

A Revision of the Japanese Species of the Genera *Elodes* and *Sacodes* (Coleoptera, Scirtidae)

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Abstract The Japanese species of the genera *Elodes* LATREILLE, 1796 and *Sacodes* LECONTE, 1853 are revised. *Sacodes* is a senior synonym of *Flavohelodes* KLAUSNITZER, 1980. Five species of the genus *Elodes* and six of the genus *Sacodes* are recognized. Of these, *Elodes elegans* and *Sacodes tsushimensis* are new to science. The Japanese species of *Elodes* are divided into two species-groups: the *marginata* species-group comprising *E. inornata* LEWIS, *E. wilsoni* PIC and *E. scapularis* LEWIS, and the *minuta* species-group comprising *E. elegans* sp. nov. and *E. kojimai* NAKANE. *Elodes ohbayashii* M. SATÔ and *Flavohelodes nigrata* KLAUSNITZER are junior synonyms of *E. kojimai* NAKANE. *Sarabandus monticola* NAKANE is a junior synonym of *E. wilsoni* PIC. Four new combinations are proposed in the genus *Sacodes*, viz., *nakanei*, *amamiensis*, *minima* and *dux*.

Descriptions of the two genera are given with keys to species. All the adults here dealt with and the immature stages of *E. inornata*, *E. wilsoni*, *E. kojimai*, *S. nakanei*, *S. protecta* and *S. dux* are described or redescribed with figures.

Introduction

Elodes LATREILLE, 1796 is the third largest genus of the family Scirtidae and is represented by about 100 species from all over the world. *Flavohelodes* KLAUSNITZER, 1980 was erected for the *flavicollis* species-group of the genus *Elodes* and contains 17 species recorded from the Holarctic and the Oriental Regions. These genera are considered closely related to each other and show sister-group relationship with other scirtid genera on the basis of phylogenetic studies of adults and larvae (KLAUSNITZER, 1974a; HANNAPPEL & PAULUS, 1987). Unfortunately, *Flavohelodes* is a junior synonym of *Sacodes* LECONTE, 1853 described on three North American species.

The first study on the Japanese species of the genus *Elodes* and its relatives was made by KIESENWETTER (1874) who recorded *Helodes flavicollis* KIESENWETTER from Nagasaki. Since then, many taxonomic and faunal studies were published by the following entomologists: HAROLD (1881); LEWIS (1895); PIC (1914, 1918); NAKANE

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(1963); SATÔ (1966, 1985 a, b, 1989), SATÔ & CHÛJÔ (1972); SATOU (1975) and KLAUSNITZER (1973, 1974 b, 1980 a, 1995). Twelve species have hitherto been recognized from Japan under the following three genera: *Elodes*, *Flavohelodes* and *Sarabandus* LEECH, 1955, but no comprehensive study about these has yet been made. Besides, there has been no study about the immature stage and biology, except HAYASHI (1957).

In this paper, I am going to revise the genera *Elodes* and *Sacodes* of Japan, with biological notes and descriptions of the immature stages of six species, viz., three *Elodes* and three *Sacodes*.

Materials and Methods

This study is mainly based on dried (adults) and alcoholic (larvae, pupae and adults; preserved in 70% ethanol) specimens in my collection. In addition, I was able to borrow and examine many specimens preserved in the following institutions and personal collections: EUM—Entomological Laboratory, Ehime University, Matsuyama; KMNH—Kurashiki Museum of Natural History; NWU—Biological Laboratory, Nagoya Women's University; TMNH—Toyohashi Museum of Natural History; TPM—Tochigi Prefectural Museum; TN—T. NAKANE's private collection; SO—S. OHMOMO's private collection; SI—S. IMASAKA's private collection; SS—S. SAKURAI's private collection; YH—Y. HIRANO's private collection.

The holotypes and some paratypes of the two species to be described herein will be preserved in the National Science Museum (Nat. Hist.), Tokyo, and other paratypes are in the Biological Laboratory, Nagoya Women's University and in my personal collection.

General observation and dissection were made under a stereoscopic microscope. Microstructures were observed under a microscope on dissected part mounted on hollow slides with pure glycerine (mainly used for tegmen and penis) or Canada Balsam (used for other parts). Some microstructures of adults and larvae were observed with SEM (Hitachi S-2050).

