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Author(s)	Hayashi, Nodoka
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A CONTRIBUTION TO THE KNOWLEDGE OF  
THE LARVAE OF TENEBRIONIDAE OCCURRING  
IN JAPAN<sup>(1)(2)</sup>

(COLEOPTERA : CUCUJOIDEA)

By NODOKA HAYASHI<sup>(3)</sup>

Yokohama, Japan

INTRODUCTION

The family Tenebrionidae is one of the largest groups of Coleoptera, comprising approximately 15000 species in the world. Insofar as their habits are known the members of this family live in soil, stored products, fungi and dead wood.

The species living in soil are found in the farm, meadow, seashore, desert, etc. Most of the larvae feed on dry vegetable matter or dead animal matter, so that several species cause considerable damage to various crops in warm areas of the world. The species living in stored products infest refuse grain, coarse cereal, bran and mill products. *Tenebrio molitor*, *Tenebrio obscurus*, *Tribolium castaneum*, *Tribolium confusum*, etc. are known as important and largely common pests of stored products and the larvae have been described previously by many authors. Most fungus-dwelling species feed on self-fungi of dead wood, while some species live in mould-fungi of damp grains. The wood-feeding species are found under the bark and within moist fallen trees or cut logs.

So far as I am aware, about 200 species of this family have been known to occur in Japan, and yet their larvae have been scarcely studied in detail. On the other hand in Europe Korschevsky (1943) and Emden (1947) give their excellent works on the larvae of European species. These works are extremely useful for the present study. In this paper are given the descriptions of the mature larvae of 58 species belonging to 40 genera of the Tenebrionidae occurring in Japan. In classifying the larvae the structures of the head-capsule, mouth-parts, antennae, thoracic legs and ninth abdominal segment are most useful taxonomic characters. The terminology used in this paper is explained by the diagrams in Plates 1 and 2.

Before going further I wish to express my sincere thanks to Prof. Emeritus T. Uchida and Prof. C. Watanabe, both of the Hokkaido University, for their kind direction in the course of my studies. I am much grateful to Prof. C. Watanabe for his kindness in reading through this manuscript. I am particularly obliged to Prof. H. Sawada and Dr. K. Umeya for their kindness in offering their helpful advice. I am greatly indebted to Mr. M. Miyatake, Dr. T. Nakane and Mr. S. Nomura for their kindness in deter-

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(3) Address: No. 534, Kikuna-machi, Kohoku-ku, Yokohama, Japan.

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### DESCRIPTIONS OF LARVAE OF TENEBRIONIDAE OCCURRING IN JAPAN

In the larvae of this family can be seen two different types: one is represented by false wireworms, *Gonocephalum*, *Tenebrio*, *Alphitobius*, etc., which are flattened ventrally, pigmented dorsally, with anal tubes on the venter of the ninth abdominal segment. The larvae of this type superficially resemble Elaterid-larvae at first sight. The representatives of the other type are found in larvae of *Hemicera*, *Misolampidius*, *Setenis*, etc., which are cylindrical, colorless, without anal tubes. In general, the larvae of this family are closely related to those of the Nilionidae, Lagriidae and Alleculidae. They are not readily distinguished from each other, but differences among them lie in the structure of the mouth-parts, the antennae, the thoracic legs and the ninth abdominal segment, etc.

The larvae of Tenebrionidae are generally characterized by the following features:—

Body elongate. Head-capsule comparatively globular, the median and frontal sutures being visible. Antennae 3-jointed, laterad of and close to mouth-frame; 2nd joint more than 1.5 times as long as wide and shorter than 3 times of the 1st, with a C-shaped or lens-shaped sensorium; 3rd joint extremely small or reduced to a unisetiferous small swelling on apex of the 2nd. Clypeus and labrum distinct. Epipharynx furnished with 2 unisetiferous sensillae and 2 posterior lobes, the latter being unequal in shape. Mandibles asymmetrical, the left one being often strongly produced at extremity of grinding surface. Maxillae with cardo and articulating area present; mala comparatively elongate, parallel-sided or widened basally, not narrowed as in Alleculid-larvae. Labium with submentum and gula usually separated, tending to be confluent. Hypopharyngeal sclerome heavily sclerotized. Prothoracic legs not shorter than the succeeding ones, frequently much stouter; setae of claw constantly unequal in shape and constantly not on the same level; coxal cavities comparatively approaching to each other. Anal tubes frequently well developed.

#### Subfamily **Tenebrioninae**

#### Tribe **Opatrini**

#### Genus ***Gonocephalum*** Solier

##### 1. ***Gonocephalum recticollae*** Motschulsky, 1866

Body (Pl. 3, A) yellowish brown, flattened ventrally; 9th abdominal segment ending in a dull point, with a number of short spiniform setae on lateral sides, without cerci.

Head-capsule (Pl. 5, A & B) about 2.1 mm. in breadth, broadest at middle; lateral sides with numerous setae; antero-lateral angles of epicranium well developed; frontal setae absent; median suture 1/5 length of head-capsule; ocelli present. Antennae (Pl. 11, H) with 1st joint about 1.5 times as long as wide; 2nd subequal to 1st in length, club-shaped, the sensorium being C-shaped; 3rd about 1/5 as long as 2nd. Clypeal

setae not spiniform. Labrum hardly sinuate anteriorly, with median setae dull-spiniform. Epipharynx (Pl. 13, B) with unisetiferous sensillae approaching to each other; posterior lobes extremely small. Mandibles (Pl. 16, C-F) with a membranous dorso-external ridge which is strongly undulated, furnished with 2 slender setae and a spiniform seta. Maxillary mala widened towards base. Gula not strikingly swollen. Hypopharynx (Pl. 21, B) with microtrichoid swelling indistinct; hypopharyngeal sclerome subpentagonal, the apical angle being strongly exerted towards ligula.

Prothoracic legs (Pl. 23, B) much stouter than the succeeding; claw subequal to tibia in length, with setae stout, unequal in shape and not on the same level; tibia and femur with 3 spiniform setae on ventral margin; coxa with 2 spiniform setae on ventral margin. Abdominal segments except the 1st and 9th without setae on dorsum. Ninth abdominal segment (Pl. 26, A & B) with lateral margins almost straight and convergent to apex, and with many short, spiniform setae (more than 15 in number). Anal tubes very small. Body-length about 20 mm.

Larval food: Decaying vegetable matter.

Specimens examined: 4 exs. living in soil. Okazaki, Aichi-ken, 22. V. 1958, H. Ôhira leg.

### 2. *Gonocephalum japonum* Motschulsky, 1860

Head-capsule (Pl. 5, C & D) about 2.1 mm. in breadth, broadest at basal 1/3; antero-lateral angles of epicranium not strongly developed; median suture 1/4 length of head-capsule; ocelli absent. Labrum (Pl. 13, C) conspicuously sinuate anteriorly. Gula strongly swollen ventrally. Ninth abdominal segment (Pl. 26, C & D) slightly rounded laterally, with 10-13 very small, spiniform setae on lateral half which are arranged on posto-lateral margin of the segment. Body-length about 20 mm.

Larval food: Decaying vegetable matter.

Specimens examined: 2 exs. living in soil. Ikebukuro, Tokyo, V. 1958, K. Kurosa leg.

Notes: The larva of this species is distinguished from that of the preceding species, *Gonocephalum recticolle*, by the forms of the head-capsule and the ninth abdominal segment, and by the spiniform setae on the segment.

### Genus *Idisia* Pascoe

### 3. *Idisia ornata* Pascoe, 1866

Body (Pl. 3, B) pale yellow; head and thoracic segments more pigmented; 9th abdominal segment ending in a round hind margin, with a shallow excavation on posterior half of dorsum, and its posterior border with 2 small wart-like cerci.

Head-capsule (Pl. 5, E & F) about 0.64 mm. in breadth, more or less parallel-sided; lateral sides with a number of rather strong setae; frontal setae absent; ocelli present. Antennae (Pl. 11, I) stout; 1st joint almost as long as wide; 2nd about 1.5 times as long as 1st, extremely clavate apically, the sensorium being C-shaped; 3rd about 1/5 as long as 2nd. Inner clypeal setae bluntly spiniform. Labrum with median setae bluntly spiniform. Epipharynx (Pl. 13, D) with subanterior sensillae present; unisetiferous sensillae exceedingly small, arranged longitudinally; posterior lobes small. Mandibles (Pl. 16, G & H) with a membranous dorso-external ridge which is strongly undulated,

furnished with a short spiniform seta and 2 long stout setae on dorsum. Maxillary mala widened basally. Gula entirely well swollen. Hypopharynx (Pl. 21, C) with microtrichoid swelling indistinct; hypopharyngeal sclerome comparatively small, crescent-shaped.

Prothoracic legs (Pl. 23, C) much stouter than the succeeding; claw subequal to tibia in length, with setae slender, not on the same level; tibia with 2 spine-like setae on ventral margin; femur with a single knob-like seta on ventral margin; coxa lacking strong setae. Abdominal segments except the 9th with a few long setae on dorsum. Ninth abdominal segment (Pl. 26, E & F) about as long as wide, weakly attenuated behind, and slightly depressed. Anal tubes present. Body-length about 7.5 mm.

Larval food: Decaying seaweed.

Specimens examined: 1 ex. living on seashore. Tarumizu, Kagoshima-ken, 10. V. 1964, N. Hayashi & H. Takenaka leg.

### Tribe **Phaleriini**

#### Genus ***Micropedinus*** Lewis

#### 4. ***Micropedinus pallidipennis*** Lewis, 1894

Body (Pl. 3, D) lightly yellowish brown, suffused with minute setae; 9th abdominal segment with 2 large, upwardly recurved cerci.

Head-capsule (Pl. 5, K & L) about 0.51 mm. in breadth; dorsal surface scattered with minute setae; frontal setae absent; ocelli present. Antennae (Pl. 11, G) relatively well-developed; 1st joint nearly as long as wide; 2nd 2 to 2.5 times as long as 1st, club-shaped, with a number of setae on surrounding surface, the sensorium being lens-shaped; 3rd about 1/5 as long as 2nd, cone-shaped. Labrum with a few short setae behind median setae. Epipharynx (Pl. 13, A) with unisetiferous sensillae extremely small and laterad of subanterior sensillae; posterior lobes small. Mandibles (Pl. 16, A & B) with dorsal cutting edge strongly retracted; the left mandible with dorsal tooth bilobed. Maxillae with 3rd joint of palpus longest; mala widened basally. Labium (Pl. 21, A) without ligular setae. Hypopharynx (Pl. 21, A) with microtrichoid swelling indistinct; hypopharyngeal sclerome slightly pointed at antero-lateral angles.

Prothoracic legs (Pl. 23, A) subequal in length to the succeeding; segments except claw with numerous short setae, and without spiniform setae; setae of claw not spiniform, located on the same level. Tergites except for pronotum with a ridged anterior margin. Ninth abdominal segment (Pl. 26, K & L) with cerci widely separated from each other, the margin between them being deeply incurved. Anal tubes present. Body-length about 4.5 mm.

Larval food: Decaying marine products.

Specimens examined: 5 exs. living on seashore. Kuwakawa, Niigata-ken, 6. VI. 1964, N. Hayashi & H. Takenaka leg.

#### 5. ***Micropedinus algae*** Lewis, 1894

Head-capsule about 0.59 mm. in breadth. Labium with 2 ligular setae, Body-length about 7.5 mm.

Larval food: Decaying marine products.

Specimens examined: 1 ex. living on seashore. Kuwakawa, Niigata-ken, 6. VI. 1964, N. Hayashi & H. Takenaka leg.

Notes: The larva of this species is distinguished from that of the preceding species, *M. pallidipennis*, in having the ligular setae and by the body-length.

Genus *Phaleromela* Reitter

6. *Phaleromela subhumeralis* (Marseul, 1876)

Body yellowish brown, flattened ventrally; 9th abdominal segment tapering towards round caudal end, without cerci.

Head-capsule (Pl. 5, G & H) about 0.78 mm. in breadth, greatly widened basally; frontal setae absent; ocelli present. Antennae (Pl. 11, J) with 1st joint slightly longer than width; 2nd nearly 1.5 times as long as 1st, extremely thickened apically, the sensorium being C-shaped; 3rd about 1/5 as long as wide. Inner clypeal setae bluntly spiniform. Labrum with 4 bluntly spiniform setae (2 median setae and 2 marginal lateral setae). Epipharynx (Pl. 13, E) with subanterior sensillae present; posterior lobes small. Mandibles (Pl. 16, I & J) with a membranous dorso-external ridge which has 2 stout setae on dorsal surface; right mandible well developed at extremity of grinding surface. Maxillary mala slightly widened basally. Labium (Pl. 21, D) with antero-buccal surface of ligula suffused with rather conspicuous microtrichia. Hypopharynx (Pl. 21, D) with microtrichoid swelling indistinct; hypopharyngeal sclerome transversely rectangular, the anterior margin being ^-shaped.

Prothoracic legs (Pl. 23, D) much stouter than the succeeding; claw 2/3 as long as tibia, with setae unequal in shape and not on the same level; tibia and femur with 2 spiniform setae on ventral margin; coxa with a single spiniform seta on ventral margin. Abdominal segments except the 1st and 9th without setae on dorsum. Ninth abdominal segment (Pl. 26, G & H) slightly depressed, colorless laterally, with 3 or 4 strong setae on each side of dorsum. Anal tubes well developed. Body-length about 7 mm.

Larval food: Vegetable matter.

Specimens examined: 9 exs. living around roots of grass-plots on seashore. Kojôhama, near Noboribetsu, Hokkaido, 25. VI. 1964, N. Hayashi, K. Miyamori & H. Take-naka leg.

Genus *Emypsara* Pascoe

7. *Emypsara riederi* (Faldermann, 1833)

Body (Pl. 3, C) uniformly black, flattened ventrally; 9th abdominal segment tapering towards round caudal end, without cerci.

Head-capsule (Pl. 5, I & J) about 1.1 mm. in breadth, markedly widened basally; frontal setae absent; median suture a little shorter than 1/4 length of head-capsule; ocelli present. Antennae with 1st joint slightly longer than width; 2nd nearly 1.5 times as long as 1st, strikingly thickened apically, the sensorium being C-shaped; 3rd about 1/4 as long as 2nd. Inner clypeal setae spiniform. Labrum with 4 bluntly spiniform setae (2 median setae and 2 marginal lateral setae). Epipharynx (Pl. 13, F) with subanterior sensillae present; posterior lobes very small. Mandibles (Pl. 16, K & L) with a membranous dorso-external ridge which has 2 stout setae; right mandible well developed at extremity of grinding surface. Maxillary mala (Pl. 20, A) slightly widened basally. Labium (Pl. 21, E) with antero-buccal surface of ligula suffused with pronounced microtrichia. Hypopharynx (Pl. 21, E) with microtrichoid swelling indistinct; hypo-

pharyngeal sclerome trapezoidal, attenuated basally.

Prothoracic legs (Pl. 23, E) much stouter than the succeeding; claw about 2/3 as long as tibia, with setae unequal in shape and not on the same level; tibia and femur with 2 spiniform setae on ventral margin. Abdominal segments except the 9th with 2 setae on dorso-lateral side. Ninth abdominal segment (Pl. 26, I & J) flattened dorsally, with 3 pairs of short setae behind tip-end. Body-length about 10 mm.

Larval food: Decaying marine products (especially dead animal matter).

Specimens examined: 10 exs. living under refuses of marine products on seashore. Ôhata-kaigan, Aomori-ken, 30. VI. 1964, N. Hayashi & H. Takenaka leg. 3 exs. Kojô-hama, near Noboribetsu, Hokkaido, 25. VI. 1964, N. Hayashi, K. Miyamori and H. Takenaka leg.

### Tribe **Bolitophagini**

#### Genus ***Bolitophagus*** Illiger

#### 8. ***Bolitophagus reticulatus*** (Linnaeus, 1767)

References: Korschefsky, 1943, Arb. physiol. Ent. Berl., 10 (1): 65, fig. 31; Emden, 1947, Ent. mon. Mag., 83: 157 & 166.

Body whitish, largely membraneous, subcylindrical and gradually tapering towards caudal end; 9th abdominal segment with 2 spine-like caudo-projecting cerci at post-lateral angles.

Head-capsule about 1.7 mm. in breadth. Antennae with 1st and 2nd joints subequal in length, the sensorium of 2nd being cone-shaped, subequal in length to 3rd. Labrum about 1.5 times as wide as long. Mandibles with a conspicuous knob on basal part of dorso-external ridge. Body-length about 10 mm.

Larval food: Tree-fungi (*Polyporus* spp.).

Notes: This species occurs in Japan and Europe; this diagnosis is based upon the description given by Emden (1947).

#### Genus ***Parabolitophagus*** Miyatake

#### 9. ***Parabolitophagus felix*** (Lewis, 1894)

Body (Pl. 3, I) whitish, largely membraneous, subcylindrical and gradually tapering towards caudal end; 9th abdominal segment with 2 spine-like caudo-projecting cerci at post-lateral angles.

Head-capsule (Pl. 8, C & D) about 1.9 mm. in breadth, subglobulose; dorsal surface with a number of minute setae; median suture a little longer than half length of head-capsule; frons slightly pigmented, extremely small, with a narrow basal part; ocelli represented by 3 separated spots. Antennae (Pl. 12, G) with 1st and 2nd joints subequal in length, and 3 times as long as 3rd; 1st nearly as long as wide; 2nd tapering towards apex, the sensorium being cone-shaped, a little shorter than 3rd. Clypeus and labrum exceedingly narrow. Labrum about 1.5 times as wide as long, widened proximally. Epipharynx (Pl. 14, G) with unisetiferous sensillae unequal on level; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 18, A & B) with right one without carinae on grinding surface. Maxillary mala rounded apically, weakly widened basally. Mentum, submentum and gula fusing into an area. Hypopharynx (Pl. 21, T) with microtrichoid

swelling present; hypopharyngeal sclerome forming a subequilateral rectangle, the antero-lateral angles being slightly produced forwards.

