig. 108. Median lobe of *Phymatodes* (*Poecilium*) *maaki*. Ventral view.

Genus *Callidium*

41. *Callidium* (*Callidium*) *violaceum* (Linné, 1758)

Specimens examined : 2♂♂, Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts moderately curved ; the former being far shorter than the latter ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen without basal-piece ; roof

narrow in extent ; lateral lobes slender, longer than the roof, densely covered with setae at the apex ; ringed part converging. Ejaculatory duct single.

Genus *Phymatodes*

42. *Phymatodes* (*Paraphymatodes*) *albicinctus* Bates, 1873

Specimens examined : 2 ♂♂, Bankei near Sapporo, Hokkaido.

About 1 mm long. Median lobe with median struts slightly curved ; the former being extremely short compared with the latter ; the ventral edge of median orifice is pointed, median foramen elongated. Tegmen without basal-piece ; roof slightly differentiated ; lateral lobes short, with long setae at the apex, ringed part hemmed, converging. Ejaculatory duct single.

43. *Phymatodes* (*Poecilium*) *maaki* (Kraatz, 1879)

Specimens examined : 1 ♂, Akagawa near Hakodate, 1 ♂, Bankei near Sapporo, Hokkaido.

About 1.5 mm long. The genitalia of this species closely resemble those of *Phymatodes* (*Paraphymatodes*) *albicinctus*, but differ from the latter in the slender median lobe.

Remarks of Phymatodes : The genitalia of the two studied species belonging to the genus *Phymatodes* are characterized in the following respects : 1. Median struts exceedingly longer than the median lobe. 2. Ringed part hemmed.

Tribe Clytini

Genus *Xylotrechus*

44. *Xylotrechus chinensis* (Chevrolat, 1852)

Specimen examined : 1 ♂, Sapporo, Hokkaido.

About 3 mm long. Median lobe with median struts slightly curved ; the former being shorter than the latter which is broad in width, the slit between the latter is large in extent at the blind end ; the ventral edge of median orifice is weakly projected ; median foramen elongated. Tegmen without basal-piece ; roof extended ; lateral lobes far shorter than the roof, densely covered with long setae, ringed part composed of the robust arms, short, converging and hemmed. Ejaculatory duct single.

45. *Xylotrechus clarinus* Bates, 1884

Specimens examined : 2♂♂, Nukabira, Prov. Tokachi, 1 ♂, Horomi Pass, in the vicinty of Sapporo. Hokkaido.

About 2.5 mm long. The genitalia of this species are similar to those of *Xylotrechus chinensis*, but differ from the latter in the following points : 1. The arms of ringed part are narrower. 2. The lateral lobes are longer than the roof.

46. *Xylotrechus cuneipennis* (Kraatz, 1879)

Specimens examined : 2 ♂♂, Jôzankei near Sapporo, Hokkaido.

About 2.5 mm long. The genitalia of this species resemble those of *Xylotrechus chinensis* and *X. clarinus*, but differ from them in the structure of

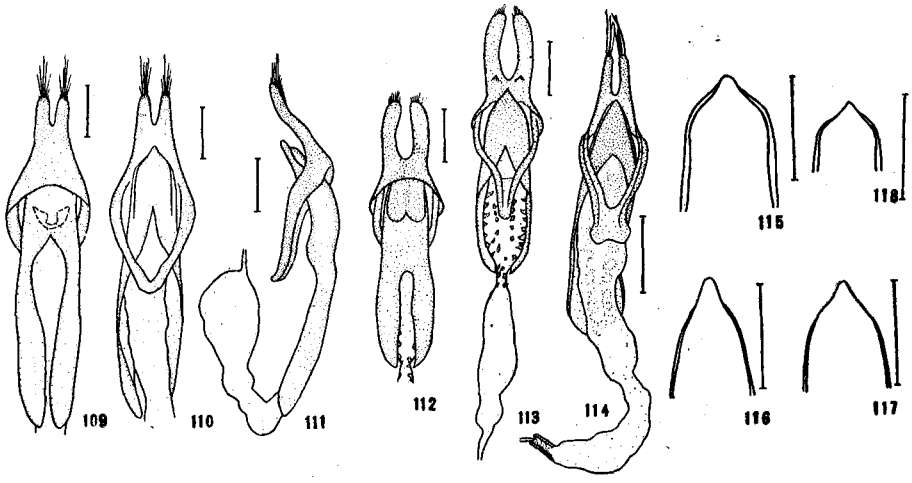
median and lateral lobes.

47. *Xylotrechus pyrrhoderus* Bates, 1873

Specimens examined : 2 ♂♂, Gifu, Honshu.

About 1.8 mm long. The genitalia of this species are similar to those of the other three studied species of *Xylotrechus*, but differ from them in the structure of the ventral aspect of median lobe.

Remarks of Xylotrechus: The genitalia of the four studied species belonging to the genus *Xylotrechus* resemble one another, but they are different from each other in the ventral structure of median lobe.



Figs. 109–111. *Xylotrechus chinensis*. Fig. 109. Dorsal view. Wig. 110. Ventral view. Fig. 11. Lateral view. Figs. 112-113. *Clytus auripilis*. Fig. 112. Dorsal view. Fig. 113. Ventral view. Fig. 114. *Clytus melaenus*. Ventral view. Figs. 115–117. Apical part of median lobe of *Xylotrechus*. All ventral view. Fig. 115. *Xylotrechus chinensis*. Fig. 116. *X. clarinus*. Fig. 117. *X. cuneipennis*. Fig. 118. *X. pyrrhoderus*.

Genus *Clytus*

48. *Clytus auripilis* Bates, 1884

Specimens examined : 4 ♂♂, Bankei near Sapporo, Hokkaido.

About 2.5 mm long. Median lobe with median struts strongly curved; the former being subequal in length to the latter; the ventral edge of median orifice is sharply pointed; median foramen elongated. Tegmen without basal-piece; roof narrow in extent, furnished with a bifurcated accessory piece at the base; lateral lobes longer than the roof, provided attractively with a ventral tooth at the base, with setae at the apex; ringed part converging. Internal sac armed remarkably; ejaculatory duct single.

49. *Clytus melaenus* Bates, 1884

Specimens examined : 2 ♂♂, Bankei near Sapporo, Hokkaido.

About 1.5 mm long. The structure considerably differs from *Clytus auripilis*. Median lobe with median struts strongly curved ; the former being shorter than the latter ; the ventral edge of median orifice is sharply pointed ; median foramen elongated. Tegmen without basal-piece ; roof extended, without accessory piece : lateral lobes slender, converging each other, as long as the roof, densely covered with long setae at the apex ; ringed part hemmed, converging towards the subdistal portion, and dilated at the distal portion. Internal sac highly armed at the base ; ejaculatory duct single.

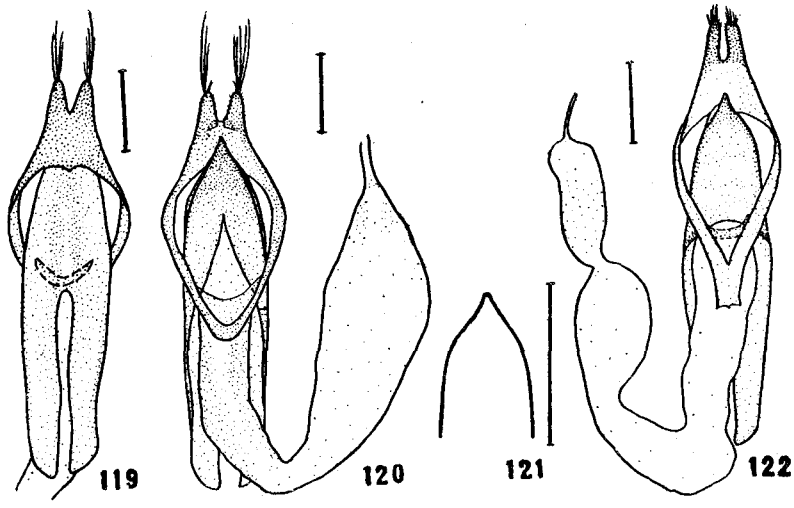
Remarks of Clytus : The genitalia of the two studied species belonging to the genus *Clytus* are considerably different from each other, as described above.

Genus *Cyrtoclytus*

50. *Cyrtoclytus caproides* (Bates, 1873)

Specimens examined : 5 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

Robust, about 2. 5mm long. Median lobe with median struts moderately curved ; the former being as long as the latter ; the ventral edge of median orifice



Figs. 119–120. *Cyrtoclytus caproides*. Fig. 119. Dorsal view. Fig. 120. Ventral view. Fig. 121. Apical part of median lobe of *Brachyclytus singularis*. Ventral view. Fig. 122. *Plagionotus pulcher*. Ventral view.

is sharply pointed ; median foramen elongated. Tegmen without basal-piece ; roof extended ; lateral lobes shorter than the roof, provided with a ventral tooth at the base, with long setae at the apex ; ringed part short, converging. Ejaculatory duct single.

Genus *Brachyclytus*

51. *Brachyclytus singularis* Kraatz, 1879

Specimens examined : 2 ♂♂, Bankei, in the vicinity of Sapporo, Hokkaido.

About 2.3 mm long. The genitalia of this species are similar to those of *Clytus caproides*, but differ from the latter in the narrowness of median lobe and the less developed armatures of internal sac.

Genus *Plagionotus*

52. *Plagionotus pulcher* (Blessig, 1872)

Specimens examined : 3 ♂♂, Maruyama near Sapporo, Hokkaido.

Robust, about 2.5 mm long. Median lobe with median struts slightly curved ; the former being shorter than the latter ; the ventral edge of median orifice is sharply pointed ; median foramen not elongated. Tegmen without basal-piece ; roof extended ; lateral lobes shorter than the roof, with setae at the apex ; ringed part converging. Ejaculatory duct single.

Genus *Chlorophorus*

53. *Chlorophorus japonicus* (Chevrolat, 1863)

Specimens examined : 3 ♂♂, Maruyama near Sapporo, 2 ♂♂, Sapporo, Hokkaido.