The terminology refers generally to NYHOLM (1972, 1984) for the genital organ, and mainly to HANNAPPEL and PAULUS (1991) for the mouth parts of the larva. The terms of some structures of larval mouth parts are shown in Fig. 1.

The abbreviations for measurements used in the present paper are as follows: HW—width of head; PL—length of pronotum; PW—width of pronotum; EL—length of elytra; EW—width of elytra; TL—total length (PL plus EL in adult); TW—maximal width (between left and right hind legs in pupa). Total length is measured from anterior margin of clypeus to apex of abdominal segment in fully extended larva, and from apex of pronotal spine to apex of abdominal segment in pupa. Arithmetic mean of the measurement is given in parentheses after the range. If possible, twenty specimens are picked up for measurement in both sexes.

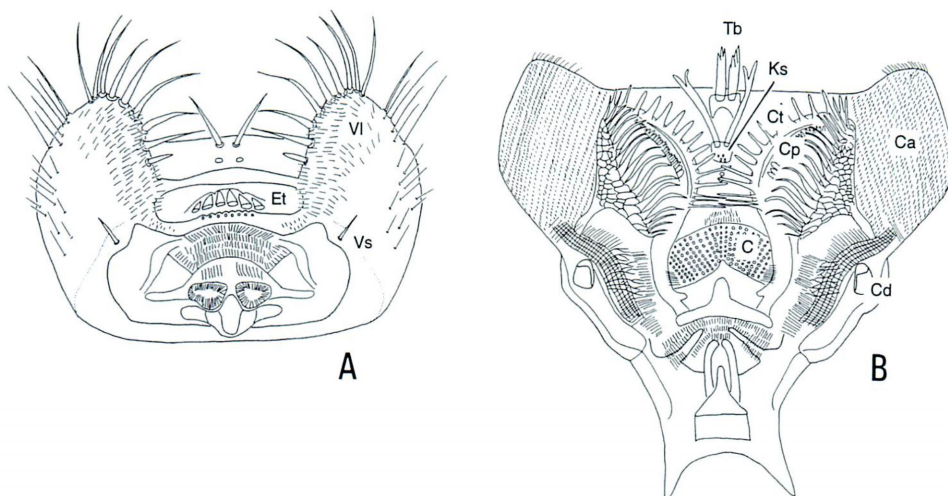


Fig. 1. Larva of *Elodes inornata*, showing terms of larval mouth parts. — A, Labrum in ventral aspect (epipharynx); B, hypopharynx. C: Cushion; Ca: claw apparatus; Cd: chitin dent; Cp: comb plate; Ct: claw teeth; Et: epipharyngeal teeth; Ks: keel-sclerite; Tb: tooth-bristles; VI: ventral lobe; Vs: ventral seta.

Genus *Elodes* LATREILLE

[Japanese name: Maruhananomi Zoku]

Elodes LATREILLE, 1796, Préc. Caract. Gen., 44. — PIC, 1914, Coleopt. Cat., (58): 21 [world list].

— POPE, 1976, Entom. mon. Mag., **111**: 186. Type species: *Lampyris minuta* LINNAEUS, 1767 (subsequent designation by LATREILLE, 1810).

Helodes [incorrect spelling]: AGASSIZ, 1847, Nom. Zool. Index Univ., 393. — KLAUSNITZER, 1974, Zool. Jb. Syst., **101**: 479. — SATÔ, 1985, Coleopt. Japan Col., Osaka, **2**: 420 [key].

Sarabandus: SATÔ, 1985, Coleopt. Japan Col., Osaka, **2**: 420 [key]. [Nec LEECH, 1955].

Adult. Body moderate in size for scirtid beetles, TL 2.8–6.0 mm, oval or oblong, lightly or moderately convex above, shining, closely covered with hairy setae. Coloration yellow to black, variable with species. Head rather small, slightly convex, completely covered by pronotum and invisible in dorsal view. Antennae filiform, covered with short setae, more or less longer in male; scape ovate, broadest; pedicel ovate, small; 3rd the smallest, with distal margin diagonal; 4th the longest in most species; 11th oblong. Pronotum semicircular, covered with setae which are easily removed. Scutellum triangular, moderate in size, visible in dorsal view. Elytra oval or oblong, with rather long setae which are easily removed. Abdominal sternites covered with short setae.