Prothoracic legs (Pl. 24, H) with many fine setae, equal to the succeeding ones in length; claw short; tibia about 1.5 times as long as wide. Meso- and metathoracic legs with distance between coxal cavities extremely wide. Body enlarged medianly, without long setae. Abdominal segments with a swelling on inferior portion of spiracle. Ninth abdominal segment (Pl. 29, A & B) with cercus slightly curved upwards and inwards. Anal tubes lacking; anal region (Pl. 29, C) developed in ventral view. Body-length about 12 mm.

Larval food: Tree-fungi (*Cryptoporus volvatus*; *Cryptoderma pini*; *Ganoderma lucidum*).

Specimens examined: 3 exs. Takaosan, Tokyo-toka, 27. V. 1961, H. Nakajima leg.

Notes: The larva of this species closely resembles that of *Bolitophagus reticulatus* (Linnaeus), but may be separated from the latter by lacking a knob on the dorso-external ridge of the mandible.

#### Genus *Bolitoxenus* Motschulsky

##### 10. *Bolitoxenus dentifrons* (Lewis, 1894)

Reference: Nakane & Ôsawa, 1947, Ins. Ecology, 2(4): 5 & 6, pl. 1.

Body (Pl. 3, J) whitish, largely membranous, subcylindrical and gradually tapering towards caudal end; 9th abdominal segment with 2 spine-like caudo-projecting cerci at post-lateral angles.

Head-capsule (Pl. 8, E & F) about 2.5 mm. in breadth, subglobulose; median suture 2/5 length of head-capsule; frons with a wart on center of lateral half, with a narrow basal part; ocelli represented by 5 spots (sometimes obsolete). Antennae (Pl. 12, H) with 1st and 2nd joints subequal in length; 1st 1.5 times as long as wide; 2nd cylindrical, the sensorium being lens-shaped, much smaller than 3rd. Clypeus and labrum exceedingly narrow, the latter being asymmetrically semicircular, nearly 1.5 times as wide as long. Epipharynx (Pl. 14, H) with microtrichia densely arranged longitudinally; unisetiferous sensillae not on the same level; left posterior lobe comb-shaped. Mandibles (Pl. 18, C-E) with a knob-like process at base of dorso-external ridge; the right one without carinae on grinding surface. Maxillary mala (Pl. 20, H) nearly parallel-sided, with a cluster of setae on apical region of buccal surface. Labium (Pl. 21, U & V) with palpi slender, the distance between them being comparatively wide; mentum, submentum and gula fusing into an area. Hypopharynx (Pl. 21, U & V) with microtrichoid swelling well developed; hypopharyngeal sclerome forming a longitudinal rectangle.

Prothoracic legs (Pl. 24, I) with a number of fine setae, subequal to the succeeding ones in length; tibia twice as long as wide. Meso- and metathoracic legs with distance between coxal cavities wide. Tergites except prothorax with a weakly ridged anterior margin. Abdominal segments with a swelling on inferior portion of spiracle. Ninth abdominal segment (Pl. 29, D & E) with cercus hardly curved inwards. Anal tubes absent; anal region developed. Body-length about 17 mm.

Larval food: Tree-fungi (*Fomes* spp.; *Ganoderma* spp).

Specimens examined: 7 exs. Shigakogen, Nagano-ken, 15. VII. 1948, N. Hayashi leg. 7 exs. Okuchichibu, Yamanashi-ken, 2. VII. 1956, H. Yamazaki leg. 2 exs. Tsuta-onsen,



Aomori-ken, 27. VI. 1964, N. Hayashi leg.

11. *Bolitoxenus bellicosus* (Lewis, 1894)

References: Hayashi, 1948, *Ins. Ecology*, 2(6/7): 59 & 60, pl. 5; Fukuda, 1959, *Illustrated insect larvae of Japan*, Tokyo, p. 477 (No. 895).

Head-capsule about 2.0 mm. in breadth; frons hardly ridged longitudinally before warts which are inserted near base of this region (Pl. 8, M). Body-length about 13 mm.

Larval food: Tree-fungi (*Fomes* spp.; *Ganoderma* spp.).

Specimens examined: 1 ex. Kanoya, Kagoshima-ken. 7. I. 1961, H. Nakagawa leg. 3 exs. Tsuta-onsen, Aomori-ken, 24, VII. 1961, N. Hayashi leg. 2 exs. Aoidake, Miyazaki-ken, 4. V. 1964, N. Hayashi leg. 1 ex. Tsuta-onsen, Aomori-ken, 28. VII. 1964, N. Hayashi leg.

Notes: The larva of this species is distinguished from the preceding species, *B. dentifrons*, by position of the warts of the frons, in having a longitudinal ridge before the wart, and by the body-length.

Tribe **Diaperini**

Genus *Diaperis* Geoffroy

12. *Diaperis lewisi* Bates, 1873

Reference: Fukuda, 1959, *Illustrated insect larvae of Japan*, Tokyo, p. 477 (No. 896).

Body (Pl. 3, H) whitish, rather membraneous and subcylindrical; 9th abdominal segment broadly rounded behind, with a transverse band of spine-like granules above apical declivity of dorsum, without cerci.

Head-capsule (Pl. 8, A & B) about 1.8 mm. in breadth, with many soft, colorless setae on dorsum; epistomal region becoming strongly declivous forwardly, the surface being weakly shagreened; anterior margin of epistoma with a forwardly projecting tooth behind antenna which is not sharply pointed (Pl. 8, K); frontal suture connected into a transverse line of epistoma at tip-end; ocelli located near venter of head-capsule. Antennae (Pl. 12, F) with 1st joint transverse; 2nd 3 to 4 times as long as 1st, cylindrical, the sensorium being C-shaped; 3rd 1/2 to 1/3 as long as 1st. Labrum about as wide as long, semicircular, with a single seta between median setae. Epipharynx (Pl. 14, F) with unisetiferous sensillae situated rather basally; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 17, Q-S) with a conspicuous knob-like process at mid-way of dorso-external ridge; the right one without carinae on grinding surface. Maxillary mala (Pl. 20, G) tapering towards acuminate apex. Labium (Pl. 21, S) with bases of palpi set close; ligula absent; ligular setae situated on buccal surface of prementum. Hypopharynx (Pl. 21, S) with microtrichoid swelling well developed; hypopharyngeal sclerome slightly produced at antero-lateral angles.

Prothoracic legs (Pl. 24, G) a little longer than the succeeding (4:3:3); setae of claw located on the same level, one being spiniform and the other slender; tibia bearing 1 or 2 spiniform setae on ventral margin and 2 spiniform setae on posterior surface; distance between coxal cavities relatively wide. Tergites except pronotum with a transverse row of spine-like granules behind anterior margin. Abdominal segments with a swelling on inferior portion of spiracle. Ninth abdominal segment (Pl. 28, N & O) with 2 closely connected large granules at center of granulose area. Anal tubes present.

Body-length about 13 mm.

Larval food: Tree-fungi (*Lentinus lepideus*; *Polyporus* spp.).

Specimens examined: 4 exs. Setagaya, Tokyo, 9. VIII. 1948, N. Hayashi leg.

13. *Diaperis niponensis* Lewis, 1887

Head-capsule about 2.1 mm. in breadth; epistoma rather strongly shagreened, with projection behind antenna rather sharply pointed (Pl. 8, L). Body-length about 16 mm.

Larval food: Tree-fungus (*Fomes pinicola*).

Specimens examined: 4 exs. Takaosan, Tokyo-toka, 18. V. 1952, M. Ohtake leg.

Notes: The larva of this species is distinguished from that of the preceding species, *D. lewisi*, by the epistomal surface, by form of projection alongside clypeus, and by the body-length.

Genus *Scaphidema* Redtenbacher

14. *Scaphidema ornatellum* Lewis, 1894

Body nearly black, flattened ventrally; caudal segments gradually narrowed posteriorly; 9th abdominal segment exceedingly small, with 2 contiguous cerci.

Head-capsule (Pl. 7, A & B) about 0.9 mm. in breadth; dorsal surface without conspicuous setae, with a number of microscopic setae; frontal setae and epistomal setae absent; clypeal condylus strongly projecting forwardly; clypeo-frontal suture roundly incurved; ocelli represented by 3 well-separated spots. Antennae (Pl. 11, Q) with 1st joint almost a half as long as wide; 2nd cylindrical, nearly 3 times as long as 1st, the sensorium being lens-shaped; 3rd cone-shaped, about 1/5 as long as 2nd. Labrum with anterior margin weakly and broadly emarginate; dorsum with many setae. Epipharynx (Pl. 13, M) without posterior lobes. Mandibles (Pl. 17, F & G) with molar part not developed; right mandible strongly pointed in a tooth at extremity of grinding surface. Maxillae (Pl. 20, E) with 1st joint of palpus partially fused with stipes; mala parallel-sided, the inner margin without setae. Labium (Pl. 21, L & M) with bases of palpi set close; ligula absent; ligular setae situated on buccal surface of prementum; gula extremely wide. Hypopharynx (Pl. 21, L & M) with a microtrichoid swelling and a hypopharyngeal sclerome, both of which are located on a strong buccal projection, the former very small and the latter slightly sclerotized and rudimental.

Prothoracic legs (Pl. 23, L) subequal to the succeeding in length; setae of claw unequal in shape and not on the same level; tibia with only a seta on ventral margin. Tergites rather densely clothed with minute setae. Ninth abdominal segment (Pl. 27, M & N) with cercus about as long as the segment, upwardly recurved. Anal tubes present. Spiracular margin of mesothoracic segment (Pl. 24, R) developed outwards. Body-length about 7 mm.

Larval food: Tree-fungi.

Specimens examined: 1 ex. Kirizumi-onsen, Gumma-ken, 26. V. 1962, N. Hayashi leg.

Genus *Martianus* Fairmaire

15. *Martianus dermestoides* (Chevrolat, 1878)

References: Suzuki, 1940, Nippon no Kôchû, 3(2): 95-105 [*Afphitobius diaperinus* (sic)]; Fukuda, 1959, Illustrated insect larvae of Japan, Tokyo, p. 479 (No. 900) (*Diaclina* sp.).

Body yellowish brown, flattened ventrally; caudal segments gradually narrower posteriorly; 9th abdominal segment very small, ending in a sharp point, without cerci.

Head-capsule (Pl. 7, G & H) about 0.86 mm. in breadth; frontal setae absent; ocelli present. Antennae (Pl. 12, C) with 1st joint a little wider than length; 2nd about twice as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd about 1/5 as long as 2nd. Labrum with a few setae behind median setae. Epipharynx (Pl. 14, C) with sub-anterior sensillae present; unisetiferous sensillae situated near base and not on the same level; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 17, L & M) with right one without conspicuous carinae on grinding surface. Maxillae with joints of palpus hardly increasing in length from 1st to 3rd (7:8:9); mala widened basally. Hypopharynx (Pl. 21, P) with microtrichoid swelling present; hypopharyngeal sclerome produced at antero-lateral angles.

Prothoracic legs (Pl. 24, C) subequal to the succeeding in length; setae of claw short, spiniform, lying on the same level; tibia with 3 or 4 spiniform setae on ventral margin. Abdominal segments with many setae in dorso-lateral region. Ninth abdominal segment (Pl. 28, E & F) with 4 short, spiniform setae in posterior region of dorsum, of which the anterior ones are located laterally, and the posterior located at any rate behind terminal spine. Anal tubes present. Body-length about 11 mm.

Larval food: Stored products.

Specimens examined: 20 exs. Yokohama, Kanagawa-ken, V. 1965, N. Hayashi leg.

#### Genus *Platydema* Laporte et Brullé

##### 16. *Platydema nigroaeneum* Motschulsky, 1860

Body umber-brown, flattened ventrally; caudal segments gradually narrower posteriorly; 9th abdominal segment very small, ending in a sharp point, without cerci.

Head-capsule (Pl. 7, I & J) about 1.5 mm. in breadth, relatively strikingly widened basally; dorsal surface well pigmented, finely punctate; median suture a little shorter than 1/3 of head-capsule; frontal setae absent; ocelli present. Antennae (Pl. 12, D) with 1st joint as long as or hardly longer than wide, 2nd about twice as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd nearly 1/3 as long as 2nd. Labrum semi-circular, with a few short setae behind median setae. Epipharynx (Pl. 14, D) with sub-anterior sensillae present; unisetiferous sensillae placed near base, not on the same level; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 17, N) with right one without conspicuous carinae on grinding surface. Maxillary mala (Pl. 20, F) ampricated basally. Hypopharynx (Pl. 21, Q) with microtrichoid swelling present; hypopharyngeal sclerome slightly pointed at antero-lateral angles.

Prothoracic legs (Pl. 24, D) subequal to the succeeding in length; setae of claw short, spiniform, lying on the same level; tibia with 4 to 6 spiniform setae on ventral margin. Abdominal segments except the 9th without setae on dorsum. Ninth abdominal segment (Pl. 28, G & H) with 2 short, spiniform setae on each side of posterior part of dorsum, of which the posterior one is situated along terminal spine, and equal to the anterior in length; dorsal surface without minute hairs. Anal tubes present. Spiracular margin of mesothoracic segment (Pl. 24, P) developed outwards. Body-length about 12 mm.

Larval food: Tree-fungi (*Polyporus* spp.).

Specimens examined: 5 exs. Shigakogen, Nagano-ken, VII. 1949, N. Hayashi leg. 4 exs. Tsuta-onsen, Aomori-ken, 27. VI. 1964, N. Hayashi & H. Takenaka leg.

17. *Platydemia recticorne* Lewis, 1894

Reference: Fukuda, 1959, Illustrated insect larvae of Japan, Tokyo, p. 480 (No. 901).

Body pale brown. Head-capsule about 0.95 mm. in breadth, weakly widened basally; dorsal surface microscopically punctured; median suture a little longer than 1/3 of head-capsule. Prothoracic legs (Pl. 24, E) with 2 spiniform setae on ventral margin of tibia. Ninth abdominal segment (Pl. 28, I) without conspicuous minute hairs dorsally. Body-length about 8 mm.

Larval food: Tree-fungi (*Polyporus* spp.).

Specimens examined: 3 exs. Ôyama, Kanagawa-ken, V. 1950, N. Hayashi leg. 3 exs. Tsuta-onsen, Aomori-ken, 27. VI. 1964, N. Hayashi & H. Takenaka leg.

18. *Platydemia marseuli* Lewis, 1894

Body pale brown. Head-capsule about 0.95 mm. in breadth, weakly widened basally; dorsal surface wanting punctures; median suture a little longer than 1/3 of head-capsule. Prothoracic legs with 3 or 4 spiniform setae on ventral margin of tibia. Ninth abdominal segment (Pl. 28, J) with anterior spiniform setae much longer than posterior ones; dorsal surface with many minute hairs in lateral region. Body-length about 8 mm.

Larval food: Tree-fungi (*Polyporus* spp.).

Specimens examined: 20 exs. Kikuna, Yokohama, Kanagawa-ken, V. 1964, N. Hayashi leg.

19. *Platydemia subfascia* Walker, 1858

Body pale brown. Head-capsule about 0.81 mm. in breadth, weakly widened basally; dorsal surface finely punctured; median suture a little longer than 1/3 of head-capsule. Prothoracic legs with 3 or 4 spiniform setae on ventral margin of tibia. Ninth abdominal segment (Pl. 28, K) rather strongly convergent to apex laterally; spiniform setae extremely small and anterior one widely separated from posterior one; dorsal surface with many minute hairs on lateral part. Body-length about 7 mm.

Larval food: Tree-fungi.

Specimens examined: 20 exs. Kikuna, Yokohama, Kanagawa-ken, 5. VII. 1964, N. Hayashi leg.

Genus *Ischnodactylus* Chevrolat

20. *Ischnodactylus loripes* Lewis, 1894

Body yellowish brown, flattened ventrally; caudal segments gradually narrower posteriorly; 9th abdominal segment very small, terminating in a sharp point, without cerci.

Head-capsule (Pl. 7, K & L) about 1.5 mm. in breadth; dorsal surface without setae; ocelli present. Antennae (Pl. 12, E) with 1st joint nearly 1.5 times as long as wide; 2nd almost 1.5 times as long as 1st, slightly swollen apically, the sensorium being C-shaped; 3rd about 1/5 as long as 2nd, the apical seta being long. Labrum about as long as wide, subtriangular, constricted basally. Epipharynx (Pl. 14, E) with subanterior sensillae present; marginal epipharyngeal setae exceedingly small, sparse; unisetiferous

sensillae inserted proximally, unequal on level; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 17, O & P) with right one without conspicuous carinae on grinding surface. Maxillary mala slightly ampricated basally. Labium (Pl. 21, R) with ligula comparatively well elevated; submentum without setae. Hypopharynx (Pl. 21, R) with microtrichoid swelling present; hypopharyngeal sclerome forming a longitudinal rectangle, the antero-lateral angles being slightly pointed.

Prothoracic legs (Pl. 24, F) subequal to the succeeding in length; setae of claw short, spiniform, located on the same level; tibia with 5 or 6 spiniform setae on ventral margin and only one spiniform seta on posterior surface. Abdominal segments except the 9th without setae on dorsum. Ninth abdominal segment (Pl. 28, L & M) with 3 short, spiniform setae on each side of posterior portion of dorsum, of which the posterior one is situated along terminal spine; dorsal setae (Pl. 28, L: ds) short, rather stout. Anal tubes present. Spiracular margin of mesothoracic segment (Pl. 24, O) hardly developed outwards. Body-length about 12 mm.

Larval food: Tree-fungus (*Cryptoporus volvatus*).

Specimens examined: 2 exs. Takaosan, Tokyo-toka, 18. X. 1961, H. Nakajima leg.

#### Genus *Alphitophagus* Stephens

##### 21. *Alphitophagus bifasciatus* (Say, 1823)

References: Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 67; Emden, 1947, Ent. mon. Mag., 83: 158 & 166, fig. 29.