Slender, about 2.5 mm long. Median lobe with median struts slightly curved ; the former being a little shorter than the latter ; the ventral edge of median orifice is pointed ; median foramen not elongated. Roof narrow in extent ; basal-piece bifurcated ; lateral lobes longer than the roof, furnished with a keel on the ventral side of subbasal portion (Fig. 126, k), bearing setae at the apex ; ringed part converging. Internal sac attractively furnished with the armatures which are spirally arranged.

54. *Chlorophorus diadema* var. *inhirsutus* Matsushita, 1934

Specimens examined : 3 ♂♂, Sapporo, Hokkaido.

About 2.5 mm long. The genitalia of this species are almost identical with those of *Chlorophorus japonicus*, but slightly differ from the latter in the ventral structure of lateral lobes and the less developed armatures spirally arranged of internal sac.

55. *Chlorophorus notabilis* (Pascoe, 1862)

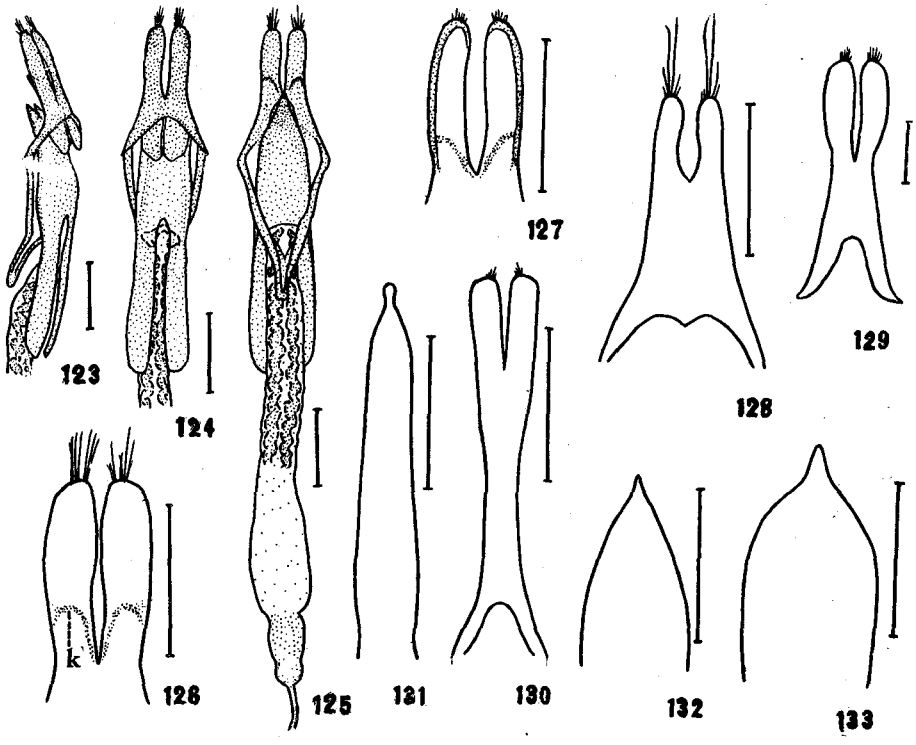
Specimens examined : 3 ♂♂, Yokohama, Honshu, 2 ♂♂, Gifu, Honshu.

Slender, 3–3.5 mm long. Median lobe with median struts slightly curved ; the former being exceedingly shorter than the latter, the ventral edge of median orifice is sharply pointed ; median foramen not elongated. Tegmen without basal-piece ; roof largely extended ; lateral lobes rather slender, shorter than the roof, with setae at the apex ; ringed part converging. Internal sac furnished markedly with the spirally arranged armatures ; ejaculatory duct single.

56. *Chlorophorus quinquefasciatus* (Castelnau et Gory, 1841)

Specimens examined : 2 ♂♂, Fnkuoka, Kyushu.

Slender, 5 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter ; the ventral edge of median orifice is sharply pointed ; median foramen not elongated. Roof extended ; basal-piece present ; lateral lobes a little longer than the roof, with setae at the apex ; ringed part converging. Internal sac provided with the spirally arranged armatures ; ejaculatory duct single.



Figs. 123–126. *Chlorophorus japonicus*. Fig. 123. Lateral view. Fig. 124. Dorsal view. Fig. 125. Ventral view. Fig. 126. Ventral view of lateral lobes. Figs. 127–130. Lateral lobes of *Chlorophorus*. Fig. 127. *Chlorophorus diadema* var. *inhirsutus*. Ventral view. Fig. 128. *Ch. notabilis*. Dorsal view. Fig. 129. *Ch. quinquefasciatus*. Dorsal view. Fig. 130. *Ch. annularis*. Dorsal view. Figs. 131–133. Median lobe of *Chlorophorus*. All ventral view. Fig. 131. *Chlorophorus annularis*. Fig. 132. *Ch. notabilis*. Fig. 133. *Ch. quinquefasciatus*.

57. *Chlorophorus annularis* (Fabricius, 1787)

Specimen examined : 1 ♂, Fukuoka, Kyushu.

Exceedingly slender, about 4.5 mm long. Median lobe with median struts

slightly curved; the former being extremely longer than the latter; the ventral edge of median orifice is projected, with a swollen apex; median foramen not elongated. Tegmen without basal-piece; roof extremely long, provided with a pair of weakly chitinized accessory pieces at the base; lateral lobes broad in width, exceedingly shorter than the roof, sparsely furnished with setae at the apex; ringed part converging. Internal sac somewhat markedly armed; ejaculatory duct single.

Remarks of Chlorophorus: The genitalia of the studied species belonging to *Chlorophorus* are characterized, more or less, by the attractive armatures of internal sac. These genitalia clearly differ from one another in the shape of lateral lobes and the structure of ventral aspect of median lobe, except *C. japonicus* and *C. diadema* var. *inhirsutus* which are slightly distinguishable merely from each other by the ventral structure of lateral lobes (Figs. 126 & 127). Those of *C. annularis* are peculiar in the extremely long lengthiness of both the roof and median lobe.

Genus *Raphuma*

58. *Raphuma xenisca* (Bates, 1884)

Specimens examined: 3 ♂♂, Maruyama near Sapporo, Hokkaido.

About 1.5 mm long. Median lobe with median struts slightly curved; the former being shorter than the latter, the ventral edge of median orifice is pointed; median foramen not elongated. Tegmen without basal-piece; roof narrow in extent; lateral lobes longer than the roof, furnished with a tooth at the ventral side of base, with long setae at the apex; ringed part converging. Ejaculatory duct single.

Genus *Demodex*

59. *Demodex transilis* Bates, 1884

Specimens examined: 3 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

Slender, about 2.5 mm long. Median lobe with median struts slightly curved; the former being a little shorter than the latter; the ventral edge of median orifice is sharply pointed, median foramen not elongated. Tegmen without basal-piece; roof extended, provided with a process at the middle of base; lateral lobes exceedingly shorter than the roof, provided with minute setae at the apex; ringed part furnished with a long process at the widest portion on either side, converging towards the subdistal portion and subparallel along the distal portion. Ejaculatory duct single.

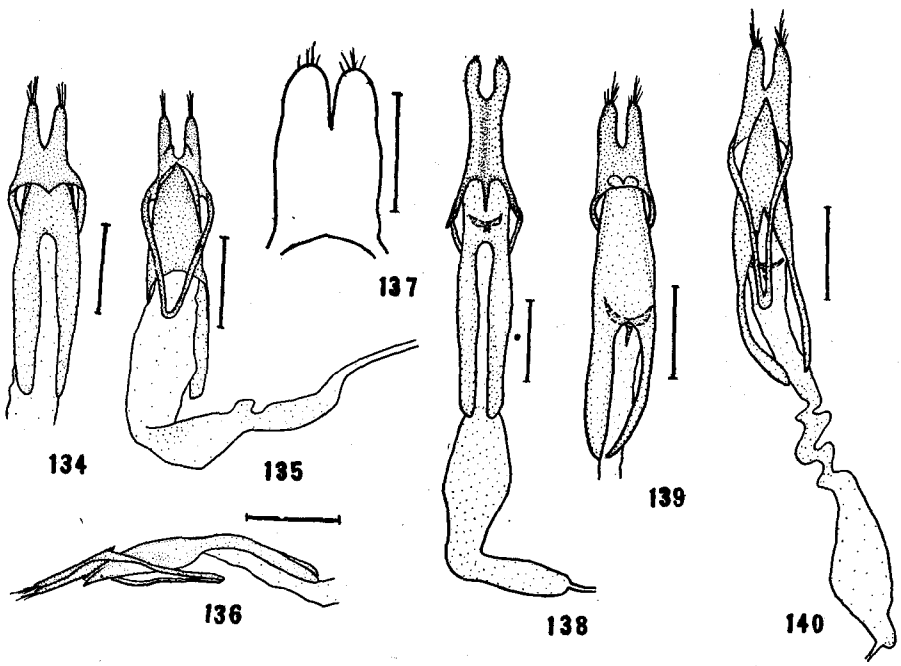
Genus *Anaglyptus*

60. *Anaglyptus niponensis* Bates, 1884

Specimens examined: 3 ♂♂, Maruyama near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts strongly curved; the former being flat, as long as the latter, the ventral edge of median orifice is sharply pointed, median foramen elongated. Tegmen without basal-piece; roof

narrow in extent, lateral lobes longer than the roof, gradually narrowing in width from base to apex, with long setae at the apex; ringed part converging. Ejaculatory duct single.



Figs. 134-136. *Raphuma xenisca*. Fig. 134. Dorsal view. Fig. 135. Ventral view. Fig. 136. Lateral view. Fig. 137. Lateral lobes of *Aglaophis colobotheoides*. Dorsal view. Fig. 138. *Demodex transilis*. Dorsal view. Figs. 139-140. *Anaglyptus niponensis*. Fig. 139. Dorsal view. Fig. 140. Ventral view.

Genus *Paraclytus*

61. *Paraclytus excultus* Bates, 1884

Specimens examined : 3 ♂♂, Maruyama near Sapporo, Hokkaido.

3–4 mm long. Median lobe with median struts slightly curved ; the former being weakly chitinized, extremely shorter than the latter, the slit between the latter is extended ; the ventral edge of median orifice is rounded ; median foramen not elongated. Tegmen deficient in basal-piece ; roof extended ; lateral lobes thumb-shaped, far shorter than the roof, with setae at the apex ; ringed part converging. Ejaculatory duct single.