Male genital organ. Eighth tergite well sclerotized, with a pair of rather long apodemes; 8th sternite well sclerotized; 9th tergite moderately sclerotized, with a pair of apodemes; 9th sternite weakly sclerotized, covered with long setae. Tegmen well sclerotized, rather small or of the same size as penis, with distinct parameres. Penis well sclerotized, stick-like, bifid in apical part (parameroids).

Female genital organ. Eighth tergite with a pair of rather long apodemes; 8th

sternite oval to oblong. Ovipositor with rather long baculus.

Larva. Body well sclerotized, campodeiform. Head visible in dorsal view. Antennae filiform, rather short, reaching thorax; scape curved posteriorly, flagellum about 30–50 segmented. Labrum transverse, with almost straight anterior margin; epipharynx with long and simple setae in anterior margin of ventral lobe, with a pair of ventral setae whose sockets have simple surrounding parts. Mandibles pointed at terminal tooth, with feathered bristles in inner areas. Maxillary palpi with some short setae in ventro-lateral area of 1st segment. Hypopharynx with separated keel-sclerite and sockets of tooth-bristles, tri- or multicornute at apical margins of tooth-bristles, with a pair of long setae on keel-sclerite. Thoraces distinctly broader than abdomen. Ninth abdominal tergite bicornute at posterior margin.

Pupa. Body very soft, with two pairs of long spines on dorsal surface of pronotum, with simple abdominal segments.

Remarks. *Cistela pallida* FABRICIUS, 1775 was designated by LATREILLE (1810) as the type species of the genus *Elodes* LATREILLE, 1796. However, this species has been regarded as a junior synonym of *Elodes minuta* (LINNAEUS, 1767) which is a common and well known species in Europe.

The genus is divided into two species-groups, namely *marginata* and *minuta* species-groups (KLAUSNITZER, 1970; NYHOLM, 1972).

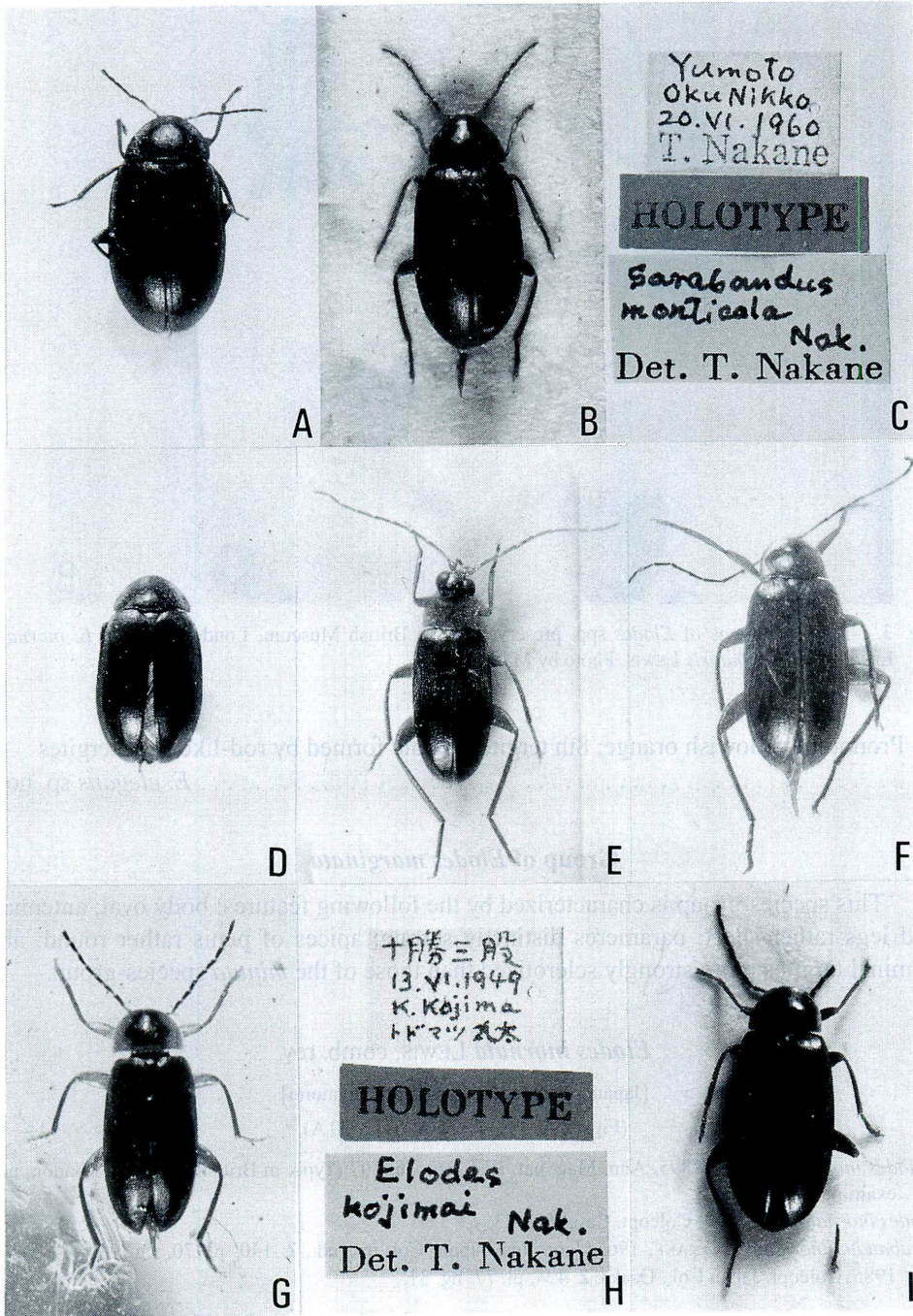
Biological notes. The habitats of the larvae so far reported are small streams and clear ponds (e.g., LESAGE, 1991; KLAUSNITZER, 1996).