Body finely umber-brown, flattened ventrally; caudal segments gradually narrowed posteriorly; 9th abdominal segment very small, terminating in a sharp point, without cerci.

Head-capsule (Pl. 7, E & F) about 0.54 mm. in breadth, rather markedly widened basally; frontal setae absent; ocelli present. Antennae (Pl. 12, B) with 1st joint transverse; 2nd 3 times as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd about half as long as 2nd, the apical seta being long. Labrum with a few short setae behind median setae. Epipharynx (Pl. 14, B) with subanterior sensillae present; unisetiferous sensillae unequal on level; posterior lobes longitudinally comb-shaped. Mandibles (Pl. 17, J & K) with right one without conspicuous carinae on grinding surface. Maxillae with apical joint of palpus longest; mala widened basally. Submentum without setae. Gula extremely wide. Hypopharynx (Pl. 21, O) with microtrichoid swelling present; hypopharyngeal sclerome pointed at antero-lateral angles.

Prothoracic legs (Pl. 24, B) subequal to the succeeding in length; setae of claw short, spiniform, placed on the same level; tibia with 2 spiniform setae on ventral margin. Abdominal segments except the 9th without setae on dorsum; posterior half of tergite colorless. Ninth abdominal segment (Pl. 28, C & D) with 3 pairs of strong setae on dorsum, of which the posterior one is located at any rate behind terminal spine, and the anterior located near center of dorsum (Pl. 28, C: ds); minute hairs present; terminal spine long, upwardly directed. Anal tubes present. Body-length about 4.5 mm.

Larval food: Stored products and mould fungi.

Specimens examined: 5 exs. Slough, Bucks., England, X. 1964, D. G. H. Halstead leg.

Notes: This species is an important pest of stored products. On the basis of British material is given the present description.

Genus *Ceropria* Laporte et Brullé

22. *Ceropria induta* (Wiedemann, 1819)

Body (Pl. 3, G) umber-brown, flattened ventrally; caudal segments gradually narrowed posteriorly; 9th abdominal segment extremely small, terminating in a single point, without cerci.

Head-capsule (Pl. 7, C & D) about 1.7 mm. in breadth, remarkably widened basally; dorsal surface lacking setae; frontal setae and epistomal setae absent; ocelli present. Antennae (Pl. 12, A) with 1st joint almost as long as wide; 2nd about 2.5 times as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd about 1/5 as long as 2nd. Labrum with some setae behind median setae. Epipharynx (Pl. 14, A) with subanterior sensillae present; unisetiferous sensillae situated near base, not on the same level; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 17, H & I) with many setae on external surface; the left one without conspicuous carinae on grinding surface. Maxillary mala dilated basally. Gula and its adjacent regions suffused with microscopic bristles. Hypopharynx (Pl. 21, N) with microtrichoid swelling present; hypopharyngeal sclerome slightly pointed at antero-lateral angles.

Prothoracic legs (Pl. 24, A) subequal to the succeeding in length; setae of claw short, spiniform and lying on the same level; tibia slender, 3.5 times as long as wide, with 6 or 7 spiniform setae on ventral margin. Abdominal segments except the 9th without setae on dorsum, with 2 transverse, umber-brown markings on dorsum, of which posterior one (caudal band) is more deeply pigmented. Ninth abdominal segment (Pl. 28, A & B) entirely depressed, lacking strong setae, the tip-end being not sharply pointed. Anal tubes abnormally thickened, strongly projecting. Spiracular margin of mesothorax (Pl. 24, Q) well developed outwards. Body-length about 15 mm.

Larval food: Tree-fungi (*Polyporus* spp.).

Specimens examined: 3 exs. Amami-Ōshima, Kagoshima-ken, 19. V. 1960, N. Hayashi leg. 2 exs. Amami-Ōshima, Kagoshima-ken, 30. V. 1963, H. Yamazaki leg.

Tribe **Phrenapatini**

Genus *Phthora* Mulsant

23. *Phthora canalicollis* Lewis, 1894

Body (Pl. 4, B) nearly white, cylindrical and elongate; 9th abdominal segment obliquely truncated dorsally, with downwardly recurved cerci.

Head-capsule (Pl. 9, A & B) about 0.7 mm. in breadth, about as long as wide; median and frontal sutures indistinct; frontal setae absent; ocelli not visible. Antennae (Pl. 12, K) with 1st joint a little longer than width; 2nd 1.5 times as long as 1st, cylindrical, the sensorium forming a large, elliptical lens-shape which occupies 1/3 of ventral surface of the joint; 3rd about 1/4 as long as 2nd. Clypeus with only one seta on lateral half. Labrum semicircular. Epipharynx (Pl. 14, K) with a cluster of microtrichia behind unisetiferous sensillae; unisetiferous sensillae distinctly separated from each other; left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 17, T & U) comparatively slender, tridentate apically; the right one lacking conspicuous carinae on

grinding surface. Maxillary mala attenuated apically, reaching apex of 2nd joint of palpus. Labium (Pl. 21, Y & Z) with base of palpi contiguous; ligula absent; ligular setae situated on buccal surface of prementum; submentum lacking setae; gula exceedingly narrowed. Hypopharynx (Pl. 21, Y & Z) considerably retracted in anterior region in lateral view, with a very small microtrichoid swelling; hypopharyngeal sclerome transversely rectangular.

Prothoracic legs (Pl. 24, L) subequal to the succeeding in length; claw short, the setae being short, rather spiniform and located on the same level; tibia about 1.5 times as long as wide, with a few strong, short setae. Abdominal segments except the 9th without long setae. Ninth abdominal segment (Pl. 29, J & K) as wide as or hardly wider than length, slightly excavate dorsally, the posterior margin scarcely emarginate medianly; cerci conjointed basally, divergent apically. Anal tubes absent. Body-length about 6.5 mm.

Larval food: Rotten coniferous wood.

Specimens examined: 3 exs. Takaosan, Tokyo-toka, VI. 1948, N. Hayashi leg. 3 exs. Daibosatsu-toge, Yamanashi-ken, 20. V. 1961, N. Hayashi leg.

#### Genus *Tagalus* Gebien

##### 24. *Tagalus* sp.

Body nearly white, cylindrical and elongate; 9th abdominal segment obliquely truncated dorsally, with 2 downwardly recurved cerci.

Head-capsule about 0.46 mm. in breadth; about as long as wide; median and frontal sutures indistinct; frontal setae lacking; ocelli sometimes visible. Antennae (Pl. 12, L) with 1st joint slightly longer than width; 2nd 1.3 times as long as 1st, cylindrical, the sensorium forming a large, elliptical lens-shape which occupies 1/3 of ventral surface of the joint; 3rd nearly 1/4 as long as 2nd. Clypeus with a single clypeal seta on lateral half. Labrum semicircular. Epipharynx (Pl. 14, L) with a cluster of microtrichia behind unisetiferous sensillae; unisetiferous sensillae far separated from each other; left posterior lobe longitudinally comb-shaped, while right posterior lobe absent. Mandibles rather slender, tridentate apically; the right one lacking conspicuous carinae on grinding surface. Maxillary mala (Pl. 20, J) attenuated apically, not reaching apex of 2nd joint of palpus. Labium with bases of palpi approached; ligula absent, having 2 ligular setae on buccal surface of prementum; submentum lacking setae; gula extremely narrowed. Hypopharynx strikingly retracted in anterior region in lateral view, with a very small microtrichoid swelling; hypopharyngeal sclerome transversely rectangular.

Prothoracic legs subequal to the succeeding in length; claw short, the setae being short, rather spiniform and lying on the same level; tibia about 1.5 times as long as wide, with a few strong, short setae. Abdominal segments except the 9th without conspicuous setae. Ninth abdominal segment (Pl. 29, L) much longer than width, the posterior margin being not emarginate; cerci slightly longer than that of the preceding species, *Phthora canalicollis*, the margin between them being incised. Body-length about 6.0 mm.

Larval food: Rotten coniferous wood.

Specimens examined: 20 exs. Takatoriyama, Fukuoka-ken, 10. V. 1962, A. Haga leg.

Tribe **Ulomini**Genus **Gnathocerus** Thunberg25. **Gnathocerus cornutus** (Fabricius, 1798)

References: Korschefsky, 1943, Arb. physiol. Ent. Berl., 10 (1): 67, fig. 27; Emden, 1947, Ent. mon. Mag., 83: 159 & 168, figs. 7 & 27.

Body pale yellowish brown, flattened ventrally; 9th abdominal segment ending in a sharp point.

Head-capsule (Pl. 6, A & B) about 0.81 mm. in breadth; frontal setae absent; ocelli hardly visible or obsolete. Antennae (Pl. 11, M) with 1st joint as long as wide; 2nd about twice as long as 1st, slightly club-shaped, the sensorium being C-shaped; 3rd nearly 1/3 as long as 2nd. Epipharynx (Pl. 13, I) with subanterior sensillae present; left posterior lobe comb-shaped. Mandibles (Pl. 16, Q & R) with dorsal tooth of the left one indistinct; grinding surface of the right one almost even. Maxillae with 2nd and 3rd joints of palpus equal in length, the 1st being shortest; mala widened basally. Hypopharynx (Pl. 21, H) with microtrichoid swelling present; hypopharyngeal sclerome slightly pointed at antero-lateral angles.

Prothoracic legs (Pl. 23, H) scarcely longer than the succeeding ones (6 : 5 : 5); setae of claw extremely small, unequal in shape and not on the same level; tibia with 2 spiniform setae on ventral margin. Abdominal segments except the 9th with a long seta in dorso-lateral region. Ninth abdominal segment (Pl. 27, E & F) strongly recurved upwards, with 2 spiniform setae on lateral side behind terminal spine which are slightly curled. Anal tubes well developed. Body-length about 7.5 mm.

Larval food: Stored products.

Specimens examined: 9 exs, Oxford, England, 3. IX. 1963, J. C. Watt leg.

Notes: This species is a common pest of stored products. On the basis of British material is given the present description.

Genus **Latheticus** Waterhouse26. **Latheticus oryzae** Waterhouse, 1880

Reference: Emden, 1947, Ent. mon. Mag., 83: 159 & 168, figs. 1, 20 & 38.

Body (Pl. 3, F) pale yellow, flattened ventrally, suffused with thin setae; caudal segments gradually narrowed posteriorly; 9th abdominal segment with 2 large, spiniform cerci.

Head-capsule (Pl. 6, K & L) about 0.60 mm. in breadth, bearing numerous setae; frontal setae absent; ocelli present or absent. Antennae (Pl. 11, P) with 1st and 2nd joints variable in length, the former being 2 to 3 times as long as wide; 2nd slightly clavate, the sensorium being lens-shaped. Labium (Pl. 13, L) with many setae on disk. Epipharynx (Pl. 13, N) with unisetiferous sensillae located basally; posterior lobes greatly small. Mandibles (Pl. 17, C-E) longitudinally triangular; external surface depressed; grinding surface even. Maxillae (Pl. 20, D) with 3rd joint of palpus as long as the combined length of 1st and 2nd; mala widely rounded apically. Labium (Pl. 21, K) with ligula much wider than distance between palpi, lacking ligular setae; submentum and gula confused; gula extremely wide, furnished with several setae. Hypopharynx (Pl. 7, U) with microtrichoid swelling present; hypopharyngeal sclerome comparatively small,



rectangular, the antero-lateral angles hardly developed.

Prothoracic legs (Pl. 23, K) subequal to the succeeding in length; claw lacking setae; tibia with 2 spiniform setae on ventral margin. Ninth abdominal segment (Pl. 27, K & L) with cerci straight or upcurved, the distance between cerci being very variable in individuals. Anal tubes absent; anal region developed. Body-length about 5.5 mm.

Larval food: Stored products.

Specimens examined: 9 exs. Oxford, England, IX. 1963, J. C. Watt leg.

Notes: This species is a common pest of stored products. On the basis of British material is given the present description.

#### Genus *Tribolium* MacLeay

##### 27. *Tribolium castaneum* (Herbst, 1797)

References: Korschefsky, 1943, Arb. Physiol. Ent. Berl., 10(1): 65, fig. 16; Emden, 1947, Ent. mon. Mag., 83: 159, 161 & 168, fig. 44; Hayashi, 1959, Illustrated insect larvae of Japan, Tokyo, p. 480 (No. 902).

Body lightly testaceous, flattened ventrally, suffused with inconspicuous setae; caudal segments gradually narrowed posteriorly; 9th abdominal segment with 2 large cerci.

Head-capsule (Pl. 6, I & J) about 0.65 mm. in breadth, more or less parallel-sided; median suture about a half length of head-capsule; base of frons (junction of frontal sutures) narrowly and sharply pointed backwards; frontal setae absent; ocelli present. Antennae (Pl. 11, O) with 1st joint almost as long as wide; 2nd just over twice as long as 1st, scarcely clavate, the sensorium being lens-shaped; 3rd a little shorter than 1st. Labrum straight or scarcely incurved at anterior margin. Epipharynx (Pl. 13, K) with subanterior sensillae present; posterior lobes lacking. Mandibles (Pl. 17, A & B): the right one lacking carinae on grinding surface. Maxillae with 3rd joint of palpus longest, about 1.5 times as long as 2nd; mala widened basally. Hypopharynx (Pl. 21, J) with microtrichoid swelling indistinct; hypopharyngeal sclerome absent.

Prothoracic legs (Pl. 23, J) subequal to the succeeding in length; claw with a single small seta; tibia with 2 strong setae on ventral margin. Meso- and metathoracic legs each with only one strong seta on ventral margin of tibia. Abdominal tergites finely ridged at anterior margin, with a transverse band of microscopic granules separating spiracle area from tergite. Ninth abdominal segment (Pl. 27, I & J) with margin between 2 cerci narrowly and deeply incurved, the cercus very evenly upcurved and gradually tapering. Anal tubes present. Body-length about 6 mm.

Larval food: Stored products.

Specimens examined: 20 exs. Yokohama, Kanagawa-ken, VIII. 1961, N. Hayashi leg.

##### 28. *Tribolium confusum* Jacquelin Duval, 1868

References: Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 65; Emden, 1947, Ent. mon. Mag., 83: 159, 161 & 168, fig. 17.

Head-capsule about 0.65 mm. in breadth; frons broadly rounded behind, almost truncated. Abdominal segments merely with a very short band separating spiracle area from tergite. Cercus as a rule somewhat stouter than that of the preceding species, *T. castaneum*. Body-length about 6 mm.

Larval food: Stored products.

Notes: According to the work of Emden (1947), the larva of this species is distinguished from that of the preceding species, *T. castaneum*, by the frons, by the short line separating the spiracle area from the tergite, and by the cercus.

Genus *Palorus* Mulsant

29. *Palorus subdepressus* Wollaston, 1864

References: Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 65; Emden, 1947, Ent. mon. Mag., 83: 159, 161 & 168. Emden, 1948, Ent. mon. Mag., 84: 10, fig. 47.

Body pale yellowish brown, flattened ventrally and parallel-sided; 9th abdominal segment conical, ending in 2 small cerci.

Head-capsule (Pl. 6, E & F) about 0.50 mm. in breadth, more or less parallel-sided; median suture very short, about 1/5 length of head-capsule; frontal setae absent; ocelli present. Antennae (Pl. 11, N) with 1st joint almost as long as wide; 2nd about twice as long as 1st, slightly clavate, the sensorium being lens-shaped; 3rd subequal to 1st in length, having a long apical seta. Epipharynx (Pl. 13, J) with subanterior sensillae present; unisetiferous sensillae longitudinally arranged basally; posterior lobes small. Mandibles (Pl. 16, S & T) with grinding surface of the right one even. Maxillae (Pl. 20, C) with 3rd joint of palpus longest, nearly 2/3 length of the combined length of 1st and 2nd; mala widened proximally. Gula and epicranium confused. Hypopharynx (Pl. 21, I) with microtrichoid swelling present; hypopharyngeal sclerome slightly pointed at antero-lateral angles.

Prothoracic legs (Pl. 23, I) scarcely larger than the succeeding ones (7:6:6); setae of claw unequal in shape and not on the same level, of which one is extremely small; tibia with only one spiniform seta on ventral margin. Abdominal segments each with several long setae on dorsum. Ninth abdominal segment (Pl. 27, G & H) moderately convergent laterally, rather strongly recurved upwards, without spiniform setae; dorsum lacking a longitudinal colorless line at middle; cercus sharply pointed. Anal tubes present. Body-length about 4.5 mm.

Larval food: Stored products.

Specimens examined: 10 exs. Yokohama, Kanagawa-ken, V. 1964, N. Hayashi leg.

30. *Palorus ratzeburgi* (Wissmann, 1848)

References: Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 65; Emden, 1947, Ent. mon. Mag., 83: 159, 161 & 168, fig. 40; Emden, 1948, Ent. mon. Mag., 84: 10.

Body pale yellow. Head-capsule about 0.45 mm. in breadth; frontal suture widely colorless near tip-end; ocelli absent. Gular sutures distinct only behind submentum. Ninth abdominal segment (Pl. 27, O) nearly twice as wide as long, strongly convergent laterally, with a longitudinal colorless line at middle of dorsum; cercus not sharply pointed. Body-length about 3.5 mm.

Larval food: Stored products.

Specimens examined: 1 ex. Yokohama, Kanagawa-ken, VII. 1963, N. Hayashi leg.

Notes: The larva of this species is distinguished from that of the preceding species, *P. subdepressus*, by the forms of the ninth abdominal segment and the cercus, and in having a colorless line on the ninth abdominal segment.

Genus *Alphitobius* Stephens31. *Alphitobius diaperinus* (Panzer, 1797)

References: St. George, 1926, Proc. ent. Soc. Wash., 28(5): 105, fig. 27 (*Alphitobius* sp.); Suzuki, 1940, Nippon no Kôchû, 3(2): 95-105; Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 67 & 68, fig. 28; Emden, 1947, Ent. mon. Mag., 83: 159, 160 & 168, fig. 25.