Genus *Aglaophis*

62. *Aglaophis colobotheoides* Bates, 1884

Specimens examined : 2 ♂♂, Maruyama near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts moderately curved; the former being slightly shorter than the latter; the ventral edge of median orifice is pointed; median foramen not elongated. Tegmen without basal-piece; roof extended; lateral lobes shorter than the roof, with long setae at the apex; ringed part converging. Ejaculatory duct single.

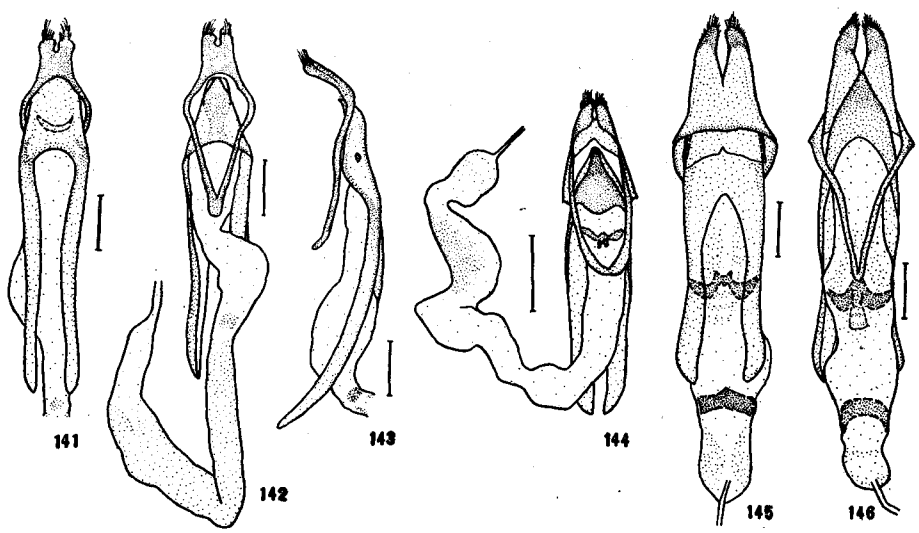
Tribe Cleomenini

Genus *Dere*

63. *Dere thoracica* White, 1855

Specimens examined: 3 ♂♂, Higashiyama near Kyoto, Honshu.

About 2 mm long. Median lobe with median struts slightly curved; the former being flat, shorter than the latter; the ventral edge of median orifice is projected; median foramen not elongated. Tegmen without basal-piece; roof extended; lateral lobes shorter than the roof, with setae at the apex; ringed part broad in width along the whole length, though slightly narrowing towards the distal portion.



Figs. 141–143. *Paraclytus excultus*. Fig. 141. Dorsal view. Fig. 142. Ventral view. Fig. 143. Lateral view. Fig. 144. *Dere thoracica*. Ventral view. Figs. 145–146. *Purpuricenus spectabilis*. Fig. 145. Dorsal view. Fig. 146. Ventral view.

Tribe Stenaspini

Genus *Purpuricenus*

64. *Purpuricenus spectabilis* Motschulsky, 1857

Specimen examined : 1 ♂, Bankei in the vicinity of Sapporo, Hokkaido.

Robust, about 3 mm long. Median lobe with median struts slightly curved ; the former being shorter than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof extended, furnished with an accessory piece at the base ; lateral lobes obliquely truncated, a little longer than the roof, with setae at the apex ; ringed part converging. Internal sac provided with a strongly chitinized transverse armature in the proximal portion ; ejaculatory duct single.

Subfamily LAMIINAE

Tribe Dorcadionini

Genus *Plectrura*

65. *Plectrura* (*Phlyctidola*) *metallica* (Bates, 1884)

Specimens examined : 2 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

About 3.8 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter ; the ventral edge of median orifice is rounded ; median foramen elongated. Roof absent ; lateral lobes separated from each other, gradually narrowing in width from base to apex, bearing setae at the apex ; basal-piece weakly chitinized ; ringed part hemmed, converging, and dilated distally. Ejaculatory duct single.

Tribe Monochamini

Genus *Psacothea*

66. *Psacothea hilaris* (Pascoe, 1857)

Specimens examined : 3 ♂♂, Tokyo.

Stout, about 4 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter which is broad in width ; the ventral edge of median orifice is rounded ; median foramen elongated. Roof absent ; lateral lobes separated from each other, densely clothed with setae at the apical portion ; basal-piece weakly chitinized ; ringed part hemmed, converging, geniculated at the widest portion. Ejaculatory ducts double.

Genus *Monochamus*

67. *Monochamus rosenmülleri* (Cederhjelm, 1789)

Specimens examined : 6 ♂♂, Jôzankei, in the vicinity of Sapporo, Hokkaido.

Stout ; about 5. 2 mm long. Median lobe with median struts moderately curved ; the former being subequal in length to the latter which is broad in width ; the ventral edge of median orifice is truncated ; median foramen elongated. Roof scarcely differentiated ; lateral lobes densely covered with setae at the apical portion ; basal-piece present ; ringed part hemmed, converging, geniculated at the

widest portion. Ejaculatory ducts double.

68. *Monochamus grandis* Waterhouse, 1881

Specimens examined: 3 ♂♂, Jôzankei, in the vicinity of Sapporo, Hokkaido.

6–7 mm long.

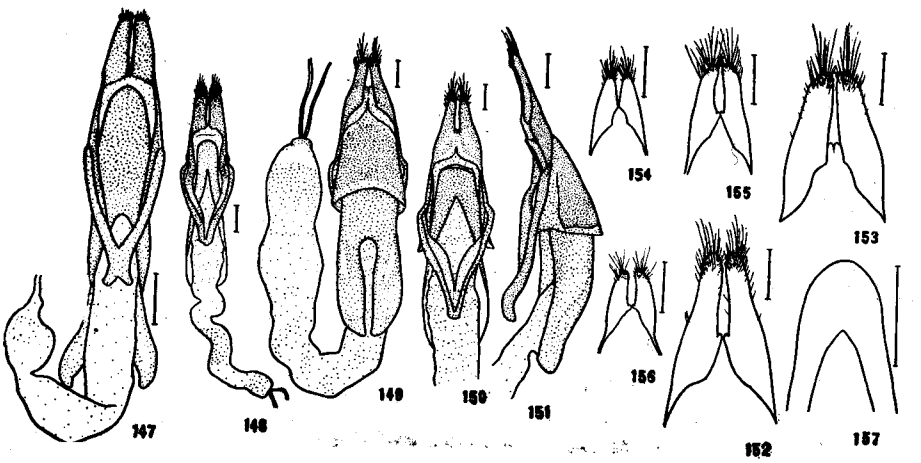


Fig. 147. *Plectrura* (*Phlyctidola*) *metallica*. Ventral view. Fig. 148. *Psacothea hilaris*. Ventral view. Figs. 149-152. *Monochamus rosenmülleri*. Fig. 149. Dorsal view. Fig. 150. Ventral view. Fig. 151. Lateral view. Fig. 152. Dorsal view of lateral lobes. Figs. 153–156. Lateral lobes of *Monochamus*. All dorsal view. Fig. 153. *Monochamus grandis*. Fig. 154. *M. tesserula*. Fig. 155. *M. saltuarius*. Fig. 156. *M. beloni*. Fig. 157. Median lobe of *Monochamus beloni*. Ventral view.

69. *Monochamus tesserula* White, 1858

Specimens examined: 2 ♂♂, Tokyo.

About 2.7 mm long.

70. *Monochamus saltuarius* Gebler, 1830

Specimens examined: 2 ♂♂, Yukomanbetsu, in the vicinity of Asahigawa, Hokkaido.

About 3.3 mm long.

The genitalia of *Monochamus grandis*, *M. tesserula*, *M. saltuarius* and *M. rosenmülleri* resemble one another, but differ from one another in the structure of lateral lobes (Figs. 152–156).

71. *Monochamus beloni* Pic, 1901

Specimens examined: 3 ♂♂, Bankei near Sapporo, Hokkaido.

2.5–2.8 mm long. The genitalia of this species are similar to those of the above four species of *Monochamus*, but differ from them in the structure of median

and lateral lobes.

Remarks of Monochamus: So far as the author studied, the genitalia of *Monochamus* closely resemble in structure in species, but differ slightly from one another in the shape of lateral lobes at least.

Genus *Dihammus*

72. *Dihammus luxuriosus* (Bates, 1873)

Specimens examined: 2 ♂♂, Maruyama near Sapporo, 1 ♂, Nukabira, Prov. Tokachi, Hokkaido.

Stout; 5–6 mm long. Median lobe with median struts moderately curved; the former being subequal in length to the latter which is broad in width; the ventral edge of median orifice is truncated; median foramen elongated. Roof scarcely differentiated; lateral lobes gradually narrowing towards the apex, densely covered with setae on the dorsal side; basal-piece present; ringed part hemmed, converging, geniculated at the widest portion. Internal sac provided with a small diverticulum at the base; ejaculatory ducts double, but united with each other near the base of internal sac.

73. *Dihammus fraudator* (Bates, 1873)

Specimens examined: 4 ♂♂, Jôzankei, in the vicinity of Sapporo, Hokkaido.

About 3.8 mm long. The genitalia of this species resemble those of *Dihammus luxuriosus*, but are different from the latter in the shape of lateral lobes (Fig. 159).

Remarks of Dihammus: The genitalia of the two studied species belonging to *Dihammus* are similar to those of the studied species of *Monochamus*.

Genus *Melanauster*

74. *Melanauster chinensis* var. *macularius* (Thomson, 1865)[1]

Specimens examined: 2 ♂♂, Sapporo, 1 ♂, Nopporo near Sapporo, Hokkaido.

Stout and robust; about 7 mm long. Median lobe with median struts slightly curved; the former being a little longer than the latter which is broad in width; the ventral edge of median orifice is rounded; median foramen elongated. Tegmen without roof; lateral lobes separated from each other, densely covered with setae at the apical portion; basal-piece weakly chitinized; ringed part hemmed broadly, converging, geniculated at the widest portion. Internal sac armed with two chitinous rods; ejaculatory ducts doulbe.