Key to the Japanese Species of the Genus *Elodes*

1. Antenna and legs moderate in length; body oval; (*marginata* species-group). 2.
— Antennae and legs long; body oblong, almost parallel-sided; (*minuta* species-group)
..... 4.
2. Pronotum with shallow and distinct concavities, seemingly distinctly punctate
..... *E. inornata* LEWIS.
— Pronotum finely punctate 3.
3. Frons and clypeus yellow in male; 7th sternite shallowly concave . . . *E. wilsoni* PIC.
— Frons and clypeus brownish black; 7th sternite deeply concave
..... *E. scapularis* LEWIS*).
4. Pronotum with black marking; 8th tergite of male trapezoidal.
..... *E. kojimai* NAKANE.

*) Female has not been determined yet.

Fig. 2. Habitus of *Elodes* spp. — A, *E. inornata* LEWIS, male; B, *E. wilsoni* PIC, female (holotype of *Sarabandus monticola* NAKANE, 1963); C, type labels of *Sarabandus monticola*; D, *E. scapularis* LEWIS, male; E, *E. elegans* sp. nov., holotype, male; F, ditto, paratype, female; G, *E. kojimai* NAKANE, holotype, female; H, ditto, labels; I, ditto, female (holotype of *E. ohbayashii* M. SATÔ, 1985).



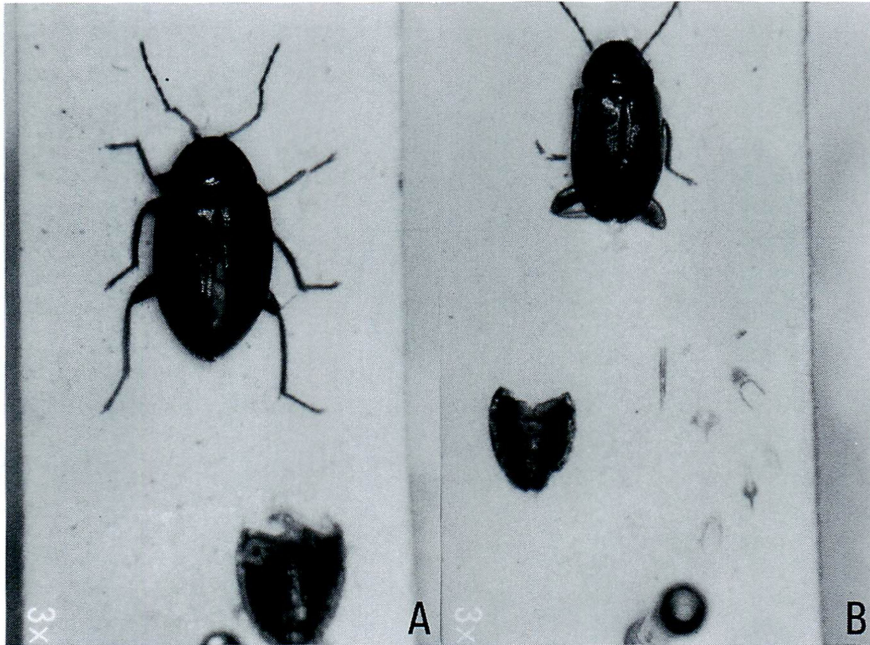


Fig. 3. Type specimens of *Elodes* spp. preserved in the British Museum, London. — A, *E. inornata* LEWIS; B, *E. scapularis* LEWIS. Photo by M. SATÔ.