Body (Pl. 3, E) umber-brown, flattened ventrally; caudal segments gradually narrowed posteriorly; 9th abdominal segment ending in a sharp point, scattered with many short, spiniform setae on dorsum, without cerci.

Head-capsule (Pl. 6, G & H) about 1.4 mm. in breadth, markedly widened basally; clypeal condylus comparatively well developed; frontal setae absent; ocelli present. Antennae (Pl. 11 L) with 1st joint a little longer than wide; 2nd about 1.5 times as long as 1st, moderately clavate, the sensorium being C-shaped; 3rd nearly 1/3 as long as 1st. Labrum almost 3 times as wide as long, scarcely incurved anteriorly. Epipharynx (Pl. 13, H) with subanterior sensillae present; posterior lobes inconspicuous. Mandibles (Pl. 16, O & P) with 5 or more setae on external surface; the right one sharply pointed at extremity of grinding surface. Maxillary mala broadened proximally. Submentum and gula extremely wide, well pigmented, the suture between them being indistinct. Hypopharynx (Pl. 21, G) with microtrichoid swelling present; hypopharyngeal sclerome transversely trapezoidal.

Prothoracic legs (Pl. 23, G) subequal to the succeeding in length; setae of claw unequal in shape and not on the same level, of which one is exceedingly small; tibia with 4 or more and 2 spiniform setae on ventral margin and posterior surface respectively. Thoracic and abdominal segments each with a large, transverse brown marking on dorsum, with many conspicuous setae in dorso-lateral region; abdominal segments except the 9th with an irregular row of 4 or more conspicuous setae in lateral region of sternite. Ninth abdominal segment (Pl. 27, C & D) with terminal spine upwardly pointed, much longer than subapical spine-like seta along terminal spine. Body-length about 10 mm.

Larval food: Stored products.

Specimens examined: 30 exs. Yokohama, Kanagawa-ken, VIII. 1960, N. Hayashi leg.

32. *Alphitobius laevigatus* (Fabricius, 1781)

References: St. George, 1926, Proc. ent. Soc. Wash., 28(5): 105, fig. 27 (*Alphitobius* sp.); Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 67, fig. 32; Emden, 1947, Ent. mon. Mag., 83: 159, 160 & 168, fig. 25.

Body pale testaceous. Head-capsule about 1.2 mm. in breadth. Abdominal segments except the 9th with only 2 setae in lateral region of sternite. Ninth abdominal segment with terminal spine subequal to subapical spine-like seta in length. Body-length about 8 mm.

Larval food: Stored products.

Notes: According to the work of Emden (1947), the larva of this species is distinguished from that of the preceding species, *A. diaperinus*, by the number of the setae of the abdominal sternite, and by the length of the terminal spine of the ninth abdominal segment.

Genus *Uloma* Latreille33. *Uloma* sp.

Body (Pl. 4, D) yellowish brown, cylindrical, suffused with large punctures; 9th abdominal segment ellipsoidal, circular in cross-section, without cerci.

Head-capsule (Pl. 9, G & H) about 1.4 mm. in breadth, globular, conspicuously punctate dorsally; frons and clypeus tending to be confluent, the suture between them being obscure, strongly incurved; median suture about  $1/5$  length of head-capsule; frontal sutures nearly straight; frontal setae absent; ocelli present. Antennae (Pl. 12, O) with 1st joint nearly 1.5 times as wide as long; 2nd about 2.5 times as long as 1st, cylindrical, the sensorium being C-shaped; 3rd  $1/5$  as long as 2nd. Epipharynx (Pl. 15, A) with unisetiferous sensillae far separated from each other, with a cluster of microtrichia behind unisetiferous sensillae; posterior lobes comparatively small. Mandibles (Pl. 18, L & M) tridentate apically; the right one with 2 carinae on grinding surface. Maxillae (Pl. 20, L) with 3 joints of palpus subequal in length, the basal 2 joints being transverse; mala parallel-sided, with a large incision on apical margin. Labium (Pl. 22, C) with palpus short; ligula well developed. Hypopharynx (Pl. 22, C) without microtrichoid swelling; hypopharyngeal sclerome with a long projection from basal thickening, the apex of projection reaching apex of ligula.

Prothoracic legs (Pl. 25, A) extremely small, subequal to the succeeding ones in length, with many short, spiniform setae; setae of claw unequal in shape, lying on the same level, of which one is very small spiniform. Eighth abdominal segment lacking pleural sutures. Abdomen slightly enlarged backwards. Ninth abdominal segment (Pl. 30, A & B) about as long as wide, with a small papilla at tip-end. Anal usually concealed in 8th abdominal segment; anal tubes absent. Body-length about 18 mm.

Larval food: Decaying wood.

Specimens examined: 3 exs. Amami-Ōshima, Kagoshima-ken, 22. V. 1960, N. Hayashi leg.

Tribe **Tenebrionini**Genus *Setenis* Motschulsky34. *Setenis oshimanus* Miwa, 1935

Body (Pl. 4, J) nearly white, subcylindrical; 9th abdominal segment with 2 short, spine-like cerci, with several tooth-like, unisetiferous granules on dorsum.

Head-capsule (Pl. 11, E & F) about 5.2 mm. in breadth; dorsal surface with many large punctures; frons with 2 frontal setae on lateral half; ocelli absent. Antennae (Pl. 12, Z): relative lengths of joints: I : II : III = 6 : 5 : 1; 1st joint a little longer than twice of width; 2nd slightly clavate, the sensorium being C-shaped. Labrum with anterior margin weakly notched medianly; dorsum with a few short setae behind median setae. Epipharynx (Pl. 15, O) with a V-shaped ridge near posterior lobes; posterior lobes strongly and longitudinally ridged. Mandibles (Pl. 19, Q & R): the left one with 2 dorsal teeth; the right one with 3 carinae on grinding surface. Maxillary mala parallel-sided, with an uncus at inner-distal angle. Labium (Pl. 22, P) with palpi far separated at base, the basal joint being much longer than the apical; ligula with a brush of numerous ligular setae. Hypopharynx (Pl. 22, P) without microtrichoid swelling; hypopharyngeal sclerome

tricuspidate.

Prothoracic legs (Pl. 25, L) much larger than the succeeding (3 : 2 : 2), with a number of unisetiferous granules on venter. Meso- and metathoracic segments each with anterior margin of tergite ridged. Abdominal segments without punctures. Ninth abdominal segment (Pl. 31, L) smooth dorsally, without any granule before median granule (Pl. 31, L: mg); cercus slightly recurved forwards. Anal tubes absent. Body-length about 50 mm.

Larval food: Decaying wood.

Specimens examined: 3 exs. Amami-Ōshima, Kagoshima-ken, 19. V. 1960, N. Hayashi leg.

35. *Setenis valgipes* Marseul, 1876

Head-capsule about 4.6 mm. in breadth; dorsal surface with rather small punctures. Antennae: relative lengths of joints: I : II : III = 5 : 4 : 1. Abdominal segments except the 9th with many obscure punctures in anterior region of each tergite. Ninth abdominal segment (Pl. 31, M & N) conspicuously punctured, with a single granule in dorso-lateral region before median granule (Pl. 31, M: mg) which is located in basal region of the segment. Body-length about 50 mm.

Larval food: Decaying wood.

Specimens examined: 6 exs. Kurosaki, Fukuoka-ken, 8. V. 1962, A. Haga leg.

Notes: The larva of this species is readily distinguished from that of the preceding species, *S. oshimanus*, in having punctuation on the ninth abdominal segment, and in having a granule before median granule.

Genus *Encyalesthus* Motschulsky

36. *Encyalesthus violaceipennis* Marseul, 1876

Body nearly white, strongly depressed; abdomen slightly narrower than thorax, parallel-sided; 9th abdominal segment with 2 short, spine-like cerci, with 2 tooth-like, unisetiferous granules on dorsum.

Head-capsule (Pl. 11, A & B) about 3.5 mm. in breadth; hind margin of dorsum roundly and deeply incised at middle; frons with 2 frontal setae on lateral half; ocelli absent. Antennae (Pl. 12, W) with 1st joint a little longer than 3 times of width; 2nd 2/3 as long as 1st, enlarged apically, the sensorium being lens-shaped; 3rd about 1/6 as long as 2nd. Labrum with anterior margin strongly notched medianly; dorsum with a number of setae. Epipharynx (Pl. 15, L) with a cluster of numerous bristles in anterior region of lateral half; posterior lobes strongly and longitudinally ridged. Mandibles (Pl. 19, K & L) tridentate apically; dorsal and ventral cutting edges remarkably retracted; the right one with about 4 carinae on grinding surface. Maxillae with palpus slender; mala parallel-sided; with a well-developed uncus at inner-distal angle. Labium (Pl. 22, M) with palpi far separated at base, the basal joint being much longer than the apical; ligula with a brush of numerous ligular setae. Hypopharynx (Pl. 22, M) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate.

Prothoracic legs (Pl. 25, I) much larger than the succeeding (4 : 3 : 3), with many unisetiferous granules on ventral surface. Prothoracic segment strikingly sclerotized dorsally, subequal to the combined length of meso- and metathoracic segments. Meso-

and metathoracic segments each with anterior margin of tergite ridged. Ninth abdominal segment (Pl. 31, E-G) with cerci rather approached at base (width between them is 1/4 of the greatest width of the segment), slightly recurved forwards. Anal tubes absent. Body-length about 24 mm.

Larval food: Decaying oaken wood.

Specimens examined: 9 exs, living under bark of dead oak. Setagaya, Tokyo, 19. II. 1948, 10. II. 1950, 13. X, 1951, A. Haga & N. Hayashi leg. 1 ex. Saeki, Ôita-ken, V. 1950, K. Kurosa leg.

#### Genus *Menephilus* Mulsant

##### 37. *Menephilus arciscelis* Marseul, 1876

Body (Pl. 4, G) nearly white, subcylindrical; caudal segments punctate; 9th abdominal segment with 2 large, hook-like cerci which are strongly recurved forwards.

Head-capsule (Pl. 10, E & F) about 2.2 mm. in breadth; dorsal surface with rather large punctures; frons with 2 frontal setae on lateral half; ocelli present. Antennae (Pl. 12, T) with 1st joint about twice as long as wide; 2nd 7/9 as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd 1/7 as long as 2nd. Epipharynx (Pl. 15, I) with a V-shaped ridge near posterior lobes; posterior lobes contiguous with each other, relatively small. Mandibles (Pl. 19, E & F): the left one with 2 dorsal teeth; the right one with 2 carinae on grinding surface. Maxillary mala slightly widened basally, without an uncus at inner-distal angle. Labium (Pl. 22, J) with palpi comparatively well separated at base, the basal joint being hardly longer than the apical; ligula with 3 pairs of ligular setae. Hypopharynx (Pl. 22, J) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate.

Prothoracic legs (Pl. 25, F) much larger than the succeeding ones (4 : 3 : 3); tibia with 2 strong setae on each of ventral margin and posterior surface. Eighth abdominal segment (Pl. 30, J & K) with a strongly sunken caudal band (posttergite), with 2 large elevations before the caudal band. Ninth abdominal segment (Pl. 30, J & K) consisting chiefly of cerci, with a weak hump on each lateral side; cercus much longer than the segment, with 4 spines on base, of which the largest is located on the inner side. Anal tubes absent. Body-length about 20 mm.

Larval food: Decaying wood.

Specimens examined: 4 exs. Amami-Ôshima, Kagoshima-ken, 19. V. 1960, N. Hayashi leg. 2 exs. Satamisaki, Kagoshima-ken, 6. V. 1964, N. Hayashi leg.

#### Genus *Tenebrio* Linnaeus

##### 38. *Tenebrio obscurus* Fabricius, 1792

References: Arendsen Hein, 1923. Ent. Mitt., 12(2): 134-136, 139, figs. 2 & 3; St. George, 1926, Proc. ent. Soc. Wash., 28(5): 102-111, pls. 9 & 10; Cotton & St. George, 1929, U.S. Dept. Agric. Techn. Bull., 95: 33-35; Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 63; Emden, 1947, Ent. mon. Mag., 83: 159, 161 & 168, fig. 15; Peterson, 1951, Larvae of Insects II, Columbus, Ohio, p. 180, fig. K.

Body (Pl. 1, A & B) brown, flattened ventrally and parallel-sided; 9th abdominal segment conical, terminating in 2 small cerci, furnished with 2 short spines on each lateral side.

Head-capsule (Pl. 1, C & D) about 2.5 mm. in breadth; frontal setae absent; ocelli frequently present. Antennae (Pl. 1, E) with 1st joint nearly twice as long as wide; 2nd about 1.5 times as long as 1st, scarcely clavate, the sensorium being C-shaped; 3rd 1/5 to 1/6 as long as 2nd. Epipharynx (Pl. 1, F) with subanterior sensillae present; posterior lobes ridged, slightly comb-shaped. Mandibles (Pl. 2, A & B) with grinding surface of the right one 2- or 3-carinate, while that of the left one strongly excavated. Maxillary mala (Pl. 2, C) attenuated apically. Hypopharynx (Pl. 2, D & E) with microtrichoid swelling present; hypopharyngeal sclerome tricuspidate, the median projection being stronger.

Prothoracic legs (Pl. 2, F) subequal to the succeeding in length (8 : 7 : 7); claw with a small, spiniform seta; tibia with 3-6 (usually 4) spiniform setae on ventral margin; trochanter with a single short, spiniform seta on venter. Tergites umber to blackish brown. Ninth abdominal segment (Pl. 2, G-I) slightly concaved dorsally; cercus upwardly pointed. Anal tubes present. Body-length, about 30 mm.

Larval food: Stored products.

Specimens examined: 30 exs. Yokohama, Kanagawa-ken, VII. 1969, N. Hayashi leg.

#### 39. *Tenebrio molitor* Linnaeus, 1758

References: Arendsen Hein, 1923, Ent. Mitt., 12(2): 122-133, 138; St. George, 1926, Proc. ent. Soc. Wash., 28(5): 102-111, pls. 9 & 10; Cotton & St. George, 1929, U.S. Dept. Agric. Techn. Bull., 95: 25-33; Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 63, figs. 10 & 30; Emden, 1947, Ent. mon. Mag., 83: 159, 162, 168 & 170, fig. 39; Peterson, 1951, Larvae of Insects II, Columbus, Ohio, p. 180, figs. I & J; Marcuzzi & Rampazzo, 1960, Eos, Madrid 36: 104-106, pl. 14.

Head-capsule about 2.5 mm. in breadth. Epipharynx with many bristles behind antero-lateral margin of lateral half. Prothoracic legs with 2 short, spiniform setae on trochanter. Tergites largely ochreous-yellow. Body-length about 30 mm.

Larval food: Stored products.

Notes: According to the account of St. George (1926), the larva of this species is readily distinguished from that of the preceding species, *T. obscurus*, in having many bristles on the epipharynx and 2 spiniform setae on the trochanter.

#### Genus *Neatus* Le Conte

#### 40. *Neatus picipes* (Herbst, 1797)

References: Arendsen Hein, 1923, Ent. Mitt., 12(2): 136-138, fig. 9; St. George, 1926, Proc. ent. Soc. Wash., 28(5): 103 & 106, pls. 9 & 10; Korschefsky, 1943, Arb. physiol. Ent. Berl., 10(1): 63.

Body yellowish brown, flattened ventrally and parallel-sided; 9th abdominal segment terminating in a single point, with numerous short, spiniform setae on dorsum, without cerci.

Head-capsule (Pl. 6, C & D) about 2.5 mm. in breadth; frontal setae absent; ocelli frequently present. Antennae (Pl. 11, K) with 1st joint a little longer than wide; 2nd about 2 times as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd nearly 1/6 as long as 2nd. Labrum with a few setae behind median setae; anterior margin straight or scarcely incurved. Epipharynx (Pl. 13, G) with subanterior sensillae present; posterior lobes comb-shaped. Mandibles (Pl. 16, M & N) with a number of setae on external surface; the left one with 3 carinae on grinding surface. Maxillary mala (Pl.

20, B) widened basally. Hypopharynx (Pl. 21, F) with microtrichoid swelling present; hypopharyngeal sclerome slightly 4-cuspidate.

Prothoracic legs (Pl. 23, F) subequal to the succeeding in length; claw with a single spiniform seta; tibia with about 5 spiniform setae on ventral margin. Ninth abdominal segment (Pl. 27, A & B) not sharply pointed backwardly, without terminal spine. Anal tubes present. Body-length about 30 mm.

Larval food: Stored products.

Specimens examined: 3 exs. Kitatama, Tokyo-toka, 11. VIII. 1964, E. Mitsui leg.

### Tribe **Belopini**

#### Genus ***Cryphaeus*** Klug

#### 41. ***Cryphaeus duellicus*** (Lewis, 1894)

Body (Pl. 4, A) parallel-sided, flattened ventrally, and strongly punctured dorsally; ground color yellow, with brown to black stripes; 9th abdominal segment with 2 knob-shaped cerci which are pointed apically, rather approached to each other.

Head-capsule (Pl. 8, G & H) about 2.5 mm. in breadth, subglobular; dorsal surface strongly punctured; clypeal condylus strikingly produced forwards; median suture a little shorter than half length of head-capsule; frons without a marking; frontal setae absent; ocelli represented by 3 spots. Antennae (Pl. 12, I) with 1st joint slightly shorter than wide; 2nd nearly 1.5 times as long as 1st, weakly tapered apically, the sensorium being indistinct; 3rd exceedingly small. Labium with anterior margin hardly produced; dorsum with many setae. Epipharynx (Pl. 14, I) with numerous bristles in antero-lateral regions; posterior lobes lacking. Mandibles (Pl. 18, F-I) with grinding surface well developed at extremity; the left one with an additional tooth alongside ventral tooth. Maxillary mala slightly widened basally and rounded apically. Ligula (Pl. 21, W) not elevated. Hypopharynx (Pl. 21, W) with microtrichoid swelling inconspicuous; hypopharyngeal sclerome absent.