Genus *Eupromus*

75. *Eupromus ruber* (Darman, 1817)

Specimens examined: 2 ♂♂, Shiroyama near Misaki, Kanagawa Pref.,

1) The male genitalia of *M. chinensis* were already described by Zia (1936).

Honshu.

Stout ; about 4.5 mm long. Median lobe with median struts moderately curved ; the former being longer than the latter which is broad in width, the slit between the latter is extended ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen deficient in roof ; lateral lobes gradually narrowing in width towards the apical portion which is abundantly furnished with setae ; basal-piece very weakly chitinized ; ringed part hemmed, converging, geniculated at the widest portion. Ejaculatory ducts double.

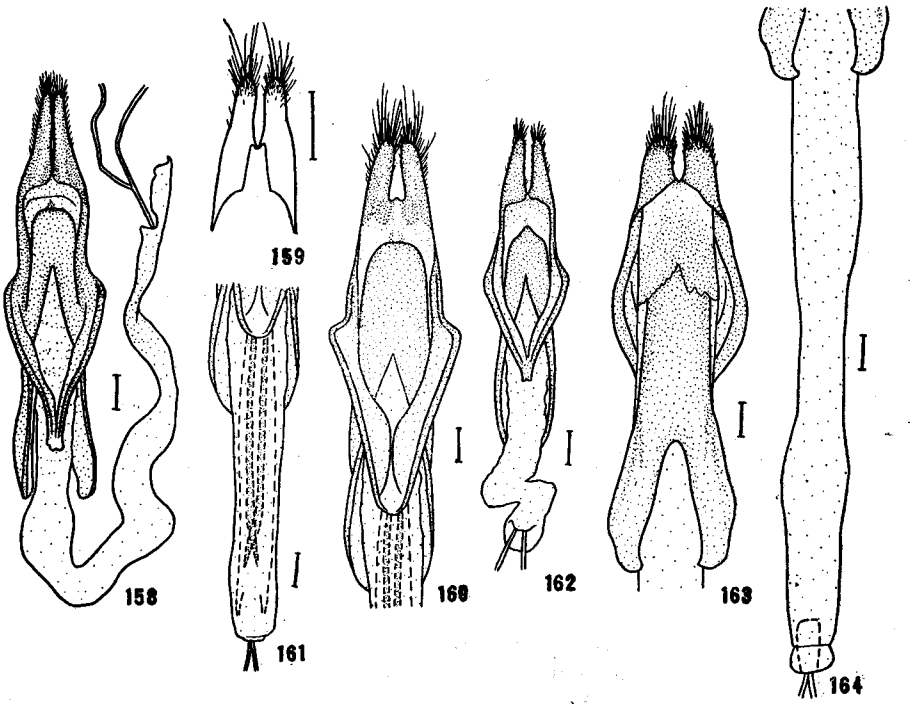


Fig. 158. *Dihammus luxuriosus*. Ventral view. Fig. 159. Lateral lobes of *Dihammus fraudator*. Dorsal view. Figs. 160–161. *Melanauster chinensis* var. *macularius*. Fig. 160. Ventral view. Fig. 161. Internal sac. Fig. 162. *Eupromus ruber*. Ventral view. Figs. 163–164. *Batocera* (*Batocera*) *lineolata*. Fig. 163. Dorsal view. Fig. 164. Internal sac.

Tribe Batocerini

Genus *Batocera*

76. *Batocera* (*Batocera*) *lineolata* Chevrolat, 1852[1)]

Specimens examined : 2 ♂♂, Tokyo.

1) The male genitalia of this species were formerly described by Zia (1936).

Robust and stout ; about 7 mm long. Median lobe with median struts moderately curved ; the former being longer than the latter which is broad in width ; the ventral edge of median orifice is rounded ; median foramen elongated. Roof scarcely differentiated ; lateral lobes thumb-shaped, furnished densely with setae at the apical portion ; basal-piece present ; ringed part hemmed, converging, without geniculation at the widest portion. Ejaculatory ducts double.

Genus *Apriona*

77. *Apriona germari* (Hope, 1831)

Specimen examined : 1 ♂, Japan (locality not indicated).

Stout and robust ; about 6 mm long. Median lobe with median struts moderately curved ; the former being shorter than the latter ; the ventral edge of median orifice is rounded, but slightly notched at the apex ; median foramen elongated. Roof scarcely differentiated ; lateral lobes broad in width, basal-piece present ; ringed part hemmed, converging, geniculated at the widest portion. Ejaculatory ducts double.

Tribe Mesosini

Genus *Mesosa*

78. *Mesosa myops* var. *japonica* Bates, 1873

Specimens examined : 8 ♂♂, Bankei near Sapporo, Hokkaido.

Slender ; 3.5–4 mm long. Median lobe with median struts moderately curved ; the former being longer than the latter ; the ventral edge of median orifice is more or less pointed ; median foramen elongated. Roof scarcely differentiated ; lateral lobes rather slender, densely covered with setae at the apical portion ; basal-piece rather membranous ; ringed part constricted subproximally, hemmed, converging. Internal sac provided with a diverticulum at the base ; ejaculatory duct single.

79. *Mesosa hirsuta* Bates, 1884

Specimens examined : 4 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

About 3 mm long. The genitalia of this species resemble those of *Mesosa myops* var. *japonica*, but differ from the latter in the ventral structure of median lobe.

80. *Mesosa longipennis* Bates, 1873

Specimens examined : 2 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

About 4.5 mm long. The genitalia of this species are similar to those of *Mesosa myops* var. *japonica* and *M. hirsuta*, but differ from them in the ventral structure of median lobe and better developed basal-piece.

Remarks of Mesosa : The genitalia of the three studied species belonging to the genus *Mesosa* are characterized by the presence of diverticulum of internal sac.

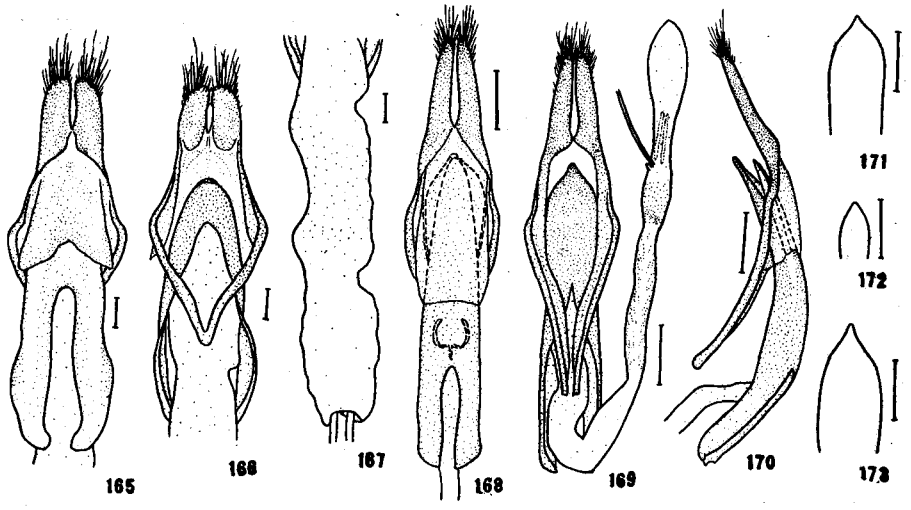
Tribe Ancylonotini

Genus *Apalimna*

81. *Apalimna liturata* Bates, 1884

Specimens examined : 2 ♂♂, Mt. Moiwa near Sapporo, 2 ♂♂, Jôzankei in the vicinity of Sapporo, Hokkaido.

4–5 mm long. Median lobe with median struts slightly curved ; the former being as long as the latter ; the ventral edge of median orifice is weakly projected ; median orifice elongated. Roof narrow in extent ; lateral lobes broad in width, longer than the roof, with setae at the apex ; basal-piece weakly chitinized ; ringed part converging, hemmed, weakly geniculated at the widest portion. Ejaculatory duct single.



Figs. 165–167. *Apriona germari*. Fig. 165. Dorsal view. Fig. 166. Ventral view. Fig. 167. Internal sac. Figs. 168–171. *Mesosa myops* var. *japonica*. Fig. 168. Dorsal view. Fig. 169. Ventral view. Fig. 170. Lateral view. Fig. 171. Ventral view of apical part of median lobe. Figs. 172–173. Apical part of median lobe of *Mesosa*. Both ventral view. Fig. 172. *Mesosa hirsuta*. Fig. 173. *M. longipennis*.

Tribe Xenoleini

Genus *Jezohammus*

82. *Jezohammus nubilus* Matsushita, 1933

Specimens examined : 2 ♂♂, Bankei near Sapporo, Hokkaido.

Slender ; about 2 mm long. Median lobe with median struts moderately curved ; the former being longer than the latter ; the ventral edge of median orifice is rounded ; median foramen elongated. Roof absent ; lateral lobes

abundantly furnished with long setae at the apex ; basal-piece weakly chitinized ; ringed part weakly constricted subproximally, hemmed, converging. Ejaculatory duct single.

Tribe Niphonini

Genus *Pterolophia*

83. *Pterolophia jugosa* (Bates, 1873)

Specimens examined : 4 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

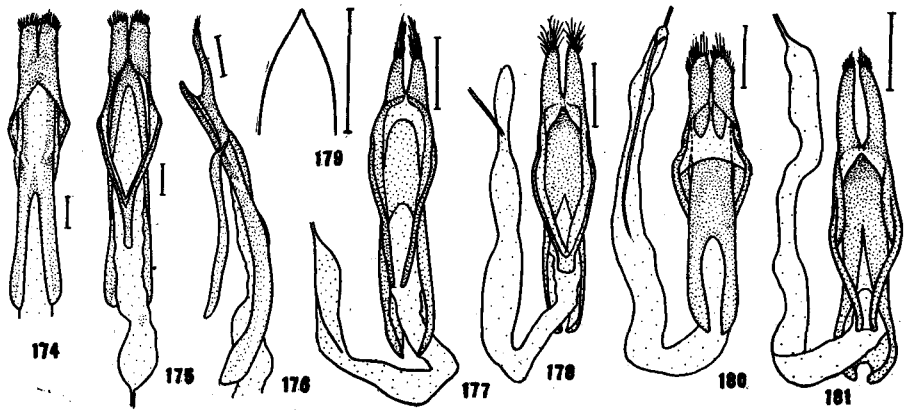
About 2. 5 mm long. Median lobe with median struts moderately curved, the former being longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes densely covered with setae at the apex ; ringed part constricted subproximally, hemmed, converging. Internal sac provided with a diverticulum at the base ; ejaculatory duct single.