— Pronotum yellowish orange; 8th tergite of male formed by rod-like hemitergites . . .
 *E. elegans* sp. nov.

Group of *Elodes marginata*

This species-group is characterized by the following features: body oval; antennae and legs rather short; parameres distinctly serrate; apices of penis rather round; abdominal tergites more strongly sclerotized than those of the *minuta* species-group.

Elodes inornata LEWIS, comb. rev.

[Japanese name: Ko-kuro-maruhananomi]

(Figs. 2 A, 3 A, 4 A, 5 A, 6–12, 20 A)

Helodes inornatus LEWIS, 1895, Ann. Mag. nat. Hist., (6), **16**: 107 (Type: in British Museum, London, not examined, Fig. 3 A).

Elodes inornata: PIC, 1914, Coleopt. Cat., (58): 23.

Sarabandus inornatus: NAKANE, 1963, Icon. Ins. Japon. Col. nat. ed., **2**: 140, pl. 70, fig. 18. — SATÔ, 1985, Coleopt. Japan Col., Osaka, **2**: 424, pl. 77, fig. 31.

Adult. Body oval, moderately convex, closely covered with yellowish white

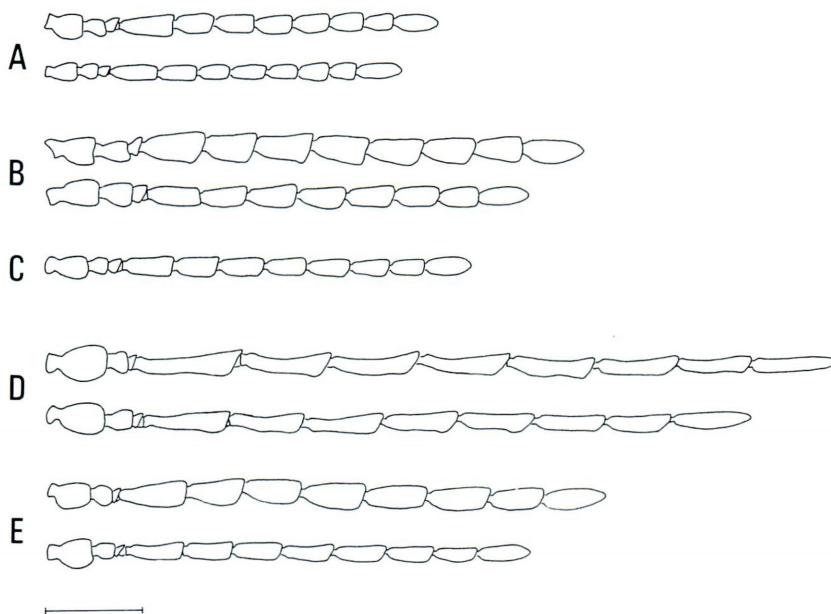


Fig. 4. Antennae of *Elodes* spp. (above, male; below, female). — A, *E. inornata* LEWIS; B, *E. wilsoni* PIC; C, *E. scapularis* LEWIS; D, *E. elegans* sp. nov.; E, *E. kojimai* NAKANE. (Scale: 0.5 mm.)

hairs. Head black; labrum yellowish brown; maxillary and labial palpi and mandibles yellow, but the apices of maxillary and labial palpi are somewhat darker; 1st to 3rd antennal segments yellow; 4th antennal segment brownish yellow, its apical end somewhat darker; 5th to 11th antennal segments brownish black, but 5th and 6th segments paler; pronotum black, but anterior and lateral margins paler; scutellum and elytra brownish black; ventral surface of body black; fore legs yellow, except for dusky tarsi; mid coxae yellow to brown, variable in color; mid femora yellow, except for blackish brown apex and posterior margin; mid tibiae and tarsi black; hind legs black, but hind tarsi paler.