Prothoracic legs (Pl. 24, J) subequal to the succeeding in length, with a number of thin setae. Abdominal segments with tergite about 3 times as wide as long, the anterior margin being strongly ridged. Ninth abdominal segment (Pl. 29, F & G) with margin of tergite microscopically crenulate; cercus caudo-dorsally projecting, abruptly turned outwards at tip-end, without a spine on innerside. Anal tubes small. Body-length about 14 mm.

Larval food: Tree-fungi and decaying wood.

Specimens examined: 3 exs. Aoyama, Tokyo, V. 1948, T. Nakane leg. 4 exs. Kikuna, Yokohama, Kanagawa-ken, 12. VI. 1964, N. Hayashi leg.

#### Genus ***Toxicum*** Latreille

#### 42. ***Toxicum tricornutum*** Waterhouse, 1874

Body parallel-sided, flattened ventrally, and microscopically haired; ground color orange yellow, with black stripes; 9th abdominal segment with 2 knob-shaped cerci which are pointed apically, broadly separated from each other.

Head-capsule (Pl. 8, I & J) about 2.8 mm. in breadth, subglobular; dorsal surface strongly punctured, finely haired; clypeal condylus strikingly produced forwards; median



suture just a half length of head-capsule; frons with a large black marking at base, without frontal setae; ocelli represented by 4 spots on each side. Antennae (Pl. 12, J) with 1st joint 1.5 times as long as wide; 2nd nearly 1.5 times as long as 1st, cylindrical, the sensorium being indistinct; 3rd extremely small. Labrum with cephalic border almost straight; dorsum with many setae. Epipharynx (Pl. 14, J) with a number of bristles in anterolateral regions; posterior lobes absent. Mandibles (Pl. 18, J & K) with grinding surface well developed at extremity; the left one with a small additional tooth alongside ventral tooth. Maxillary mala (Pl. 20, I) weakly widened basally, rounded apically. Labium (Pl. 21, X) with palpi set close at base; ligula not raised. Hypopharynx (Pl. 21, X) with microtrichoid swelling inconspicuous; hypopharyngeal sclerome forming a subtrapezoid, the antero-lateral angles being round.

Prothoracic legs (Pl. 24, K) nearly equal to the succeeding ones in length, with many fine setae. Prothoracic segment with 7 black maculations, of which 2 ones are  $\Gamma$ -shaped. Abdominal segments each with tergite about 3 times as wide as long, the anterior margin being strongly ridged. Ninth abdominal segment (Pl. 29, H & I) with margin of tergite microscopically crenulate; cercus caudo-dorsally projecting, abruptly turned forwards at tip-end, with a spine on innerside. Anal tubes small. Body-length about 19 mm.

Larval food: Tree-fungi and decaying wood.

Specimens examined: 1 ex, Sengokubara, Hakone, Kanagawa-ken, VI. 1951, H. Ôhira leg. 6 exs. Gotoyama, Fukuoka-ken, 4. VII. 1965, A. Haga leg. 1 ex. Tanzawa, Kanagawa-ken, 22. IX. 1965, N. Hayashi & H. Takenaka leg.

#### Tribe **Cnodalonini**

##### Genus ***Tetraphyllus*** Laporte et Brullé

#### 43. ***Tetraphyllus lunuliger*** (Marseul, 1876)

Body nearly white, subcylindrical; 9th abdominal segment with 2 short, spine-like cerci.

Head-capsule (Pl. 10, G & H) about 1.5 mm. in breadth, about 1.4 times as long as wide, and scarcely widened posteriorly; median and frontal sutures inconspicuous; frons with 2 frontal setae on lateral half; ocelli present or absent. Antennae (Pl. 12, U) with 1st joint 1.5 times as long as wide; 2nd nearly equal to 1st in length, cylindrical, the sensorium being bean-shaped and scarcely swollen; 3rd about 1/5 as long as 2nd. Epipharynx (Pl. 15, J) with unisetiferous sensillae stout; posterior lobes slightly comb-shaped. Mandibles (Pl. 19, G & H) tridentate apically; the left one with 2 dorsal teeth. Maxillary mala (Pl. 20, N) practically ampricated basally, lacking an uncus at inner-distal angle. Labium (Pl. 22, K) with palpi far separated at base, the basal joint being much longer than the apical; ligula with 3 pairs of ligular setae. Hypopharynx (Pl. 22, K) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate, the median projection being strongly produced.

Prothoracic legs (Pl. 25, G) much larger than the succeeding ones (3 : 2 : 2); tibia with 2 spiniform setae respectively on ventral margin and posterior surface. Ninth abdominal segment (Pl. 31, A & B) without granules; cercus slightly recurved forwards. Anal tubes absent. Body-length about 12 mm.

Larval food: Decaying hardwood.

Specimens examined: 3 exs. Aoidake, Miyazaki-ken, 4. V. 1964, N. Hayashi leg.

Genus *Hemicera* Laporte et Brullé44. *Hemicera alternata nodokai* Nakane, 1963

Body (Pl. 4, H) nearly white, subcylindrical; 9th abdominal segment with 2 short, spine-like cerci.

Head-capsule (Pl. 10, I & J) about 2.1 mm. in breadth, transversely subrectangular; posterior margin of dorsum straight or hardly incurved in dorsal view; frons with 2 frontal setae on lateral half; ocelli present. Antennae (Pl. 12, V) with 1st joint 2.5 times as long as wide; 2nd a little shorter than 1st, slightly enlarged apically, the sensorium being C-shaped; 3rd about 1/5 as long as 2nd. Labrum strongly constricted proximally. Epipharynx (Pl. 15, K) with posterior lobes extremely small. Mandibles (Pl. 19, I & J) with grinding surface well developed at extremity. Maxillary mala nearly parallel-sided, without an uncus at inner-distal angle. Labium (Pl. 22, L) with palpi far separated at base, the basal joint a little longer than the apical; ligula with a tuft of many ligular setae; gula and epicranium confused. Hypopharynx (Pl. 22, L) without microtrichoid swelling; hypopharyngeal sclerome cap-shaped.

Prothoracic legs (Pl. 25, H) much larger than the succeeding (2 : 1 : 1); tibia with 1 and 2 strong setae on ventral margin and posterior surface respectively. Eighth abdominal segment tapered posteriorly. Ninth abdominal segment (Pl. 31, C & D) without granules; cercus slightly recurved forwards. Anal tubes absent. Body-length about 22 mm.

Larval food: Decaying hardwood.

Specimens examined: 3 exs. Amami-Ôshima, Kagoshima-ken. 25. V. 1960, N. Hayashi leg.

Genus *Phaedis* Pascoe45. *Phaedis helopioides* (Pascoe, 1866)

Reference: Kurosa, 1959, Illustrated insect larvae of Japan, Tokyo, p. 478 (No. 898).

Body (Pl. 4, F) nearly white, subcylindrical; 9th abdominal segment with 2 large, hook-like cerci which are strongly recurved forwards and set close.

Head-capsule (Pl. 10, A & B) about 1.6 mm. in breadth; median and frontal sutures inconspicuous; frons with a single frontal seta on lateral half; ocelli present. Antennae (Pl. 12, R) with 1st joint about twice as long as wide; 2nd a little shorter than 1st (6 : 7), slightly enlarged apically, the sensorium being lens-shaped; 3rd 1/4 as long as 2nd. Epipharynx (Pl. 15, G) with left posterior lobe longitudinally comb-shaped. Mandibles (Pl. 19, A & B) with grinding surface of the right one tricarinate. Maxillary mala practically widened proximally, lacking an uncus at inner-distal angle. Labium (Pl. 22, H) with palpi comparatively far separated at base, the basal joint of palpus being a little longer than the apical; ligula with 3 pairs of ligular setae. Hypopharynx without microtrichoid swelling; hypopharyngeal sclerome tricuspidate.

Prothoracic legs (Pl. 25, D) larger than the succeeding (9 : 7 : 7); tibia with 2 strong setae respectively on ventral margin and posterior surface. Caudal segments of abdomen punctured dorsally. Eighth abdominal segment (Pl. 30, F & G) constricted posteriorly; dorsum becoming gradually declivous towards hind margin, with 4 weak knob-like elevations. Ninth abdominal segment (Pl. 30, F & G) strikingly depressed, without

granules. Anal tubes absent. Body-length about 13 mm.

Larval food: Decaying wood.

Specimens examined: 3 exs. living within rotten branches. Saeki, Ôita-ken, K. Kurosa leg.

#### Genus *Simalura* Gebien

##### 46. *Simalura coerulea* (Lewis, 1894)

Body nearly white, subcylindrical; 9th abdominal segment with 2 large, hook-like cerci which are moderately recurved forwards and widely separated from each other.

Head-capsule (Pl. 10, C & D) about 2.1 mm. in breadth; lateral side evenly swollen; median and frontal sutures inconspicuous; frons with 3 longitudinal ridges on base, with a frontal seta on lateral half; ocelli present. Antennae (Pl. 12, S) with 1st joint 2.5 times as long as wide; 2nd a little shorter than 1st (15:18), slightly clavate, the sensorium being nearly lens-shaped. Labrum with anterior margin moderately emarginated medianly. Epipharynx (Pl. 15, H) with subanterior sensillae present; left posterior lobe longitudinally comb-shaped basally. Mandibles (Pl. 19, C & D): the right one with several weak carinae on grinding surface. Maxillary mala practically widened basally, lacking an unculus at inner-distal angle. Labium (Pl. 22, I) with palpi far separated at base, the basal joint being a little longer than the apical; ligula with 3 pairs of ligular setae. Hypopharynx (Pl. 22, I) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate, the median projection being stronger.

Prothoracic legs (Pl. 25, E) much larger than the succeeding (9:6:5); tibia with 3 strong setae on posterior surface, of which one is located ventrally. Eighth abdominal segment (Pl. 30, I) becoming gradually and weakly declivous towards hind margin, with a weak elevation on base of dorsum. Ninth abdominal segment (Pl. 30, H & I) moderately depressed, with 3 or more unisetiferous granules on lateral half. Anal tubes absent. Body-length about 15 mm.

Larval food: Decaying wood (*Aucuba japonica*).

Specimens examined: 20 exs. living within rotten stems. Takaosan, Tokyo-toka, 10. XI, 1965, N. Hayashi leg.

#### Tribe *Misolampini*

##### Genus *Misolampidius* Solsky

##### 47. *Misolampidius rugipennis* Lewis, 1894

Body (Pl. 4, I) nearly white, subcylindrical; 9th abdominal segment with 2 spine-like cerci which are conjoined basally.

Head-capsule (Pl. 10, K & L) about 3.1 mm. in breadth; frons with a frontal seta on lateral half; ocelli present. Antennae (Pl. 12, X) with 1st joint a little longer than twice of width; 2nd 2/3 as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd about 1/4 as long as 2nd. Labrum with cephalic margin weakly produced. Epipharynx (Pl. 15, M) with posterior lobes longitudinally ridged. Mandibles (Pl. 19, M & N) tridentate apically; dorsal and ventral cutting edges markedly retracted; grinding surface of the right one obscurely tricarinate. Maxillary mala (Pl. 20, O) nearly parallel-sided, with an unculus at inner-distal angle. Labium (Pl. 22, N) with palpi far separated at base,

the basal joint much longer than the apical; ligula with many ligulal setae. Hypopharynx (Pl. 22, N) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate, the median projection being slightly stronger.

Prothoracic legs (Pl. 25, J) slightly larger than the succeeding (9 : 7 : 6); tibia with 3 strong setae on posterior surface, of which one is located on ventral margin. Ninth abdominal segment (Pl. 31, H & I) without granules; cercus projecting backwardly, slightly recurved upwardly, and greatly thickened basally. Anal tubes absent. Body-length about 24 mm.

Larval food: Decaying wood.

Specimens examined: 1 ex. Daibosatsu-toge, Yamanashi-ken, 20. V. 1961, N. Hayashi leg.

#### Genus *Stenophanes* Solsky

##### 48. *Stenophanes rubripennis* Marseul, 1876

Body nearly white, subcylindrical; 9th abdominal segment with 2 short, spine-like cerci, with several tooth-like, unisetiferous granules on dorsum.

Head-capsule (Pl. 11, C & D) about 3.6 mm. in breadth; dorsal surface finely punctured; lateral side with many setae; median suture comparatively long, about a half length of head-capsule; frons with 2 frontal setae on lateral half; ocelli indistinct. Antennae (Pl. 12, Y) with 1st joint 3 times as long as wide; 2nd 2/3 as long as 1st, slightly clavate, the sensorium being C-shaped; 3rd about 1/8 as long as 1st. Labrum with cephalic margin weakly produced medianly; disk with a number of setae. Epipharynx (Pl. 15, N) with 2 longitudinal clusters of numerous bristles; posterior lobes longitudinally ridged. Mandibles (Pl. 19, O & P) tridentate apically; the left one with 2 dorsal teeth; the right one with 3 carinae on grinding surface. Maxillae with joints of palpus decreasing in length towards apex (5 : 4 : 3); mala nearly parallel-sided, with an uncus at inner-distal angle; stipes bearing numerous setae. Labium (Pl. 22, O) with palpi far separated at base, the basal joint being a little longer than the apical; ligula with a brush of many ligulal setae. Hypopharynx (Pl. 22, O) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate.

Prothoracic legs (Pl. 25, K) larger than the succeeding (7 : 6 : 5); tibia with numerous setae. Ninth abdominal segment (Pl. 31, J & K) with many setae; cercus slightly recurved upwardly. Anal tubes absent. Body-length about 33 mm.

Larval food: Decaying wood.

Specimens examined: 1 ex. Gongenyama, Fukuoka-ken, 2. II. 1960, A. Haga leg. 2 exs. Hobashirayama, Fukuoka-ken, 7. III. 1961, A. Haga leg.

#### Tribe *Amarygmini*

##### Genus *Plesiophthalmus* Motschulsky

##### 49. *Plesiophthalmus nigrocyaneus* Motschulsky, 1857

Reference: Fukuda, 1959, Illustrated insect larvae of Japan, Tokyo, p. 481 (No. 903).

Body (Pl. 4, C) umber-brown, cylindrical; 9th abdominal segment obliquely truncated dorsally, with a spoon-like excavation, without cerci.

Head-capsule (Pl. 9, E & F) about 3.5 mm. in breadth, subglobular; clypeal condylus

comparatively well developed; frontal setae absent; ocelli represented by 2 groups (a large spot and 3 small, contiguous ones) which are far separated from each other. Antennae (Pl. 12, N) with 1st joint a little longer than wide; 2nd 1.5 times as long as 1st and cylindrical, the sensorium being bean-shaped; 3rd about 1/6 as long as 2nd. Epipharynx (Pl. 14, N) with a V-shaped ridge near posterior lobes; posterior lobes longitudinally ridged and slightly comb-shaped. Mandibles (Pl. 18, U & V) tridentate apically; the left one with 2 dorsal teeth; the right one with 2 carinae on grinding surface. Maxillary mala parallel-sided, lacking an uncus at inner-distal angle. Labium (Pl. 22, B) with ligula well developed, bearing 4 to 6 ligular setae on buccal surface; submentum without setae. Hypopharynx (Pl. 22, B) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate, the median projection being stronger.

Prothoracic legs (Pl. 24, N) larger than the succeeding ones (4 : 3 : 3); tibia with 3 (rarely 2 or 4) and 4 or 5 spiniform setae on ventral margin and posterior surface respectively. Thoracic and abdominal segments heavily sclerotized, smooth and shiny. Ninth abdominal segment (Pl. 29, O & P) weakly rugose and sparsely punctured; hind margin scarcely angulated in individuals. Anal tubes present. Body-length about 33 mm.

Larval food: Decaying wood.

Specimens examined: 2 exs. Takaosan, Tokyo-toka, 9. V. 1961, N. Hayashi leg. 4 exs. Yunoyama, Mie-ken, 31. III. 1961, N. Hayashi leg.

#### Genus *Elixota* Pascoe

##### 50. *Elixota curva* Marseul, 1876

Body nearly black, metallic shiny, slightly depressed; 9th abdominal segment widely concaved dorsally, with 2 spine-like angulations on lateral half of hind margin, without cerci.

Head-capsule (Pl. 9, C & D) about 1.7 mm. in breadth, subglobular; dorsal surface strongly punctured, without setae (frontal setae lacking); clypeal condylus strongly produced; ocelli represented by 2 groups (a large spot and 3 small, contiguous ones) which are far separated from each other. Antennae (Pl. 12, M) with 1st as wide as or scarcely wider than long; 2nd about twice as long as 1st, cylindrical, the sensorium being bean-shaped; 3rd nearly 1/7 as long as 2nd. Epipharynx (Pl. 14, M) with sub-anterior sensillae present; posterior lobes short, comb-shaped. Mandibles (Pl. 18, S & T) with grinding surface of the right one bicarinate. Maxillary mala (Pl. 20, K) parallel-sided, rounded apically. Ligula (Pl. 22, A) well developed, with 4 to 6 ligular setae on buccal surface. Hypopharynx (Pl. 22, A) without microtrichoid swelling; hypopharyngeal sclerome tricuspidate, the median projection being much stronger.

Prothoracic legs (Pl. 24, M) subequal to the succeeding ones in length; tibia with 2 setae on each of ventral margin and posterior surface. Thoracic and abdominal tergites with transverse rugosities and small punctures. Ninth abdominal segment (Pl. 29, M & N) extremely wide, conspicuously punctured. Anal tubes stout, strongly projecting. Body-length about 10 mm.

Larval food: Wood (bark of *Zelkova serrata*).

Specimens examined: 5 exs. living under loose bark. Setagaya, Tokyo, 5. V. 1964, N. Hayashi & H. Takenaka leg. 1 ex. Ôyama, Kanagawa-ken, 19. IX. 1965, N. Hayashi & H. Takenaka leg.