84. *Pterolophia rigida* (Bates, 1873)

Specimens examined : 3 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

2–2.5 mm long. The genitalia of this species are similar to those of *Pterolophia jugosa*, but different from the latter in the ventral structure of median lobe.

Remarks of Pterolophia : The genitalia of the two studied species of this genus are characterized by the presence of diverticulum of internal sac.



Figs. 174–176. *Apalimna liturata*. Fig. 174. Dorsal view. Fig. 175. Ventral view. Fig. 176. Lateral view. Fig. 177. *Jezohammus nubilus*. Ventral view. Fig. 178. *Pterolophia jugosa*. Ventral view. Fig. 179. Apical part of median lobe of *Pterolophia rigida*. Ventral view. Fig. 180. *Asaperda agapanthina*. Dorsal view. Fig. 181. *Rhopaloscelis unifasciatus*. Ventral view.

Tribe Apomecynini

Genus *Asaperda*

85. *Asaperda agapanthina* Bates, 1873

Specimens examined : 2 ♂♂, Maruyama near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts strongly curved ; the former being subequal in length to the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece and roof ; lateral lobes broad in width, densely covered with setae at the apex, provided respectively with an accessory piece at the base ; ringed part geniculated at the widest portion, hemmed, converging. Internal sac armed with a flagellum in the proximal part.

Tribe Apodasyini

Genus *Rhopaloscelis*

86. *Rhopaloscelis unifasciatus* Blessig, 1873

Specimens examined : 3 ♂♂, Bankei near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts strongly curved ; the former being longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in basal-piece and roof ; lateral lobes slender, converging each other towards the apex which is furnished with setae ; ringed part constricted subproximally, hemmed along the proximal portion, converging.

Genus *Terinaea*

87. *Terinaea atrofusca* Bates, 1884

Specimens examined : 2 ♂♂, Bankei near Sapporo, Hokkaido.

About 1.5 mm long. Median lobe with median struts moderately curved ; the former being shorter than the latter ; the ventral edge of median orifice is rounded ; median foramen elongated. Tegmen without roof ; lateral lobes densely clothed with long setae at the apex ; basal-piece weakly chitinized ; ringed part converging, without hem and constriction or geniculation. Ejaculatory duct single.

Tribe Estolini

Genus *Sydonia*

88. *Sydonia divaricata* Bates, 1884

Specimens examined : 2 ♂♂, Bankei near Sapporo, Hokkaido.

About 2 mm long. Median lobe with median struts moderately curved ; the former being longer than the latter ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Roof slightly differentiated ; lateral lobes abundantly furnished with setae at the apex ; basal-piece present ; ringed part constricted subproximally, hemmed along the proximal portion, converging.

Ejaculatory duct single.

Tribe Pogonocherini

Genus *Pogonocherus*

89. *Pogonocherus* (*Pogonocherus*) *seminiveus* Bates, 1873

Specimens examined : 4 ♂♂, Takinosawa near Sapporo, Hokkaido.

About 1.5 mm long. Median lobe with median struts strongly curved ; the former being as long as the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen deficient in basal-piece and roof ; lateral lobes bearing setae at the apex ; ringed part geniculated at the widest portion, converging, hemmed along the proximal portion. Ejaculatory duct single.

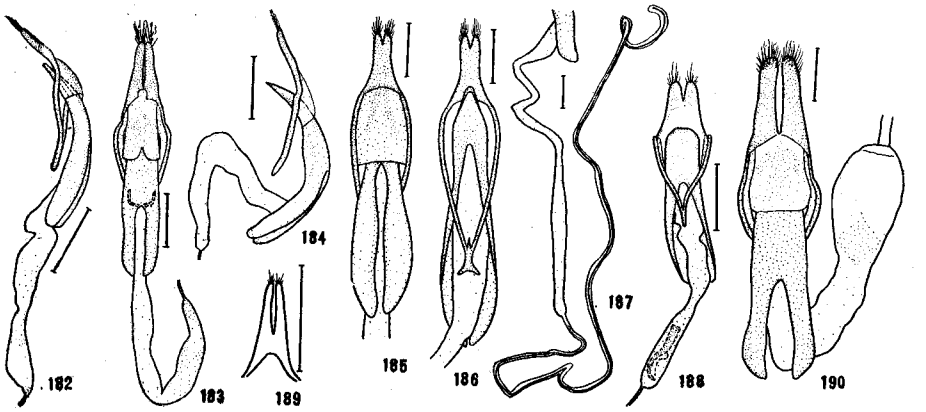


Fig. 182. *Terinaea atrofusca*. Lateral view. Fig. 183. *Sydonia divaricata*. Dorsal view. Fig. 184. *Pogonocherus* (*Pogonocherus*) *seminiveus*. Lateral view. Figs. 185--187. *Acanthocinus* (*Acanthocinus*) *griseus*. Fig. 185. Dorsal view. Fig. 186. Ventral view. Fig. 187. Internal sac and ejaculatory duct. Fig. 188. *Exocentrus guttulatus*. Ventral view. Fig. 189. Lateral lobes of *Exocentrus fasciolatus*. Dorsal view. Fig. 190. *Agapanthia daurica*. Dorsal view.

Tribe Acanthocinini

Genus *Acanthocinus*

90. *Acanthocinus* (*Acanthocinus*) *griseus* (Fabricius, 1792)

Specimens examined : 1 ♂, Sapporo, 1 ♂, Jôzankei near Sapporo, 1 ♂, Nukabira, Prov. Tokachi, Hokkaido.

About 3 mm long. Median lobe with median struts slightly curved ; the former being flat, shorter than the latter which is broad in width ; the ventral edge of median orifice is not pointed ; median foramen elongated. Roof well developed ; lateral lobes exceedingly shorter than the roof, with setae at the apex ; basal-piece weakly chitinized but partially chitinized normally ; ringed part converging,

not constricted near the widest portion at all, without hem. Ejaculatory duct single, armed with a flagellum.

Genus *Exocentrus*

91. *Exocentrus guttulatus* Bates, 1873

Specimens examined : 5 ♂♂, Bankei near Sapporo, Hokkaido.

About 1.5 mm long. Median lobe with median struts slightly curved ; the former being as long as the latter which is broad in width ; the ventral edge of median orifice is rounded ; median foramen elongated. Tegmen without basal-piece ; roof scarcely differentiated ; lateral lobes broad in width, with long setae at the apex ; ringed part converging, geniculated at the widest portion, hemmed along the proximal portion. Ejaculatory duct single.

92. *Exocentrus fasciolatus* Bates, 1873

Specimens examined : 6 ♂♂, Bankei near Sapporo, Hokkaido.

Slender ; about 1.5 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter : the ventral edge of median orifice is rounded but slightly notched at the apical point ; median foramen elongated. Tegmen without basal-piece ; roof narrow in extent ; lateral lobes slender, with setae at the apex ; ringed part geniculated at the widest portion, not hemmed, converging towards the subdistal portion, rod-shaped distally. Ejaculatory duct single, armed with a flagellum which arises from the proximal portion of internal sac.

Remarks of Exocentrus : The genitalia of the two studied species belonging to *Exocentrus* are considerably different from each other as seen from the above descriptions.

Tribe Agapanthiini

Genus *Agapanthia*

93. *Agapanthia daurica* Ganglbauer, 1884

Specimens examined : 3 ♂♂, Nukabira, Prov. Tokachi, 1 ♂, Bankei near Sapporo, Hokkaido.

About 3 mm long. Median lobe with median struts slightly curved ; the former being longer than the latter, the ventral piece of the former is membranous apically ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Tegmen without roof ; lateral lobes abundantly furnished with setae at the apex ; basal-piece present ; ringed part geniculated at the widest portion, hemmed, converging. Ejaculatory duct single.

Tribe Saperdini

Genus *Saperda*

94. *Saperda octomaculata* Blessig, 1873

Specimens examined : 5 ♂♂, Bankei near Sapporo, Hokkaido.

Median lobe with median struts slightly curved ; the former being subequal

in length to the latter ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Roof scarcely differentiated ; lateral lobes densely furnished with setae at the apex ; basal-piece present, deeply bifurcated distally ; ringed part geniculated at the widest portion, hemmed, converging. The proximal part of internal sac is armed with three chitinous rods, the basal portion of which is naked.

Genus *Eutetrapha*

95. *Eutetrapha ocelota* (Bates, 1873)

Specimens examined : 3 ♂♂, Jôzankei near Sapporo, Hokkaido.

About 3.5 mm long. Median lobe with median struts moderately curved ; the former being shorter than the latter ; the ventral edge of median orifice is bluntly pointed ; median foramen elongated. Roof scarcely differentiated ; lateral lobes broad in width, densely covered with setae at the apex ; basal-piece bifurcated distally ; ringed part geniculated at the widest portion, hemmed, converging. The armatures of internal sac are well developed, especially, three rods attractive, naked basally. Ejaculatory duct single.

96. *Eutetrapha sedecimpunctata* (Motschulsky, 1860)

Specimens examined : 2 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

About 3 mm long. The genitalia of this species resemble those of *Eutetrapha ocelota*, but are different from the latter in the slender lateral lobes.

Remarks of Eutetrapha : The genitalia of the two studied species are similar to each other in many points, especially, in the structure of ringed part and armatures of internal sac.

Genus *Cagosima*

97. *Cagosima sanguinolenta* Thomson, 1864

Specimens examined : 2 ♂♂, Yokohama, Honshu.