Head finely and sparsely punctate. Eyes moderate in size, prominent; the distance between eyes about 1.6 times as long as the diameter of an eye in male, 1.8 times in female. Front margin of clypeus straight. Antennae moderate in length, reaching about proximal 1/5 of elytra, broadest at apical end of 4th segment; approximate ratio of antennal segments as 2.5 : 1.6 : 1.0 : 3.6 : 2.8 : 2.8 : 2.7 : 2.7 : 2.5 : 2.1 : 3.1 in male (n=2, mean) and 2.6 : 1.7 : 1.0 : 3.5 : 3.1 : 2.9 : 2.9 : 2.7 : 2.6 : 2.3 : 3.4 in female (n=2, mean). Pronotum semicircular, sparsely and finely punctate, closely covered with large and shallow concavities which have a seta at each center; the distance between concavities of the same length as a diameter of concavity; PW/PL 1.5–2.0 (1.7) in male and 1.6–1.9 (1.7) in female. Scutellum finely punctate. Elytra oval, broadest at the middle, with a deep and distinct puncture situated on posterior end of each setal socket, but the puncture is shallow and indistinct in proximal area; EL/EW 1.4–1.5 (1.4) in male and

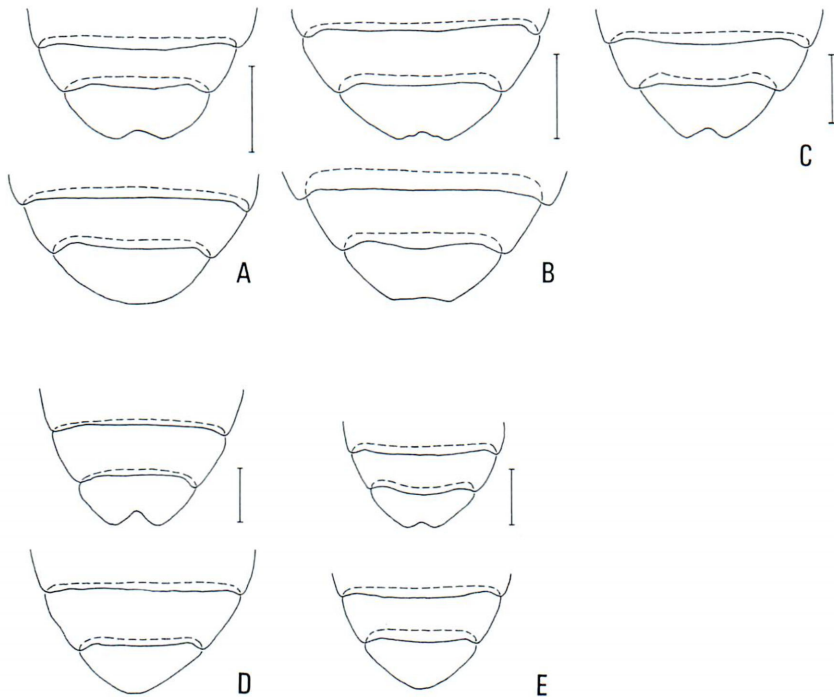


Fig. 5. Sixth to 7th abdominal sternites of *Elodes* spp. (above, male; below, female). — A, *E. inornata* LEWIS; B, *E. wilsoni* PIC; C, *E. scapularis* LEWIS; D, *E. elegans* sp. nov.; E, *E. kojimai* NAKANE. (Scales: 0.5 mm.)

1.3–1.5 (1.4) in female; EL/PL 2.8–3.7 (3.1) in male and 2.9–3.7 (3.2) in female; EW/PW 1.2–1.4 (1.3) in male and 1.3–1.4 (1.3) in female; TL/EW 1.8–1.9 (1.9) in male and 1.8–2.0 (1.8) in female. Ventral surface of body closely covered with fine punctures. Legs moderate in length.

Male. Apical margin of 7th abdominal sternite concave. Eighth tergite semicircular, covered with minute spines in apical area; 8th sternite ginkgo-leaf shaped, covered with minute spines on apical margin; 9th tergite moderately sclerotized, but broadly membranous in apical and lateral areas, with a pair of stout apodemes; 9th sternite oblong, with long setae at apical margin. Tegmen bifid in about apical 1/3 (parameres), with rounded apices; lateral margins of parameres serrate in apical 1/5 and 3/5 to base. Penis about 1.0 mm in length, sparsely covered with punctures in apical 2/5, bifid in about apical 1/5 (parameroids), with rounded apices, with a pair of small hooks at about apical 2/3 of lateral margins of parameroids; dorso-proximal margin deeply concave; ventro-proximal margin deeply notched.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite moderately sclerotized, covered with fine punctures and minute spines at apical margin; 8th sternite weakly sclerotized, covered with fine punctures, with deeply notched apical margin which is covered with minute spines. Ovipositor moderate in length; stylus

with two setae at apical end; coxite and baculus long, finely punctate; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=2, mean):—1.0 : 4.1 : 13.9.