Tribe **Strongyliini**Genus *Ainu* Lewis51. *Ainu tenuicornis* Lewis, 1894

Body pale brown, slightly depressed and parallel-sided, with numerous large punctures behind anterior margins of tergites; 9th abdominal segment with 2 large cerci which are stout, widely separated from each other.

Head-capsule (Pl. 9, K & L) about 1.9 mm. in breadth; frontal setae usually absent; ocelli represented by 5 well-contiguous spots. Antennae (Pl. 12, Q) with 1st joint a little longer than wide; 2nd about 1.7 times as long as 1st, rather cylindrical, the sensorium forming an undulate band; 3rd 1/5 as long as 2nd. Epipharynx (Pl. 15, F) with posterior lobes comb-shaped at base. Mandibles (Pl. 18, Q & R) with only one seta on external surface; the left one with 2 dorsal teeth; the right one with 2 carinae on grinding surface. Maxillary mala (Pl. 20, M) parallel-sided; distal margin with a small incision near innerdistal angle. Labium (Pl. 22, G) with palpi far separated from each other, the basal joint slightly longer than the apical; ligula moderately elevated, with 2 pairs of ligular setae. Hypopharynx (Pl. 22, G) without microtrichoid swelling; hypopharyngeal sclerome with a long projection from basal thickening, the apical part being notched.

Prothoracic legs (Pl. 25, C) subequal to the succeeding in length; tibia with many spiniform setae, of which 3 are located on ventral margin. Abdominal segments except the 1st and 9th with 3 pairs of strong setae on tergite. Ninth abdominal segment (Pl. 30, D & E) extremely short, and strongly punctured dorsally, with 3 tooth-like spines (rarely 2) on lateral half of dorsum; cerci widely separated, nearly as long as length of the segment, caudo-dorsally projecting. Anal tubes absent. Body-length about 16 mm.

Larval food: Decaying wood.

Specimens examined: 1 ex. Takaosan, Tokyo-toka, V. 1950, N. Hayashi leg. 4 exs. living within decaying stems and branches of shrub. Ôyama, Kanagawa-ken, 19. IX. 1965, N. Hayashi & H. Takenaka leg.

Genus *Strongylium* Kirby52. *Strongylium japonum* Marseul, 1876

Reference: Kurosa, 1959, Illustrated insect larvae of Japan, Tokyo, p. 481 (No. 904).

Body (Pl. 4, E) nearly white except head, pronotum and apical 2 segments of abdomen, cylindrical; 9th abdominal segment truncate terminally, furnished with a dentate-serrate ridge, 2 uncinated spines and a transverse fossa on lateral half of truncate surface.

Head-capsule (Pl. 9, I & J) about 3.1 mm, in breadth, globular; dorsal surface wrinkled and punctured; frons strongly elevated proximally, with a single frontal seta on lateral half; ocelli represented by 2 dots on each side which are far separated from each other. Antennae (Pl. 12, P) 2-jointed; 1st joint as long as or slightly longer than wide; 2nd about 1.5 times as long as 1st, cylindrical, the sensorium being C-shaped. Labrum with a number of setae on disk. Epipharynx (Pl. 15, C) with several bristles (less than 12 on lateral half in number); median region obviously ridged; posterior lobes slightly ridged. Mandibles (Pl. 18, N-P) tridentate apically; grinding surface of the right one vaguely carinate, well developed at extremity. Maxillary mala parallel-sided, without

an uncus at inner-distal angle. Labium (Pl. 22, D) with palpi widely separated at base; ligula with a brush of numerous ligular setae. Hypopharynx (Pl. 22, D) without microtrichoid swelling; hypopharyngeal sclerome (Pl. 22, D & E) exceedingly large, with a continuation towards apex of ligula which is expanded apically.

Prothoracic legs (Pl. 25, B) much larger than the succeeding ones (5 : 3 : 3), comparatively small, with numerous setae; tibia about 1.5 times as long as wide. Abdominal segments except the 9th without setae. Eighth abdominal tergite punctured and wrinkled, with a medianly pointed lobe on posterior margin. Ninth abdominal segment (Pl. 30, C; Pl. 32, E & F) with 5 teeth on dorsal ridge (Pl. 32, E: DR) which are equal in shape and arranged in the same interval; fossa (Pl. 32, E: FO) located across middle of truncate surface; outer spine (Pl. 32, F: SB) stouter than inner one (Pl. 32, F: SA); median tubercle absent; ventral margin of tergite even. Anal tubes absent. Body-length about 30 mm.

Larval food: Decaying wood (*Litsea japonica*).

Specimens examined: 5 exs. Shiroyama, Kagoshima-ken, 17. V. 1960, N. Hayashi leg. 4 exs. Shakadake, Fukuoka-ken, 9. XII. 1961, A. Haga leg.

53. *Strongylium apterum* Nomura et Yamazaki, 1960

Head-capsule about 1.7 mm. in breadth. Epipharynx (Pl. 15, B) with many minute bristles which are distributed in a circle. Eighth abdominal tergite rather weakly punctured, the posterior margin being almost straight (Pl. 30, L). Ninth abdominal segment (Pl. 32, A & B) with about 7 teeth on dorsal ridge (Pl. 32, A: DR) which are unequal in shape and arranged in different interval; outer spine (Pl. 32, B: SB) much longer than inner one (Pl. 32, B: SA); median tubercle absent; ventral margin of tergite even. Body-length about 19 mm.

Larval food: Decaying wood.

Specimens examined: 4 exs. Kurosaki, Fukuoka-ken, 12. VI. 1951, A. Haga leg.

54. *Strongylium marseuli* Lewis, 1894

Head-capsule about 1.7 mm. in breadth. Eighth abdominal tergite rather strongly punctured, the posterior margin with a medianly notched lobe at middle (Pl. 30, M). Body-length about 19 mm.

Larval food: Decaying wood.

Specimens examined: 5 exs. Satamisaki, Kagoshima-ken, 6. V. 1964, N. Hayashi leg.

Notes: The larva of this species is distinguished from that of the preceding species, *S. apterum*, by the punctuation and by the notched lobe of the 8th abdominal tergite.

55. *Strongylium impigrum* Lewis, 1894

Head-capsule about 1.6 mm. in breadth. Epipharynx with many bristles (about 22 on lateral half in number); posterior lobes extremely small; median region elevated. Eighth abdominal tergite without a lobe on posterior margin. Ninth abdominal segment (Pl. 32, C & D) with about 10 teeth of irregular shape on dorsal ridge (Pl. 32, C: DR); outer spine (Pl. 32, D: SB) very long, much larger than inner one, which is situated on innerside of outer spine; median tubercle (Pl. 32, D: TU) located near ventral margin of tergite, sharply pointed in an elongate spine; ventral margin of tergite serrate. Body-length about 18 mm.

Larval food: Decaying wood.

Specimens examined: 4 exs. living within decaying stems of shrub. Takaosan, Tokyo-toka, 17. V. 1960, N. Hayashi leg. 1 ex. Hikosan, Fukuoka-ken, X. 1961, N. Hayashi leg.

56. *Strongylium brevicorne* Lewis, 1894

Head-capsule about 1.5 mm. in breadth. Epipharynx (Pl. 15, E) with many bristles (about 15 on lateral half in number); posterior lobes exceedingly small; median region not ridged. Hypopharyngeal sclerome (Pl. 22, F) narrow. Eighth abdominal tergite lacking a lobe on posterior margin. Ninth abdominal segment (Pl. 32, K & L) with 5 subequal teeth on dorsal ridge (Pl. 32, K: DR); outer spine (Pl. 32, L: SB) and inner spine (Pl. 32, L: SA) equal in shape, far separated from each other; median tubercle (Pl. 32, K: TU) located between inner spines, not strongly pointed; ventral margin of tergite vaguely serrate. Body-length about 16 mm.

Larval food: Decaying wood.

Specimens examined: 3 exs. Daibosatsu-toge, Yamanashi-ken, 20. V. 1961, N. Hayashi leg. 3 exs. Karuizawa, Nagano-ken, 8-12. VI. 1961, N. Hayashi leg. 1 ex. Kiri-zumi-onsen, Gumma-ken, 28. V. 1962, N. Hayashi leg.

57. *Strongylium oshimanum* Fairmaire, 1897

Head-capsule about 3.5 mm. in breadth; dorsal surface strongly punctured and deeply wrinkled; frontal sutures strikingly developed outwardly. Epipharynx (Pl. 15, D) with many bristles (about 31 on lateral half in number); median region conspicuously ridged, heavily sclerotized. First to 7th abdominal tergites each with a large castaneous marking. Eighth abdominal tergite with a well-developed, medianly notched lobe on posterior margin. Ninth abdominal segment (Pl. 32, G & H) with 5 teeth on dorsal ridge (Pl. 32, G: DR); 4th and 5th teeth (numbered from median notch) much stouter than the rest; 4th tooth projecting beyond level of apex of 1st to 3rd; outer spine (Pl. 32, H: SB) hardly longer than inner one (Pl. 32, H: SA); median tubercle (Pl. 32, G: TU) situated between inner spines, not strongly pointed; ventral margin of tergite serrate. Body-length about 34 mm.

Larval food: Decaying wood.

Specimens examined: 9 exs. Amami-Ôshima, Kagoshima-ken, 19. V. 1960, N. Hayashi leg.

58. *Strongylium niponicum* Lewis, 1894

Head-capsule about 2.8 mm. in breadth; dorsal surface rather strongly punctured and deeply wrinkled; frontal sutures strikingly developed outwardly. Epipharynx with many bristles (about 20 on lateral half in number); median region ridged. First to 7th abdominal tergites each with a castaneous marking on anterior half. Eighth abdominal tergite with medianly notched lobe on posterior margin. Ninth abdominal segment (Pl. 32, I & J) with 5 subequal teeth on dorsal ridge (Pl. 32, I: DR); 4th tooth with a small additional tooth laterally; outer spine (Pl. 32, J: SB) scarcely longer than inner one (Pl. 32, J: SA); median tubercle (Pl. 32, I: TU) located between inner spines, slightly pointed; ventral margin of tergite serrate. Body-length about 30 mm.

Larval food: Decaying wood.

Specimens examined: 3 exs. Daibosatsu-toge, Yamanashi-ken, 20. V. 1961, N.



Hayashi leg. 2 exs. Shakadake, Fukuoka-ken, 22. V. 1961, A. Haga leg. 2 exs. Kirizumi-  
onsen, Gumma-ken, 28. V. 1961, N. Hayashi leg. 1 ex. Mitsuminesan, Yamanashi-ken,  
24. VI. 1951, N. Hayashi leg.

### KEY TO THE SPECIES BASED ON THE LARVAE

In the preceding pages are given the descriptions of the larvae of 58 species  
belonging to 40 genera. Making use of larval characters the key to the species is  
intended as follows:—

- 1 Anal region developed (Anal tubes frequently produced) (Pl. 2, H; Pl. 29, C). . . . . 2.
- Anal region not developed (Anal tubes absent) (Pl. 31, G). . . . . 38.
- 2 Mentum and submentum not fused into an area. Coxae of metathoracic legs moderately sepa-  
rated from each other. . . . . 3.
- Mentum and submentum fused into an area (Pl. 8, D & F). Coxae of metathoracic legs widely  
separated from each other. . . . . 35.
- 3 Setae of claw of prothoracic leg present or absent, if present 1 or 2 in number and not situated  
on the same level. (Pl. 23, B-L). . . . . 4.
- Setae of claw of prothoracic leg situated on the same level, always 2 in number. . . . . 20.
- 4 Prothoracic leg much stouter than the succeeding. Median setae of labrum spiniform. Larva  
living in soil. . . . . 5.
- Prothoracic leg not much stouter than the succeeding. Median setae of labrum not spiniform.  
Larva living in tree-fungi or stored products. . . . . 9.
- 5 Clypeus without spiniform setae (Pl. 5, A & C). Ninth abdominal segment with many spine-  
like setae (more than 4 in number on each side) on lateral sides (Pl. 26, A-D). (*Gonocephalum*)  
. . . . . 6.
- Clypeus with spiniform setae. Ninth abdominal segment with or without a few spine-like setae  
(less than 4 in number on each side) on lateral sides. . . . . 7.
- 6 Epicranium strongly developed laterally at antero-lateral angles (Pl. 5, A). Ninth abdominal  
segment almost straightly convergent laterally; spiniform setae more than 15 in number on  
lateral half (Pl. 26, A & B). . . . . *Gonocephalum recticolle*. (p. 2)
- Epicranium hardly developed laterally at antero-lateral angles (Pl. 5, C). Ninth abdominal  
segment roundly convergent laterally; spiniform setae less than 15 in number on lateral half  
(Pl. 26, C & D). . . . . *Gonocephalum japanum*. (p. 3)
- 7 Ninth abdominal segment slightly concave dorsally, with 2 small wart-like processes on hind  
margin (Pl. 26, E & F). Body nearly white except head and thorax. . . . . *Idisia ornata*. (p. 3)
- Ninth abdominal segment entirely even dorsally, without wart-like processes. Body uniformly  
pigmented. . . . . 8.
- 8 Ninth abdominal segment with 4 long, stout setae on each side of dorsum (Pl. 26, G & H). Body  
umber-brown; about 7 mm. in length. . . . . *Phaleromela subhumeralis*. (p. 5)
- Ninth abdominal segment without long, stout setae (Pl. 26, I & J). Body nearly black; about  
10 mm. in length. . . . . *Emyopsara riederi*. (p. 5)
- 9 Clypeal condylus strongly produced forwards (Pl. 7, A). Larva living in tree-fungi. . . . .  
. . . . . *Scaphidema ornatellum*. (p. 9)
- Clypeal condylus weakly produced forwards. Larva living in stored products. . . . . 10.
- 10 Ninth abdominal segment terminating at a single point (cerci absent). . . . . 11.
- Ninth abdominal segment terminating at 2 points (cerci present). . . . . 14.
- 11 Ninth abdominal segment with only 2 spiniform setae on each side of dorsum (Pl. 27, E & F).  
Body about 6 mm. in length. . . . . *Gnathocerus cornutus*. (p. 15)
- Ninth abdominal segment with a number of spiniform setae on dorsum. Body more than  
6 mm. in length. . . . . 12.
- 12 Ninth abdominal segment not sharply and elongately pointed upwardly at apex (Pl. 27, A & B).

- Body about 30 mm. in length. . . . . *Neatus picipes*. (p. 22)
- Ninth abdominal segment sharply and elongately pointed upwardly at apex. Body 7-11 mm. in length. (*Alphitobius*) . . . . . 13.
- 13 Abdominal segments with 4 or more setae on lateral side of each sternite. Caudal spine of 9th abdominal segment strongly produced (Pl. 27, C & D). Body about 10 mm. in length. . . . . *Alphitobius diaperinus*. (p. 18)
- Abdominal segments with only 2 setae on lateral side of each sternite. Caudal spine of 9th abdominal segment weakly produced. Body about 8 mm. in length. . . . . *Alphitobius laevigatus*. (p. 18)
- 14 Ninth abdominal segment with 2 large cerci. . . . . 15.
- Ninth abdominal segment with 2 small cerci. . . . . 17.
- 15 Claw of prothoracic leg without a seta (Pl. 23, K). Ninth abdominal segment without many thin setae; cerci slender (Pl. 27, K & L). . . . . *Latheticus oryzae*. (p. 15)
- Claw of prothoracic leg with a seta (Pl. 23, J). Ninth abdominal segment without many thin setae; cerci gradually tapered (Pl. 27, I & J) (*Tribolium*). . . . . 16.
- 16 Frons narrowly pointed at base (Pl. 6, I). Abdominal tergites with a long transverse band separating spiracle area. . . . . *Tribolium castaneum*. (p. 16)
- Frons broadly rounded at base. Abdominal tergites with a short transverse band separating spiracle area. . . . . *Tribolium confusum*. (p. 16)
- 17 Ninth abdominal segment without spines (Pl. 27, G & H). Body 3-6 mm. in length. (*Palorus*) . . . . . 18.
- Ninth abdominal segment with 2 small spines on each side (Pl. 2, G & I). Body about 30 mm. in length. (*Tenebrio*) . . . . . 19.
- 18 Ninth abdominal segment moderately convergent laterally, without a median longitudinal colorless line on dorsum (Pl. 27, G). . . . . *Palorus subdepressus*. (p. 17)
- Ninth abdominal segment strongly convergent laterally, with a median longitudinal colorless line on dorsum (Pl. 27, O). . . . . *Palorus ratzeburgi*. (p. 17)
- 19 Epipharynx without many bristles behind each antero-lateral margin (Pl. 1, F). Prothoracic leg with a single spiniform seta on trochanter (Pl. 2, F). . . . . *Tenebrio obscurus*. (p. 21)
- Epipharynx with many bristles behind each antero-lateral margin. Prothoracic leg with 2 spiniform setae on trochanter. . . . . *Tenebrio molitor*. (p. 22)
- 20 Cerci absent. . . . . 21.
- Cerci present. . . . . 32.
- 21 Setae of claw short, spiniform (rarely one seta not spiniform) (Pl. 24, A-G). Ninth abdominal segment not concaved dorsally. Larva living in tree-fungi or stored products. . . . . 22.
- Setae of claw not short, spiniform. Ninth abdominal segment widely concaved dorsally. Larva living in dead wood. . . . . 31.
- 22 Ninth abdominal segment semicircular in dorsal view, with a granulose area on dorsum (Pl. 28, N & O). Epistoma with a well-developed projection alongside clypeal condylus (Pl. 8, A). Body nearly white. (*Diaperis*) . . . . . 23.
- Ninth abdominal segment triangular in dorsal view, without granulose area on dorsum. Epistoma without a projection alongside clypeal condylus. Body usually pigmented. . . . . 24.
- 23 Epistomal surface vaguely shagreened. Projection alongside clypeal condylus dully pointed (Pl. 8, K). Body less than 14 mm. in length. . . . . *Diaperis lewisi*. (p. 8)
- Epistomal surface clearly shagreened. Projection alongside clypeal condylus strongly pointed (Pl. 8, L). Body more than 14 mm. in length. . . . . *Diaperis niponensis*. (p. 9)
- 24 Ninth abdominal segment not sharply pointed upwardly, without strong setae (Pl. 28, A & B). Tibia of prothoracic leg with 6 or 7 spiniform setae on ventral margin (Pl. 24, A). Caudal bands of tergites deeply pigmented (Pl. 3, G). Body about 15 mm. in length. . . . . *Ceropria induta*. (p. 13)
- Ninth abdominal segment sharply pointed upwardly, with a few strong setae. Tibia of prothoracic leg with 2 to 6 spiniform setae on ventral margin. Caudal bands of tergites slightly