About 4 mm long. Median lobe with median struts moderately curved ; the former being as long as the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Roof slightly differentiated ; lateral lobes converging each other towards the apex, longer than the roof, abundantly bearing setae at the apex ; basal-piece bifurcated distally ; ringed part geniculated at the widest portion, hemmed, converging. Internal sac armed with three chitinous rods within the proximal part.

Tribe Gleneini

Genus *Glenea*

98. *Glenea* (*Glenea*) *relicta* Pascoe, 1858

Specimens examined : 2 ♂♂, Bankei near Sapporo, Hokkaido.

About 3 mm long. Median lobe with median struts moderately curved ;

the former being shorter than the latter, the apical portion of the former is elongated ; the ventral edge of median orifice is pointed ; median foramen elongated. Roof slightly differentiated ; lateral lobes abundantly provided with setae at the apex ; basal-piece bifurcated distally ; ringed part geniculated at the widest portion, hemmed along the proximal portion, converging towards the subdistal portion, subparallel in the distal portion. The proximal part of internal sac is armed with three chitinous rods, the basal portion of which is naked. Ejaculatory duct single.

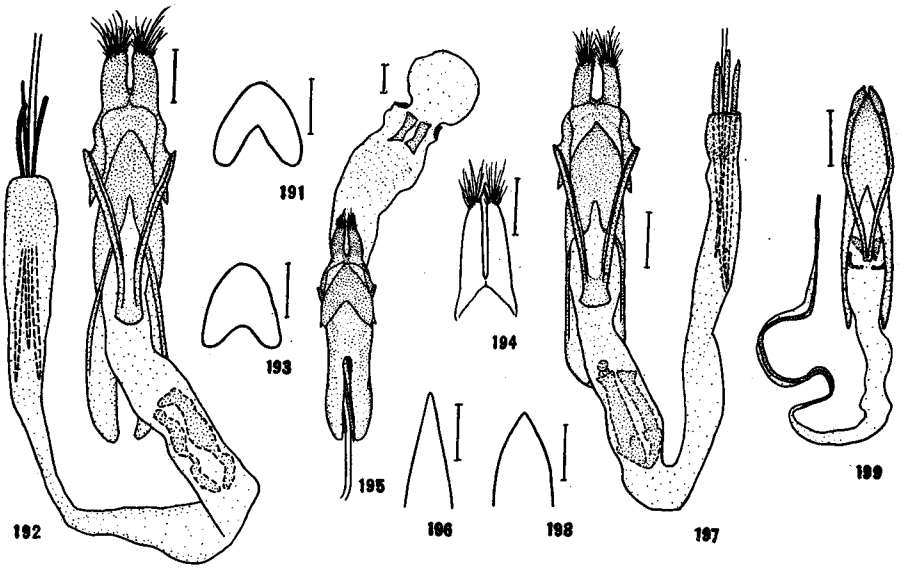


Fig. 191. Basal-piece of *Saperda octomaculata*. Dorsal view. Figs. 192–193. *Eutetrapha ocelota*. Fig. 192. Ventral view. Fig. 193. Dorsal view of basal-piece. Fig. 194. Lateral lobes of *Eutetrapha sedecimpunctata*. Dorsal view. Fig. 195. *Cagosima sanguinolenta*. Dorsal view. Fig. 196. Apical part of median lobe of *Glenea* (*Glenea*) *relicta*. Ventral view. Fig. 197. *Paraglenea fortunei*. Ventral view. Fig. 198. Apical part of median lobe of *Paraglenea chrysochloris*. Ventral view. Fig. 199. *Chreonema fortunei*. Ventral view.

Genus *Paraglenea*

99. *Paraglenea fortunei* (Saunders, 1853)

Specimens examined : 4 ♂♂, Japan (locality not indicated).

About 3 mm long. Median lobe with median struts slightly curved ; the former being as long as the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Roof scarcely differentiated ; lateral lobes short, abundantly possessing setae at the apex ; basal-piece bifurcated distally ; ringed part geniculated at the widest portion, converging, slightly hemmed. The armatures of internal sac are well developed, especially, three rods attractive, naked

basally. Ejaculatory duct single.

100. *Paraglenea chrysochloris* (Bates, 1879)

Specimens examined : 2 ♂♂, Horomi Pass, in the vicinity of Sapporo, Hokkaido.

About 3.5 mm long. The genitalia of this species resemble those of *Paraglenea fortunei*, but differ from the latter in the ventral structure of median lobe.

Remarks of Paraglenea : So far as the author observed, the genitalia of the two species belonging to *Paraglenea* resemble those of *Glenea, Cagosima, Eutetrapha* and *Saperda.*

Tribe Tetraopini

Genus *Chreonema*

101. *Chreonema fortunei japonica* Gahan, 1901

Specimens examined : 3 ♂♂, Fukuoka, Kyushu.

Weakly chitinized ; about 2 mm long. Median lobe with median struts slightly curved ; the former being flat, longer than the latter ; the ventral edge of median orifice is pointed ; median foramen elongated. Tegmen without basal-piece and with roof which is provided dorsally with a tooth on either side, the upper part of tegmen is exceedingly short ; lateral lobes a little shorter than the roof, the apical setae of the lobes are obscure ; ringed part hemmed, converging, without geniculation or constriction. Internal sac armed with a flagellum in the proximal portion.

Discussion

1. *Categorical stability of main characters adopted.* First of all, there has been examined from Table 2 the categorical stability of several important characters of male genitalia in three large subfamilies, in which a number of species were studied as described above. The results of the examination were shown in the Table 3, in which the data were listed by both the exact and rough standard, i.e. the standard without exceptions and with a few exceptions. As seen from the Table, the categorical stability of characters bears not

Table 2.

A comparison of some main characters of male genitalia among the species studied

Explanation of marks.

A. Curvature of median lobe with median struts. + : strongly curved, ± : moderately curved, − : slightly curved, or nearly straight.

B. Comparison of the length between the median lobe and median struts, ++ : median lobe ≫ median struts, + : median lobe > median struts, ± : median lobe ≒ median struts, − : median lobe < median struts, −− : median lobe ≪ median struts.

C. Structure of ventral edge of median orifice. ▲ : strongly projected, ● : weakly projected, △ : pointed, □ : truncated, ○ : rounded.

D. Comparison of the length between the lateral lobes and roof. ++ : lateral

lobes ≫ roof, + : lateral lobes > roof, ± : lateral lobes ≒ roof, − : lateral lobes < roof, − − : lateral lobes ≪ roof.

E. Differentiation of basal-piece. + : basal-piece present, − : basal-piece absent.

F. Structure of ringed part. ▽ : ringed part gradually narrowing from the widest to the distal portion (converging), □ : ringed part subparallel from the widest to the distal portion.

G. Geniculation or constriction of ringed part. + : ringed part weakly constricted between the proximal and the widest portion, + + : ringed part moderately constricted, ○ : ringed part weakly geniculated at the widest portion, ○○ : ringed part moderately or strongly geniculated, − : ringed part without constriction or geniculation.

H. Hem along the ringed part. + : ringed part hemmed nearly along the whole length, ± : ringed part partially hemmed, − : ringed part not hemmed.

I. Diverticulum and specialized armatures of internal sac (the armatures of ejaculatory duct are included). ○ : diverticulum, F : flagellum, R : rods. "1, 2 & 3" in parentheses showing the number of these armatures.

J. Number of ejaculatory ducts.

Species \ Characters	A	B	C	D	E	F	G	H	I	J
Spondylis buprestoides	±	−	△	+	−	□	−	+		1
Megopis (A.) sinica sinica	−	− −	○	+ +	−	▽	−	−		1
Prionus insularis	−	±	▲	−	−	▽	−	−		1
Distenia gracilis	−	+ +	△	+ +	−	▽	−	−	R(2)	1
Rhagium (H.) inquisitor japonicum	+	+ +	△	+ +	−	▽	−	−		1
Stenocorus coeruleipennis	+	+	△	+ +	−	▽	−	±		1
Gaurotes (P.) doris	+	+	△	+ +	−	▽	−	−		1
Pidonia (Pidonia) maculithorax	+	±	△	+ +	−	▽	−	−	○	1
Pidonia (Pseudopidonia) grallatrix	+	+	△	+ +	−	□	−	−	○	1
Pidonia (Pseudopidonia) amentata	+	+	△	+ +	−	□	−	−	○	1
Pidonia (Pseudopidonia) debilis	+	+	△	+ +	−	▽	−	−	○	1
Pidonia (Pseudopidonia) insuturata	+	+	△	+ +	−	□	−	−	○	1
Pidonia (Pseudopidonia) signifera	+	+	△	+ +	−	▽	−	−	○	1
Grammoptera elegantula	+	+	△	+ +	−	□	−	−		1
Alosterna tabacicolor	±	±	△	+ +	−	▽	−	−		1
Judolia (J.) cometes	+	±	△	+ +	−	▽	−	−		1
Leptura (A.) cyanea	+	+	△	+ +	−	▽	−	−		1
Leptura (K.) azumensis	±	+	△	+	−	▽	−	−		1
Leptura (L.) scotodes	±	+	△	+ +	−	▽	−	−		1
Leptura (L.) sequensi	±	+	△	+ +	−	▽	−	−		1
Leptura (L.) succedanea	±	+	△	+ +	−	▽	−	−		1
Leptura (L.) variicornis	±	+	△	+ +	−	▽	−	−		1
Strangalomorpha tenuis	+	+	△	+ +	−	▽	−	−		1

Eustrangalis distenioides	+	+	△	+ +	−	▽	−	−		1
Oedecnema dubia	+	+	△	+ +	−	▽	−	−		1
Strangalia (P.) xanthoma	+	+	△	+	−	▽	−	−		1
Strangalia (S.) arcuata f. *mimica*	+	+	△	+ +	−	▽	−	−	F(1)	1
Strangalia (S.) aethiops	+	+	△	+ +	−	▽	−	−	F(1)	1
Strangalia (S.) latipennis	+	+	△	+ +	−	▽	−	−	F(1)	1
Strangalia (S.) ochraceofasciata	+	+	△	+ +	−	▽	−	−	F(1)	1
Strangalia (S.) vicaria	+	+	△	+ +	−	▽	−	−		1
Strangalia (S.) regalis	+	+	△	+ +	−	▽	−	−		1
Criocephalus (M.) quadricostulatum	±	+	▲	+	−	▽	−	−		1
Mallambyx raddei	−	±	○	+	−	▽	−	−		1
Aromia (A.) moschata var. *orientalis*	−	+	△	±	−	▽	−	−		1
Chloridolum (P.) thaliodes	−	±	△	+	−	▽	−	−		1
Leontium viride	−	+	△	±	−	▽	−	−		1
Rosalia (R.) batesi	−	− −	○	− −	−	▽	−	−		1
Rhopalopus (P.) signaticollis	±	− −	○	+	−	▽	−	−		1
Semanotus rufipennis	−	− −	△	±	−	▽	−	−		1
Callidium (C.) violaceum	±	− −	△	+	−	▽	−	−		1
Phymatodes (Paraphymatodes) albicinctus	−	− −	△	+	−	▽	−	+		1
Phymatodes (Poecilium) maaki	−	− −	△	+	−	▽	−	+		1
Xylotrechus chinensis	−	−	●	−	−	▽	−	+		1
Xylotrechus clarinus	±	−	●	+	−	▽	−	+		1
Xylotrechus cuneipennis	−	−	●	+	−	▽	−	+		1
Xylotrechus pyrrhoderus	−	−	●	−	−	▽	−	+		1
Clytus auripilis	+	±	△	+	−	▽	−	−		1
Clytus melaenus	+	−	△	±	−	▽	−	+		1
Cyrtoclytus caproides	±	±	△	−	−	▽	−	−		1
Brachyclytus singularis	±	−	△	+	−	▽	−	−		1
Plagionotus pulcher	−	−	△	−	−	▽	−	−		1
Chlorophorus japonicus	−	−	△	+	+	▽	−	−		1
Chlorophorus diadema var. *inhirsutus*	−	−	△	+	+	▽	−	−		1
Chlorophorus notabilis	−	− −	△	−	−	▽	−	−		1
Chlorophorus quinquefasciatus	−	+	△	+	+	▽	−	−		1
Chlorophorus annularis	−	+ +	▲	− −	−	▽	−	−		1
Raphuma xenisca	−	−	△	+	−	▽	−	−		1
Demodex transilis	−	−	△	− −	−	▽	−	−		1
Anaglyptus niponensis	+	±	△	+	−	▽	−	−		1
Paraclytus excultus	−	− −	△	−	−	▽	−	−		1
Aglaophis colobotheoides	±	−	△	−	−	▽	−	−		1
Dere thoracica	−	−	▲	−	−	□	−	−		1
Purpuricenus spectabilis	+	−	△	+	−	▽	−	−		1

Species \ Characters	A	B	C	D	E	F	G	H	I	J
Plectrura (Phlyctidola) metallica	−	+	○	+ +	+	▽	−	+		1
Psacothea hilaris	−	+	○	+ +	+	▽	○○	+		2
Monochamus rosenmülleri	±	±	□	+ +	+	▽	○○	+		2
Monochamus grandis	±	±	□	+ +	+	▽	○○	+		2
Monochamus tesserula	±	±	□	+ +	+	▽	○○	+		2
Monochamus saltuarius	±	±	□	+ +	+	▽	○○	±		2
Monochamus beloni	±	±	○	+ +	+	▽	○○	±		2
Dihammus luxuriosus	±	±	□	+ +	+	▽	○○	+	○	2
Dihammus fraudator	−	±	□	+ +	+	▽	○○	+		2
Melanauster chinensis var. *macularius*	−	+	○	+ +	+	▽	○○	+	R(2)	2
Eupromus ruber	±	+	△	+ +	+	▽	○○	+		2
Batocera (B.) lineolata	±	+	○	+ +	+	▽	−	+		2
Apriona germari	±	−	○	+ +	+	▽	○	+		2
Mesosa myops var. *japonica*	±	+	△	+ +	+	▽	+ +	+	○	1
Mesosa hirsuta	−	+	△	+ +	+	▽	+ +	+	○	1
Mesosa longipennis	−	+	△	+ +	+	▽	+ +	+	○	1
Apalimna liturata	−	±	●	+	+	▽	○	+		1
Jezohammus nubilus	±	+	○	+ +	+	▽	+	+		1
Pterolophia jugosa	±	+	△	+ +	−	▽	+ +	+	○	1
Pterolophia rigida	±	+	△	+ +	−	▽	+ +	+	○	1
Asaperda agapanthina	+	±	△	+ +	−	▽	○○	+	F(1)	1
Rhopaloscelis unifasciatus	+	+	△	+ +	−	▽	+	±		1
Terinaea atrofusca	±	−	○	+ +	+	▽	−	−		1
Sydonia divaricata	±	+	△	+	+	▽	+ +	±		1
Pogonocherus (P.) seminiveus	+	±	△	+ +	−	▽	○○	±		1
Acanthocinus (A.) griseus	−	−	●	− −	+	▽	−	−	F(1)	1
Exocentrus guttulatus	−	±	○	+ +	−	▽	○○	+		1
Exocentrus fasciolatus	−	+	○	+	−	▽	○○	−	F(1)	1
Agapanthia daurica	−	+	△	+ +	+	▽	○○	+		1
Saperda octomaculata	−	±	△	+ +	+	▽	○○	+	R(3)	1
Eutetrapha ocelota	±	−	△	+ +	+	▽	○○	±	R(3)	1
Eutetrapha sedecimpunctata	±	±	△	+ +	+	▽	○○	±	R(3)	1
Cagosima sanguinolenta	±	±	△	+	+	▽	○○	+	R(3)	1
Glenea (G.) relicta	±	−	△	+	+	▽	○○	±	R(3)	1
Paraglenea fortunei	−	±	△	+ +	+	▽	○○	±	R(3)	1
Paraglenea chrysochloris	−	±	△	+ +	+	▽	○○	±	R(3)	1
Chreonema fortunei japonica	−	+	△	−	−	▽	−	−	F(1)	1

Table 3. Examination of the categorical stability of some characters adopted in Table 2 in three large subfamilies

The curvature of median lobe with median struts (Character A in Table 2) is excluded, because the character could not be exactly determined in its nature. Character I enlisted in Table 2 is herein divided into two, I_1 and I_2. Scientific name in parentheses shows the exceptional groups. Gothic letter, case with a few exceptions; normal letter, case without exception.

Sub-families / Characters	Lepturinae		Cerambycinae		Lamiinae	
B	**Generic** ch. (*Pidonia*)	Specific ch.	**Specific** ch.	Specific ch.	**Specific** ch.	Specific ch.
C	**Subfamilial**	Subfamilial	**Generic** (*Chlorophorus*)	Specific	**Generic** (*Monochamus*)	Specific
D	**Subfamilial** (*Leptura azumensis, Strangalia xanthoma*)	Specific	**Specific**	Specific	**Specific**	Specific
E	**Subfamilial**	Subfamilial	**Subfamilial** (*Chlorophorus japonicus, C. diadema*)	Specific	**Generic**	Generic
F	**Specific**	Specific	**Subfamilial** (*Dere thoracica*)	Generic	**Subfamilial**	Subfamilial
G	**Subfamilial**	Subfamilial	**Subfamilial**	Subfamilial	**Generic**	Generic
H	**Subfamilial** (*Stenocorus coeruleipennis*)	Generic	**Generic** (*Clytus*)	Specific	**Specific**	Specific
I_1 (Diverticulum of internal sac)	**Generic**	Generic	**Subfamilial**	Subfamilial	**Generic** (*Dihammus*)	Specific
I_2 (Specialized armature of internal sac)	**Specific**	Specific	**Subfamilial**	Subfamilial	**Generic** (*Exocentrus*)	Specific
J	**Subfamilial**	Subfamilial	**Subfamilial**	Subfamilial	**Tribal**	Tribal

the same significance in different subfamilies. Some characters are valued specifically or generically in one subfamily, but constant throughout all members in other subfamily, and vice versa. For example, the structure of the ventral edge of median orifice (C) becomes, without exceptions, a subfamilial character in the Lepturinae; whereas the structure is, with a few exceptions, only a generic character, i.e. only a specific character by the exact

standard in the Cerambycinae and Lamiinae. The character B (comparison of the length between median lobe and median struts) is valued in low categories, genus and species, whereas the character J (number of ejaculatory ducts) is valued only in high categories, subfamily and tribe. The stability of the characters except B and J is highly variable in different subfamilies.

Generally, the male genitalia of the species belonging to a single genus are allied to one another, with a few exceptions which are exceedingly different in structure from the rest species. The male genitalia, however, are divergent interspecifically more or less in the ventral structure of median lobe at least, and often also in the shape of lateral lobes, e.g. *Strangalia*. Few authors who have applicated partly the male genitalia in classification of the Cermabycidae, have adopted always the ventral structure of median lobe alone. For instance, Breuning (1943) who taxonomically revised the genus *Dorcadion* erected some new subgenera in the genus based on the ventral structure of median lobe. The present author is also of the opinion that the ventral structure of median lobe is conveniently valued for the distinction of allied species at application of male genitalia to taxonomy of the family.

As stated above, it sometimes occurs that one or two species alone in one genus, e.g. *Chlorophorus annularis*, remarkably differ from the rest species as regards the structure of male genitalia. On the other hand, some genera are clearly characterized by an attractive character, e.g. *Pidonia, Mesosa, Pterolophia*, etc. by the rod-shaped armatures of internal sac ; these facts seem to furnish one of the basis for the systematic validity of these genera. As to the male genitalia, there was often observable a remarkable similarity in some closely related genera (e.g. in *Monochamus, Dihammus, Psacothea*, etc.), as well as in some allied tribes (e.g. in Saperdini and Gleneini).

2. *Diagnosis of male genitalia of three large subfamilies.* The author wishes to summarize the general characteristics of male genitalia of the three large subfamilies, Lepturinae, Cerambycinae and Lamiinae.

Lepturinae : Slender. Generally, median lobe with median struts strongly curved; the former being longer than the latter. Roof and basal-piece absent. Ringed part not hemmed, without constriction or geniculation. Ejaculatory duct single. Besides, it was observed in many species of the Lepturinae that their median struts are jointed each other at the distal end. This character has not been toutched by the author in description. For, the character was not so convenient, as the jointing comes loose easily by some artificial effect at examination. At any rate, the jointing of median lobe should be added to the characteristics of the Lepturinae.