- pigmented. Body less than 15 mm. in length. . . . . 25.
- 25 Ninth abdominal segment with a long terminal spine, without short, spiniform setae (Pl. 28, C & D). Body about 4.5 mm. in length. . . . . *Alphitophagus bifasciatus*. (p. 12)
- Ninth abdominal segment with a short terminal spine, with short, spiniform setae. Body more than 4.5 mm. in length. . . . . 26.
- 26 Ninth abdominal segment with 2 spiniform setae on each side, of which one is located at any rate behind terminal spine (Pl. 28, E & F). Larva living in stored foods. . . . .
- . . . . . *Martianus dermestoides*. (p. 9)
- Ninth abdominal segment with 2 or 3 spiniform setae on each side, of which one is located alongside terminal spine. Larva living in tree-fungi. . . . . 27.
- 27 Ninth abdominal segment with 3 spiniform setae on each side; dorsal setae (Pl. 28, L: ds) nearly spiniform. . . . . *Ischnodactylus loripes*. (p. 11)
- Ninth abdominal segment with 2 spiniform setae on each side; dorsal setae (Pl. 28, G: ds) slender. (*Platydema*) . . . . . 28.
- 28 Ninth abdominal segment without conspicuous, minute hairs on dorsal surface. . . . . 29.
- Ninth abdominal segment with conspicuous, minute hairs on dorsal surface. . . . . 30.
- 29 Tibia of prothoracic leg with 4 to 6 spiniform setae on ventral margin (Pl. 24, D). Body umber-brown, about 12 mm. in length. . . . . *Platydema nigroaeneum*. (p. 10)
- Tibia of prothoracic leg with 2 spiniform setae on ventral margin (Pl. 24, E). Body pale brown, about 8 mm. in length. . . . . *Platydema recticorne*. (p. 11)
- 30 Anterior spiniform seta of 9th abdominal segment much longer than posterior one, the distance between them being shorter (Pl. 28, J). Head-capsule without punctures on dorsum. . . . .
- . . . . . *Platydema marseuli*. (p. 11)
- Anterior spiniform seta of 9th abdominal segment short, equal to posterior one in length, the distance between them being longer (Pl. 28, K). Head-capsule with punctures on dorsum. . . . .
- . . . . . *Platydema subfascia*. (p. 11)
- 31 Head-capsule with large punctures on dorsal surface; clypeal condylus strongly produced forwards (Pl. 9, C). Ninth abdominal segment with 2 pairs of spine-like angulations on hind margin (Pl. 29, M & N). Body metallic black, about 10 mm. in length. . . . .
- . . . . . *Elixota curva*. (p. 28)
- Head-capsule with small punctures on dorsal surface; clypeal condylus weakly produced forwards (Pl. 9, E). Ninth abdominal segment without spine-like angulations on hind margin (frequently slightly angulated) (Pl. 29, O & P). Body umber-brown, about 33 mm. in length. . . . .
- . . . . . *Plesiophthalmus nigrocyaneus*. (p. 27)
- 32 Body without blackish stripes. Cerci large, spiniform (Pl. 26, K & L). Body less than 10 mm. in length. Larva living on seashore. (*Micropedinus*) . . . . . 33.
- Body with blackish stripes. Cerci curiously knob-shaped and pointed apically. Body more than 10 mm. in length. Larva living in tree-fungi or dead wood. . . . . 34.
- 33 Labium without ligular setae (Pl. 21, A). Body about 5 mm. in length. . . . .
- . . . . . *Micropedinus pallidipennis*. (p. 4)
- Labium with ligular setae. Body about 8 mm. in length. . . . . *Micropedinus algae*. (p. 4)
- 34 Frons without a black marking (Pl. 8, G). Cerci close to each other, without a spine on innerside (Pl. 29, F). . . . . *Cryphaeus duellicus*. (p. 23)
- Frons with a black marking (Pl. 8, I). Cerci far remote from each other, with a spine on innerside (Pl. 29, H). . . . . *Toxicum tricornutum*. (p. 23)
- 35 Mandible without a knob on dorso-external ridge. . . . . *Parabolitophagus felix*. (p. 6)
- Mandible with a knob on dorso-external ridge (Pl. 18, E). . . . . 36.
- 36 Frons without warts. Sensorium of antenna subequal to 3rd joint in length. . . . .
- . . . . . *Bolitophagus reticulatus*. (p. 6)
- Frons with a pair of warts (Pl. 8, E). Sensorium of antenna much shorter than 3rd joint (Pl. 12, H). (*Bolitoxenus*). . . . . 37.
- 37 Frons not longitudinally ridged before warts which are inserted across middle of frons (Pl. 8,

- E). Body about 17 mm. in length. . . . . *Bolitoxenus dentifrons*. (p. 7)
- Frons hardly longitudinally ridged before warts which are inserted near base of frons (Pl. 8, M). Body about 13 mm. in length. . . . . *Bolitoxenus bellicosus*. (p. 8)
- 38 Ninth abdominal segment circular in cross-section, without cerci (Pl. 30, A & B). . . . . *Uloma* sp. (p. 19)
- Ninth abdominal segment not circular in cross-section, with cerci. . . . . 39.
- 39 Cerci downwardly recurved (Pl. 29, K). Body about 6 mm. in length. . . . . 40.
- Cerci upwardly recurved. Body more than 10 mm. in length. . . . . 41.
- 40 Ninth abdominal segment about as long as wide; space between cerci not incised (Pl. 29, J). . . . . *Phthora canalicollis*. (p. 13)
- Ninth abdominal segment much longer than wide; space between cerci incised (Pl. 29, L). . . . . *Tagalus* sp. (p. 14)
- 41 Antenna 2-jointed (Pl. 12, P). Eighth and 9th abdominal segments heavily sclerotized, the latter being truncated posteriorly, with denticulations and fossae (Pl. 32). (*Strongylium*) . . . . 42.
- Antenna 3-jointed. Eighth and 9th abdominal segments not heavily sclerotized, the latter being not truncated posteriorly, without denticulations and fossae. . . . . 48.
- 42 Bristles of epipharynx exceedingly small, arranged in a circle (Pl. 15, B). . . . . 43.
- Bristles of epipharynx not exceedingly small, scattered irregularly (Pl. 15, C-E). . . . . 44.
- 43 Posterior margin of 8th abdominal tergite almost even (Pl. 30, L). . . . . *Strongylium apterum*. (p. 30)
- Posterior margin of 8th abdominal tergite weakly undulated medianly (Pl. 30, M). . . . . *Strongylium marseuli*. (p. 30)
- 44 Eighth abdominal tergite sharply pointed at middle of posterior margin (Pl. 30, C). Truncate surface of 9th abdominal segment without a tubercle at center; fossae located across middle of the surface (Pl. 32, E). . . . . *Strongylium japonum*. (p. 29)
- Eighth abdominal tergite not pointed at middle of posterior margin. Truncate surface of 9th abdominal segment with a tubercle at center (median tubercle); fossae located near dorsal ridge of the surface. . . . . 45.
- 45 Median tubercle strongly pointed, inserted near posterior margin of truncate surface (Pl. 32, C & D). . . . . *Strongylium impigrum*. (p. 30)
- Median tubercle weakly or moderately pointed, inserted between uncinata spines of truncate surface. . . . . 46.
- 46 Frontal sutures not strongly developed outwards. Body about 16 mm. in length. . . . . *Strongylium brevicorne*. (p. 31)
- Frontal sutures strongly developed outwards near base. Body more than 25 mm. in length. . . . 47.
- 47 Fourth tooth (numbered from median notch) of dorsal ridge of 9th abdominal segment much exceeding beyond apices of 1st to 3rd teeth (Pl. 32, G). Body about 34 mm. in length. . . . . *Strongylium oshimanum*. (p. 31)
- Fourth tooth of dorsal ridge of 9th abdominal segment not exceeding beyond apices of 1st to 3rd teeth (Pl. 32, I). Body about 30 mm. in length. . . . . *Strongylium niponicum*. (p. 31)
- 48 Cercus as long as or longer than 9th abdominal segment. . . . . 49.
- Cercus much shorter than 9th abdominal segment. . . . . 52.
- 49 Eighth abdominal tergite even. Ninth abdominal segment not strongly depressed, with cercus about as long as the segment, not hook-shaped (Pl. 30, D & E). . . . *Ainu tenuicornis*. (p. 29)
- Eighth abdominal tergite abruptly or gradually sunken towards hind margin. Ninth abdominal segment strongly depressed, with cercus much longer than the segment, hook-shaped. . . . 50.
- 50 Eighth abdominal tergite with strongly sunken caudal band (Pl. 30, K). Cercus with a large tubercle on innerside (Pl. 30, J). . . . . *Menephilus arciscelis*. (p. 21)
- Eighth abdominal tergite without strongly sunken caudal band (Pl. 30, G & I). Cercus without a large tubercle. . . . . 51.
- 51 Frons without 3 longitudinal ridges (Pl. 10, A). Cerci close to each other (Pl. 30, F). . . . . *Phaedis helopioides*. (p. 25)

- Frons with 3 longitudinal ridges (Pl. 10, C). Cerci remote from each other (Pl. 30, H). . . . . *Simalura coerulea*. (p. 26)
- 52 Maxillary mala not well developed at inner-distal angle (Uncus absent). . . . . 53.
- Maxillary mala well developed at inner-distal angle (Uncus present). . . . . 54.
- 53 Second joint of antenna as long as 1st joint, cylindrical (Pl. 12, U). Labrum not strikingly constricted basally (Pl. 15, J). Body about 12 mm. in length. . . . . *Tetraphyllus lunuliger*. (p. 24)
- Second joint of antenna a little shorter than 1st joint, slightly clavate apically (Pl. 12, V). Labrum strikingly constricted basally (Pl. 15, K). Body about 22 mm. in length. . . . . *Hemicera alternata nodokai*. (p. 25)
- 54 Prothoracic leg without unisetiferous granules. . . . . 55.
- Prothoracic leg with many unisetiferous granules on venter (Pl. 25, I & L). . . . . 56.
- 55 Ninth abdominal segment without spine-like granules on dorsum, with cerci conjoined basally (Pl. 31, H & I). Left mandible with a single dorsal tooth (Pl. 19, N). Epipharynx without bristles (Pl. 15, M). . . . . *Misolampidius rugipennis*. (p. 26)
- Ninth abdominal segment with spine-like granules on dorsum, with cerci not conjoined basally (Pl. 31, J & K). Left mandible with 2 dorsal teeth (Pl. 19, P). Epipharynx with many bristles (Pl. 15, N). . . . . *Stenophanes rubripennis*. (p. 27)
- 56 Ninth abdominal segment with a pair of spine-like granules on dorsum (Pl. 31, E & F). Left mandible with a single dorsal tooth (Pl. 19, L). Epipharynx with numerous bristles (Pl. 15, L). . . . . *Encyalesthus violaceipennis*. (p. 20)
- Ninth abdominal segment with several spine-like granules on dorsum (Pl. 31, L-N). Left mandible with 2 dorsal teeth (Pl. 19, R). Epipharynx without bristles (Pl. 15, O). (*Setenis*) . . . . . 57.
- 57 Dorsal surface of 9th abdominal segment smooth, without a single granule before median granule (Pl. 31, L: mg). . . . . *Setenis oshimanus*. (p. 19)
- Dorsal surface of 9th abdominal segment conspicuously punctured, with a single granule before median granule (Pl. 31, M: mg). . . . . *Setenis valgipes*. (p. 20)

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### EXPLANATION OF PLATES

**Pl. 1, A-F:** Larvae of *Tenebrio obscurus*. A: Larva (dorsal view) (As: abdominal segments; A1 to A9: 1st to 9th abdominal segments; Ts: thoracic segments; T1: prothoracic segment; T2: mesothoracic segment; T3: metathoracic segment). B: ditto (ventral view) (asp: abdominal spiracle; ca: coxal cavity; msl: mesothoracic leg; msp: mesothoracic spiracle; mtl: metathoracic leg; ptl: prothoracic leg; tr: tergite). C: Head (dorsal view) (ant: antenna; cl: clypeus; f: frons; fu: frontal suture; lb: labrum; mu: median suture; oc: ocelli). D: ditto (ventral view) (cal: caldo; epc: epicranum; g: gula; m: mentum; mxa: maxillary articulating area; pm: prementum; sm: submentum; st: stipes). E: Labrum, clypeus, epistoma and antenna (right half, dorsal view) (clc: clypeal condylus; cs: clypeal setae; ep: epistoma; es: epistomal seta; me: median seta; ms: marginal setae; ss: sensorium; 1, 2, 3: 1st, 2nd and 3rd joints of antenna). F: Epipharynx (as: anterior sensillae; mes: marginal epipharyngeal setae; pl: posterior lobes; ps: posterior sensillae; sas: subanterior sensillae; us: unisetiferous sensillae).

**Pl. 2, A-I:** Larvae of *Tenebrio obscurus*. A: Right mandible (ventral view) (apt: apical tooth; dc: dorsal cutting edge; dt: dorsal tooth; gd: grinding surface; mo: mola; vc: ventral cutting edge; vt: ventral tooth). B: Left mandible (ventral view). C: Left maxilla (apical part, ventral view) (ma: mala; mp: maxillary palpus; 1, 2, 3: 1st, 2nd and 3rd joints of palpus). D: Labium (buccal view) (lg: ligula; lp: labial palpus; ls: ligular setae; hs: hypopharyngeal sclerome; 1, 2: 1st and 2nd joints of palpus). E: ditto (lateral view) (mw: microtrichoid swelling). F: Left prothoracic leg (posterior view) (c: claw; co: coxa; fe: femur; ti: tibia; to: trochanter). G: Ninth abdominal segment (dorsal view). H: ditto (ventral view) (ao: anal orifice; at: anal tubes; cr: cerci; sr: sternite; tr: tergite). I: ditto (lateral view).

**Pl. 3, A-J:** Larvae. A: *Gonocephalum recticollae* (dorsal view). B: *Idisia ornata* (dorsal view). C: *Emypsara riederi* (dorsal view). D: *Micropedinus pallidipennis* (dorsal view). E:

*Alphitobius diaperinus* (dorsal view). F: *Latheticus oryzae* (dorsal view). G: *Ceropria induta* (dorsal view). H: *Diaperis lewisi* (lateral view). I: *Parabolitophagus felix* (lateral view). J: *Bolitoxenus dentifrons* (lateral view).

**Pl. 4, A-J:** Larvae. A: *Cryphaeus duellicus* (dorsal view). B: *Phthora canalicollis* (lateral view). C: *Plesiophthalmus nigrocyaneus* (lateral view). D: *Uloma* sp. (lateral view). E: *Strongylium japonum* (lateral view). F: *Phaedis helopioides* (lateral view). G: *Menephilus arciscelis* (lateral view). H: *Hemicera alternata nodokai* (lateral view). I: *Misolampidius rugipennis* (lateral view). J: *Setenis oshimanus* (lateral view).

**Pl. 5, A-L:** Heads. A: *Gonocephalum recticolle* (dorsal view). B: ditto (ventral view). C: *Gonocephalum japonum* (dorsal view). D: ditto (ventral view). E: *Idisia ornata* (dorsal view). F: ditto (ventral view). G: *Phaleromela subhumeralis* (dorsal view). H: ditto (ventral view). I: *Emypsara riederi* (dorsal view). J: ditto (ventral view). K: *Micropedinus pallidipennis* (dorsal view). L: ditto (ventral view).

**Pl. 6, A-L:** Heads. A: *Gnathocerus cornutus* (dorsal view). B: ditto (ventral view). C: *Neatus picipes* (dorsal view). D: ditto (ventral view). E: *Palorus subdepressus* (dorsal view). F: ditto (ventral view). G: *Alphitobius diaperinus* (dorsal view). H: ditto (ventral view). I: *Tribolium castaneum* (dorsal view). J: ditto (ventral view). K: *Latheticus oryzae* (dorsal view). L: ditto (ventral view).

**Pl. 7, A-L:** Heads. A: *Scaphidema ornatellum* (dorsal view). B: ditto (ventral view). C: *Ceropria induta* (dorsal view). D: ditto (ventral view). E: *Alphitophagus bifasciatus* (dorsal view). F: ditto (ventral view). G: *Martianus dermestoides* (dorsal view). H: ditto (ventral view). I: *Platydemus nigroaeneum* (dorsal view). J: ditto (ventral view). K: *Ischnodactylus loripes* (dorsal view). L: ditto (ventral view).

**Pl. 8, A-J:** Heads. A: *Diaperis lewisi* (dorsal view). B: ditto (ventral view). C: *Parabolitophagus felix* (dorsal view). D: ditto (ventral view). E: *Bolitoxenus dentifrons* (dorsal view). F: ditto (ventral view). G: *Cryphaeus duellicus* (dorsal view). H: ditto (ventral view). I: *Toxicum tricornutum* (dorsal view). J: ditto (ventral view).

K & L: Anterior margins of head-capsules (right half, dorsal view). K: *Diaperis lewisi*. L: *Diaperis niponensis*.

M: Frons of *Bolitoxenus bellicosus*.