Cerambycinae : Median lobe with median struts slightly curved ; the former being generally shorter than the latter. The slit between the median struts is sometimes extended. Roof well developed and basal-piece absent in general. Ringed part not hemmed, without constriction or geniculation. Ejaculatory duct single.

Lamiinae : Robust. Median lobe with median struts moderately or slightly curved. In some cases the former is longer than the latter, while in other cases the two are equal in length. Generally, roof absent and basal-piece present. Ringed part hemmed, with geniculation or constriction at the subproximal portion. Ejaculatory ducts usually single but sometimes double.

Zia (1936) who described the male genitalia of a number of species belonging to the Phytophaga attached much importance to the spatial position of median struts in distinction of subfamilies in the Cerambycidae. It seems to be difficult to objectively determine this character in each species. As a general tendency, however, it can be recognized that the

median struts of the species of the Cerambycinae are subhorizontal in position and those of the species of the Lepturinae and Lamiinae are subvertical in position.

3. *Peculiarity of the male genitalia in each subfamily.* The male genitalia of *Spondylis buprestoides* are allied to those of *Criocephalus* (*Megasemum*) *quadricostulatum* belonging to the tribe Asemini in structure, especially in possessing the large fin-like accessory of ringed part. This fact agrees with the opinion of many coleopterologists that the Spondylinae are closely related to the tribe Asemini, a primitive group of the Cerambycinae. Craighead (1923) reported an affinity between *Spondylis* and Asemini, based on his studies on the external structure of larva, and furthermore, Saalas (1936) is of the same opinion with Craighead based on the comprehensive comparative anatomy of the wing veins of the cerambycid beetles.

As two examined species belonging to the Prioninae are considerably different from each other in the structure of male genitalia, the subfamilial characters of the Prioninae are at present admitted with difficulty. Many taxonomists are of the opinion that the Prioninae are more primitive than the other subfamilies of the Cerambycidae, judging from the larval and imaginal structure with the wing veins. Saalas mentioned as follows: "In der Unterfamilie der Prioninae einerseits und denjenigen der Cerambycinae und Lamiinae anderseits bestehen im Flügelgeäder ebenso wie in der Faltungsweise des Flügels sehr grosse Unterschiede." and "Aus diesem Stammbaum, ..., geht hervor, dass sich ganz zuerst die Prioninen von den übrigen Cerambyciden abtrennen." From the present study, it seems to be admittable that the male genitalia of the Prioninae are more primitive than those of the rest members of the family.

The Disteniinae, a phylogenetically problematical subfamily, resemble the Lepturinae, Cerambycinae and Spondylinae as regards the wing veins (after Saalas). So far as the present study is concerned, the male genitalia of *Distenia gracilis* are rather slightly similar to those of the Lepturinae.

The Lepturinae have often been ranked as a tribe belonging to the Cerambycinae, however, so far as the author studied, the male genitalia of the Lepturinae diverge from those of the Cerambycinae in a good number of points as already summarized above. It seems to be suggested from the present data that a line of demarcation is distinctly drawn between the Lepturinae and Cerambycinae.

Most taxonomists are of the common opinion that the Lamiinae are highly divergent from all other members of the Cerambycidae. On this point Craighead made the following statement: The Lamiinae larvae show a greater diversity of structural characters, form, and biological habits than any other subfamily. They are all characterized by the oblong head, the sides of which are parallel or converge posteriorly. This form of the head sets them in sharp contrast to all other cerambycids." In 1951 the author published a histological study on the spermatogenesis of cerambycid beetles, with special regard to their systematic relationships. At that time, he recognized that the Lamiinae are different from both the Lepturinae and Cerambycinae as regards the growth of male germ cells. Saalas stated at the explanation of his genealogical tree of the family as follows: "Die Unterfamilie der Lamiinae hat ihren Ursprung in mittlerer der Unterfamilie Cerambycinae und strahlt von hier fast strauchförmig zu den verschiedenen Untergruppen aus." Inso far as the present study is concerned, the male genitalia of the Lamiinae are more complicated than those of the other subfamilies.

4. *Peculiarity of the male genitalia of the Cerambycidae, compared with allied families.* According to some previous authors, the male genitalia of the Cerambycidae are not so variable among groups as those in the related families, Chrysomelidae and Bruchidae.

On this point, Sharp and Muir mentioned as follows: "Among the forms of this large family that we have examined there is a great uniformity of type." Zia is of the same opinion with them. The present author's data show the uniformity of type in male genitalia of the Cerambycidae. Furthermore, with respect to the constitution of sex-chromosomes, the family also presents a uniformity of type. Namely, the species belonging to the Cerambycidae uniformly possess the sex-chromosomes of XY–XX type, whereas those belonging to the Chrysomelidae carry the sex-chromosomes of XY-XX or XO-XX type (Makino's list, '51; Smith, '53). Synthesizing from these facts, the family Cerambycidae are considered to be a uniform group, at least compared with the Chrysomelidae.

It was pointed out by Sharp and Muir, and Zia that the male genitalia of the Cerambycidae are more primitive in structure than those of the allied families, Chrysomelidae and Bruchidae. Moreover, Smith (1950), who revised the constitution of chromosomes of the Coleoptera, asserted that the Cerambycidae are cytologically primitive in comparison with the other families of the Phytophaga. This Smith's opinion is strikingly accordant with the views of Sharp and Muir, and Zia. So far as the present study is concerned, the male genitalia of a few species of the Cerambycidae, *Rosalia* (*Rosalia*) *batesi*, *Paraclytus excultus* and *Acanthocinus* (*Acanthocinus*) *griseus* possess the slightly developed lateral lobes. The male genitalia of these species are somewhat similar to those of the members of the Chrysomelidae, the genitalia of the Chrysomelidae being generally deficient in lateral lobes. However, it is questionable whether these cerambycids are some of the jointing chain of the phylogenetic relationships between the two families or are simply of the convergent forms towards the Chrysomelidae about the male genitalia alone. But, the author is inclined to suppose that the latter possibility is rather appropriate.

5. *Additional morphological notes.* Finally, the author wishes to make some morphological considerations as to the male genitalia of the family. As already described, a pair of accessory pieces are sometimes differentiated in the upper part of tegmen; when the roof is absent, each of them is connected with the base of each lateral lobe, and when the roof is present, they proceed from the base of roof. In some species the accessory pieces are seemingly the elongation of lateral lobes or roof, and in other species they are scarcely established a distinction from basal-piece in structure. Moreover, in case of weakness of chitinization the accessory pieces are indistinguishable from the second connecting membrane. Therefore, as to the homology of the accessory pieces the following cases seem to be possible at present.

1. The elongation of lateral lobes or roof.
2. Homologous to basal-piece.
3. The special chitinization of the second connecting membrane.
4. Two or all among the above three possibilities.

When weakly chitinized, the basal-piece is often indistinguishable from the second connecting membrane. So that, if the basal-piece is same in origin as the second connecting membrane, the possibilities, 2 and 3 will be same. At any rate, it seems to be impossible without embryological knowledges to confirm which would be true among the above four possibilities on the origin of accessory pieces.

In the present study, the author observed the paired ejaculatory ducts in the species of the genera, *Psacothea*, *Monochamus*, *Dihammus*, *Melanauster*, *Eupromus*, *Batocera* and *Apriona*, belonging to the Lamiinae. The paired ejaculatory ducts of the Lamiinae had been already described in *Gnoma*, *Batocera*, *Lamia*, *Monochamus*, *Melanauster*, *Morimus*, *Aristobia*, etc. by the previous authors (Bordas, 1899; Sharp and Muir; Bugnion, 1931;

Zia). Judging from the knowledge, the species possessing the paired ejaculatory ducts are limited at present in the scope of the tribes, Lamiini, Monochamini, Batocerini and Gnomini.[1] Taxonomists hold the same views that these tribes are closely allied to one another in external characters of body, especially in the presence of a cicatrix at the apex of the scapus of antenna. The taxonomical data agree with the above-mentioned anatomical relationships in these tribes. So far as the author is aware, there are no species possessing the paired ejaculatory ducts in any other families of the order Coleoptera. Bordas (1899) who attached importance to the paired ducts, considered that this fact offers an evidence for the theory that the terminal parts of the canal were primitively of paired origin. On this Bordas' consideration, Sharp and Muir stated as follows : "It is possible, however, that this feature is of secondary origin, brought about by the abbreviation and suppression of the stenazygos and the lengthening of the zygotic portions, thus causing the zygotic portions to open into the eurazygos ; in some *Monochamus* there is a short stenazygos." The author observed also that the double ejaculatory ducts of *Dihammus luxuriosus* are united with each other near the base of internal sac. In any case, however, the anatomical signification of the paired ejaculatory ducts are incontestable. Future post-embryological analysis will explain this problem.

Summary

1. In the present study, the author published a comparative anatomy of the male genitalia of 101 species belonging to the Cerambycidae, covering the six subfamilies ; Spondylinae, Prioninae, Disteniinae, Lepturinae, Cerambycinae and Lamiinae.

2. The categorical stability of some characters of the organs was considered in the three large subfamilies ; Lepturinae, Cerambycinae and Lamiinae.

3. The male genitalia were confirmed to be generally valued as a suitable character for taxonomy of the family. The difference in allied species is observable at least in the shape of median lobe, and often in the structure of lateral lobes.

4. As to the male genitalia, the characteristics of three large subfamilies were enumerated ; the structure of the organs seems to suggest the significance of the Lepturinae as an independent subfamily.

5. The data obtained from the present study generally agree with the former views of the systematic relationships in subfamilies, which were considered by many authors based on the larval and imaginal external characters with wing veins.

6. It is confirmed that the male genitalia of the Cerambycidae are rather uniform, in contrast with those of the allied families, Chrysomelidae and Bruchidae.

7. Some morphological considerations of certain parts of male genitalia have been proposed.

1) The species belonging to the tribes Potemnemini and Agniini are at least quite within the bounds of possibility that they may be probably added by further studies into the group possessing the paired ejaculatory ducts.

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