**Pl. 9, A-L:** Heads. A: *Phthora canalicollis* (dorsal view). B: ditto (ventral view). C: *Elixota curva* (dorsal view). D: ditto (ventral view). E: *Plesiophthalmus nigrocyaneus* (dorsal view). F: ditto (ventral view). G: *Uloma* sp. (dorsal view). H: ditto (ventral view). I: *Strongylium japonum* (dorsal view) (fs: frontal seta). J: ditto (ventral view). K: *Ainu tenuicornis* (dorsal view). L: ditto (ventral view).

**Pl. 10, A-L:** Heads. A: *Phaedis helopioides* (dorsal view) (fs: frontal seta). B: ditto (ventral view). C: *Simalura coerulea* (dorsal view). D: ditto (ventral view). E: *Menephilus arciscelis* (dorsal view). F: ditto (ventral view). G: *Tetraphyllus lunuliger* (dorsal view). H: ditto (ventral view). I: *Hemicera alternata nodokai* (dorsal view). J: ditto (ventral view). K: *Misolampidius rugipennis* (dorsal view). L: ditto (ventral view).

**Pl. 11, A-F:** Heads. A: *Encyalesthus violaccipennis* (dorsal view). B: ditto (ventral view). C: *Stenophanes rubripennis* (dorsal view). D: ditto (ventral view). E: *Setenis oshimanus* (dorsal view). F: ditto (ventral view).

G-Q: Antennae. G: *Micropedinus pallidipennis* (right, dorsal view). H: *Gonocephalum recticolle* (right, dorsal view). I: *Idisia ornata* (left, dorsal view). J: *Phaleromela subhumeralis* (right, dorsal view). K: *Neatus picipes* (left, dorsal view). L: *Alphitobius diaperinus* (right, dorsal view). M: *Gnathocerus cornutus* (left, dorsal view). N: *Palorus subdepressus* (right, ventral view). O: *Tribolium castaneum* (right, ventral view). P: *Latheticus oryzae* (left, ventral view). Q: *Scaphidema ornatellum* (right, ventral view).

**Pl. 12, A-Z:** Antennae. A: *Ceropria induta* (right, dorsal view). B: *Alphitophagus bifasciatus* (left, ventral view). C: *Martianus dermestoides* (right, dorsal view). D: *Platydema nigroaeneum* (left, dorsal view). E: *Ischnodactylus loripes* (right, dorsal view). F: *Diaperis lewisi* (left, dorsal view). G: *Parabolitophagus felix* (right, dorsal view). H: *Bolitozenus dentifrons* (right, ventral view). I: *Cryphaeus duellicus* (right, ventral view). J: *Toxicum tricornutum* (left, dorsal view). K: *Phthora canalicollis* (right, outside view). L: *Tagalus* sp. (right, innerside view). M: *Elizota curva* (left, innerside view). N: *Plesiophthalmus nigrocyaneus* (right, outside view). O: *Uloma* sp. (left, dorsal view). P: *Strongylium japanum* (right, dorsal view). Q: *Ainu tenuicornis* (left, ventral view). R: *Phaedis helopioides* (right, ventral view). S: *Simalura coerulea* (left, ventral view). T: *Menephus arciscelis* (left, ventral view). U: *Tetraphyllus lunuliger* (left, dorsal view). V: *Hemicera alternata nodokai* (left, dorsal view). W: *Encyalesthus violaceipennis* (right, ventral view). X: *Misolampidius rugipennis* (left, ventral view). Y: *Stenophanes rubripennis* (right, dorsal view). Z: *Setenis oshimanus* (left, dorsal view) (d: shows ventral aspect of tip-end).

**Pl. 13, A-M:** Epipharynges. A: *Micropedinus pallidipennis*. B: *Gonocephalum recticolle*. C: *Gonocephalum japanum*. D: *Idisia ornata*. E: *Phaleromela subhumeralis*. F: *Emyysara riederi*. G: *Neatus picipes*. H: *Alphitobius diaperinus*. I: *Gnathocerus cornutus*. J: *Palorus subdepressus*. K: *Tribolium castaneum*. L: *Latheticus oryzae*. M: *Scaphidema ornatellum*.  
N: Labrum of *Latheticus oryzae*.

**Pl. 14, A-N:** Epipharynges. A: *Ceropria induta*. B: *Alphitophagus bifasciatus*. C: *Martianus dermestoides*. D: *Platydema nigroaeneum*. E: *Ischnodactylus loripes*. F: *Diaperis lewisi*. G: *Parabolitophagus felix*. H: *Bolitozenus dentifrons*. I: *Cryphaeus duellicus*. J: *Toxicum tricornutum*. K: *Phthora canalicollis*. L: *Tagalus* sp. M: *Elizota curva*. N: *Plesiophthalmus nigrocyaneus*.

**Pl. 15, A-O:** Epipharynges. A: *Uloma* sp. B: *Strongylium apterum*. C: *Strongylium japanum*. D: *Strongylium oshimanum*. E: *Strongylium brevicorne*. F: *Ainu tenuicornis*. G: *Phaedis helopioides*. H: *Simalura coerulea*. I: *Menephus arciscelis*. J: *Tetraphyllus lunuliger*. K: *Hemicera alternata nodokai*. L: *Encyalesthus violaceipennis*. M: *Misolampidius rugipennis*. N: *Stenophanes rubripennis*. O: *Setenis oshimanus*.

**Pl. 16, A-T:** Mandibles. A: *Micropedinus pallidipennis* (left, dorsal view). B: ditto (right, dorsal view). C: *Gonocephalum recticolle* (left, dorsal view). D: ditto (right, dorsal view). E: ditto (right, ventral view). F: ditto (left, ventral view). G: *Idisia ornata* (right, ventral view). H: ditto (left, ventral view). I: *Phaleromela subhumeralis* (right, ventral view). J: ditto (left, ventral view). K: *Emyysara riederi* (right, ventral view). L: ditto (left, ventral view). M: *Neatus picipes* (right, ventral view). N: ditto (left, ventral view). O: *Alphitobius diaperinus* (right, ventral view). P: ditto (left, ventral view). Q: *Gnathocerus cornutus* (right, ventral view). R: ditto (left, ventral view). S: *Palorus subdepressus* (right, ventral view). T: ditto (left, ventral view).

**Pl. 17, A-U:** Mandibles. A: *Tribolium castaneum* (right, ventral view). B: ditto (left, ventral view). C: *Latheticus oryzae* (right, ventral view). D: ditto (left, dorsal view). E: ditto (left, ventral view). F: *Scaphidema ornatellum* (right, ventral view). G: ditto (left, ventral view). H: *Ceropria induta* (right, ventral view). I: ditto (left, ventral view). J: *Alphitophagus bifasciatus* (left, dorsal view). K: ditto (right, dorsal view). L: *Martianus dermestoides* (right, ventral view). M: ditto (left, ventral view). N: *Platydema nigroaeneum* (right, ventral view). O: *Ischnodactylus loripes* (right, ventral view). P: ditto (left, ventral view). Q: *Diaperis lewisi* (right, ventral view). R: ditto (left, ventral view). S: ditto (left, dorsal view). T: *Phthora canalicollis* (right, ventral view). U: ditto (left, ventral view).

**Pl. 18, A-V:** Mandibles. A: *Parabolitophagus felix* (right, ventral view). B: ditto (left, ventral view). C: *Bolitozenus dentifrons* (right, ventral view). D: ditto (left, ventral view). E: ditto (left, dorsal view). F: *Cryphaeus duellicus* (right, ventral view). G: ditto (left, ventral view).



view). H: ditto (right, buccal view). I: ditto (left, buccal view). J: *Toxicum tricorutum* (right, ventral view). K: ditto (left, ventral view). L: *Uloma* sp. (right, ventral view). M: ditto (left, ventral view). N: *Strongylium japanum* (right, ventral view). O: ditto (left, ventral view). P: ditto (left, dorsal view). Q: *Ainu tenuicornis* (right, ventral view). R: ditto (left, ventral view). S: *Elizota curva* (right, ventral view). T: ditto (left, ventral view). U: *Plesiophthalmus nigrocyaneus* (right, ventral view). V: ditto (left, ventral view).

**Pl. 19, A-R:** Mandibles. A: *Phaedis helopioides* (right, ventral view). B: ditto (left, ventral view). C: *Simalura coerulea* (right, ventral view). D: ditto (left, ventral view). E: *Menephilus arciscelis* (right, ventral view). F: ditto (left, ventral view). G: *Tetraphyllus lunuliger* (left, dorsal view). H: ditto (right, dorsal view). I: *Hemicera alternata nodokai* (right, ventral view). J: ditto (left, ventral view). K: *Encyalesthus violaceipennis* (right, ventral view). L: ditto (left, ventral view). M: *Misolampidius rugipennis* (right, ventral view). N: ditto (left, ventral view). O: *Stenophanes rubripennis* (right, ventral view). P: ditto (left, ventral view). Q: *Setenis oshimanus* (right, ventral view). R: ditto (left, ventral view).

**Pl. 20, A-O:** Maxillae. (buccal view except Fig. L). A: *Emypsara riederi* (right). B: *Neatus picipes* (right). C: *Palorus subdepressus* (left). D: *Latheticus oryzae* (right). E: *Scaphidema ornatellum* (left). F: *Platydemia nigroaeneum* (right). G: *Diaperis lewisi* (left). H: *Boletoxenus dentifrons* (right). I: *Toxicum tricorutum* (left). J: *Tagalus* sp. K: *Elizota curva* (right). L: *Uloma* sp. (right, ventral view). M: *Ainu tenuicornis* (left). N: *Tetraphyllus lunuliger* (left). O: *Misolampidius rugipennis* (left).

**Pl. 21, A-Z:** Labia (buccal view except Figs. L, V, Z). A: *Micropedinus pallidipennis*. B: *Gonocephalum recticolle*. C: *Idisia ornata*. D: *Phaleromela subhumeralis*. E: *Emypsara riederi*. F: *Neatus picipes*. G: *Alphitobius diaperinus*. H: *Gnathocerus cornutus*. I: *Palorus subdepressus*. J: *Tribolium castaneum*. K: *Latheticus oryzae*. L: *Scaphidema ornatellum* (lateral view). M: ditto (apical part). N: *Ceropria induta*. O: *Alphitophagus bifasciatus*. P: *Martianus dermestoides*. Q: *Platydemia nigroaeneum*. R: *Ischnodactylus loripes*. S: *Diaperis lewisi*. T: *Parabolitophagus felix*. U: *Boletoxenus dentifrons*. V: ditto (lateral view). W: *Cryphaeus duellicus*. X: *Toxicum tricorutum*. Y: *Phthora canalicollis*. Z: ditto (lateral view).

**Pl. 22, A-P:** Labia (buccal view). A: *Elizota curva*. B: *Plesiophthalmus nigrocyaneus*. C: *Uloma* sp. D: *Strongylium japanum*. E: ditto (hypopharyngeal sclerome, lateral view). F: *Strongylium brevicorne* (hypopharyngeal sclerome). G: *Ainu tenuicornis*. H: *Phaedis helopioides*. I: *Simalura coerulea*. J: *Menephilus arciscelis*. K: *Tetraphyllus lunuliger*. L: *Hemicera alternata nodokai*. M: *Encyalesthus violaceipennis*. N: *Misolampidius rugipennis*. O: *Stenophanes rubripennis*. P: *Setenis oshimanus*.

**Pl. 23, A-L:** Prothoracic legs (posterior view). A: *Micropedinus pallidipennis* (right). B: *Gonocephalum recticolle* (left). C: *Idisia ornata* (right). D: *Phaleromela subhumeralis* (left). E: *Emypsara riederi* (left). F: *Neatus picipes* (left). G: *Alphitobius diaperinus* (left). H: *Gnathocerus cornutus* (left). I: *Palorus subdepressus* (left). J: *Tribolium castaneum* (left). K: *Latheticus oryzae* (left). L: *Scaphidema ornatellum* (left).

**Pl. 24, A-N:** Prothoracic legs (posterior view). A: *Ceropria induta* (left). B: *Alphitophagus bifasciatus* (left). C: *Martianus dermestoides* (left). D: *Platydemia nigroaeneum* (left). E: *Platydemia recticorne* (left). F: *Ischnodactylus loripes* (left). G: *Diaperis lewisi* (right). H: *Parabolitophagus felix* (right). I: *Boletoxenus dentifrons* (right). J: *Cryphaeus duellicus* (right). K: *Toxicum tricorutum* (left). L: *Phthora canalicollis* (left). M: *Elizota curva* (right). N: *Plesiophthalmus nigrocyaneus* (left).

O-R: Mesothoracic spiracles. O: *Ischnodactylus loripes*. P: *Platydemia nigroaeneum*. Q: *Ceropria induta*. R: *Scaphidema ornatellum*.

**Pl. 25, A-L:** Prothoracic legs (posterior view). A: *Uloma* sp. (left). B: *Strongylium japanum* (left). C: *Ainu tenuicornis* (left). D: *Phaedis helopioides* (right). E: *Simalura coerulea* (left). F: *Menephilus arciscelis* (right). G: *Tetraphyllus lunuliger* (left). H: *Hemicera alternata*

*nodokai* (right). I: *Encyalesthus violaceipennis* (right). J: *Misolampidius rugipennis* (right). K: *Stenophanes rubripennis* (right). L: *Setenis oshimanus* (right).

**Pl. 26**, A-L: Ninth abdominal segments. A: *Gonocephalum recticolle* (dorsal view). B: ditto (lateral view). C: *Gonocephalum japanum* (dorsal view). D: ditto (lateral view). E: *Idisia ornata* (dorsal view). F: ditto (lateral view). G: *Phaleromela subhumeralis* (dorsal view). H: ditto (lateral view). I: *Emypsara riederi* (dorsal view). J: ditto (lateral view). K: *Micropedinus palledipennis* (dorsal view). L: ditto (lateral view).

**Pl. 27**, A-O: Ninth abdominal segments. A: *Neatus picipes* (dorsal view). B: ditto (lateral view). C: *Alphitobius diaperinus* (dorsal view). D: ditto (lateral view). E: *Gnathocerus cornutus* (dorsal view). F: ditto (lateral view). G: *Palorus subdepressus* (dorsal view). H: ditto (lateral view). I: *Tribolium castaneum* (dorsal view). J: ditto (lateral view). K: *Latheticus oryzae* (dorsal view). L: ditto (caudal end, lateral view). M: *Scaphidema ornatellum* (dorsal view). N: ditto (lateral view). O: *Palorus ratzeburgi* (dorsal view).

**Pl. 28**, A-O: Ninth abdominal segments. A: *Ceropria induta* (dorsal view). B: ditto (lateral view). C: *Alphitophagus bifasciatus* (dorsal view) (ds: dorsal setae). D: ditto (lateral view). E: *Martianus dermestoides* (dorsal view). F: ditto (lateral view). G: *Platydemia nigroaeneum* (dorsal view) (ds: dorsal setae). H: ditto (lateral view). I: *Platydemia recticorne* (dorsal view). J: *Platydemia marseuli* (dorsal view). K: *Platydemia subfascia* (dorsal view). L: *Ischnodactylus loripes* (dorsal view) (ds: dorsal setae). M: ditto (lateral view). N: *Diaperis lewisi* (dorsal view). O: ditto (lateral view).

**Pl. 29**, A-P: Ninth abdominal segments. A: *Parabolitophagus felix* (dorsal view). B: ditto (lateral view). C: ditto (anal region, ventral view) (ao: anal orifice). D: *Bolitoxenus dentifrons* (dorsal view). E: ditto (lateral view). F: *Cryphaeus duellicus* (dorsal view). G: ditto (lateral view). H: *Toxicum tricorutum* (dorsal view). I: ditto (lateral view). J: *Phthora canalicollis* (dorsal view). K: ditto (lateral view). L: *Tagalus* sp. (dorsal view). M: *Elixota curva* (dorsal view). N: ditto (lateral view). O: *Plesiophthalmus nigrocyaneus* (dorsal view). P: ditto (lateral view).

**Pl. 30**, A-K: Ninth abdominal segments. A: *Uloma* sp. (dorsal view). B: ditto (lateral view). C: *Strongylium japanum* (dorsal view). D: *Ainu tenuicornis* (dorsal view). E: ditto (lateral view). F: *Phaedis helopioides* (dorsal view). G: ditto (lateral view). H: *Simalura coerulea* (dorsal view). I: ditto (lateral view). J: *Menephilus arciscelis* (dorsal view). K: ditto (lateral view).

L & M: Posterior margins of tergites of 8th abdominal segments. L: *Strongylium apterum*. M: *Strongylium marseuli*.

**Pl. 31**, A-N: Ninth abdominal segments. A: *Tetraphyllus lunuliger* (dorsal view). B: ditto (lateral view). C: *Hemicera alternata nodokai* (dorsal view). D: ditto (lateral view). E: *Encyalesthus violaceipennis* (dorsal view). F: ditto (lateral view). G: ditto (ventral view) (sr: sternite; tr: tergite). H: *Misolamphidius rugipennis* (dorsal view). I: ditto (lateral view). J: *Stenophanes rubripennis* (dorsal view). K: ditto (lateral view). L: *Setenis oshimanus* (dorsal view) (mg: median granule). M: *Setenis valgipes* (dorsal view) (mg: median granule). N: ditto (lateral view).

**Pl. 32**, A-L: Ninth abdominal segments of *Strongylium* spp. (DR: dorsal ridge; FO: fossa; PL: posterior lobe; SA: inner spine; SB: outer spine; TU: median tubercle). A: *apterum* (posterior view). B: ditto (lateral view). C: *impigrum* (posterior view). D: ditto (lateral view). E: *japanum* (posterior view). F: ditto (lateral view). G: *oshimanum* (posterior view). H: ditto (lateral view). I: *niponicum* (posterior view). J: ditto (lateral view). K: *brevicorne* (posterior view). L: ditto (lateral view).







































