Measurements of adult. Male (n=20). TL: 2.8–3.8 (3.3)mm; EW: 1.5–2.0

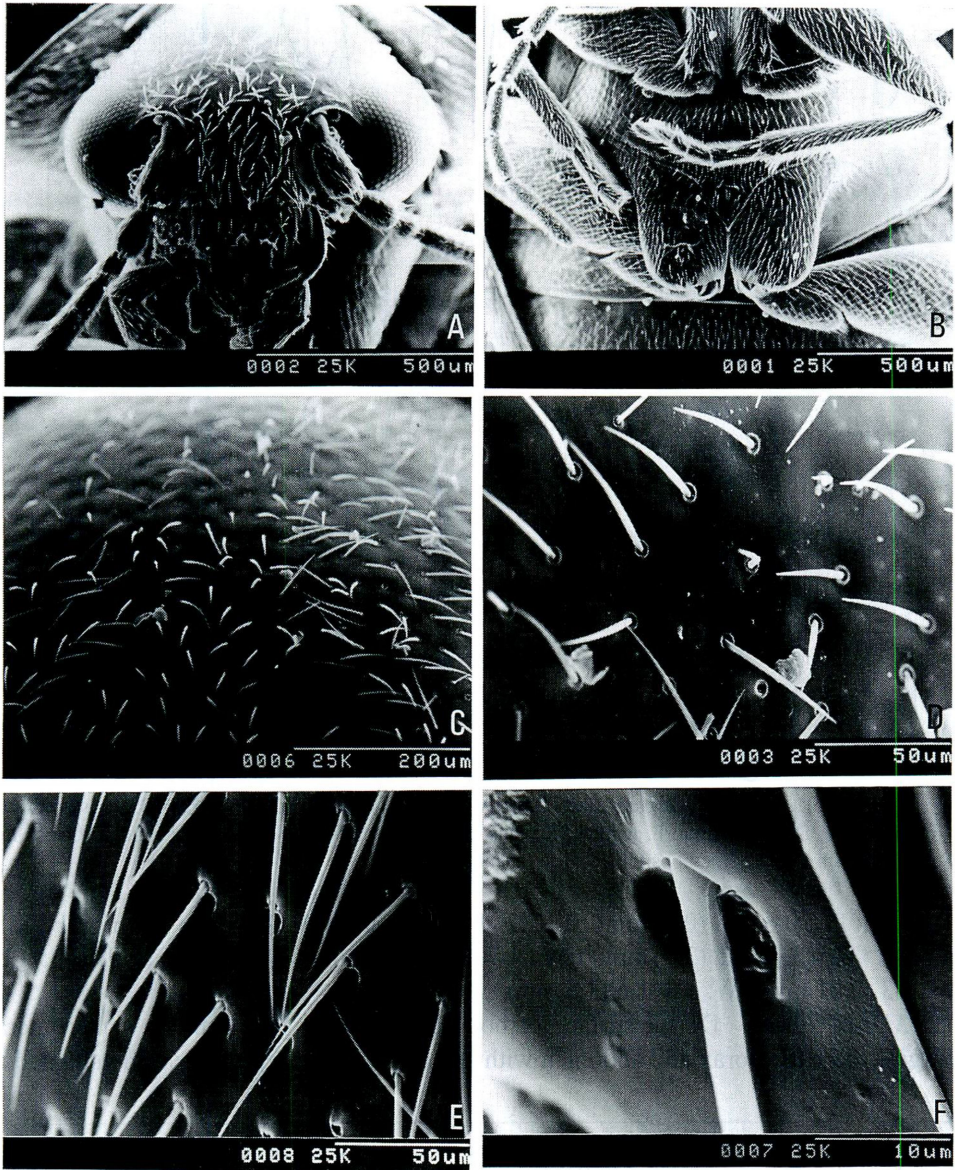


Fig. 6. *Elodes inornata* LEWIS; A, head; B, metasternum; C, pronotum; D, ditto; E, caudal area of elytron; F, ditto, seta.

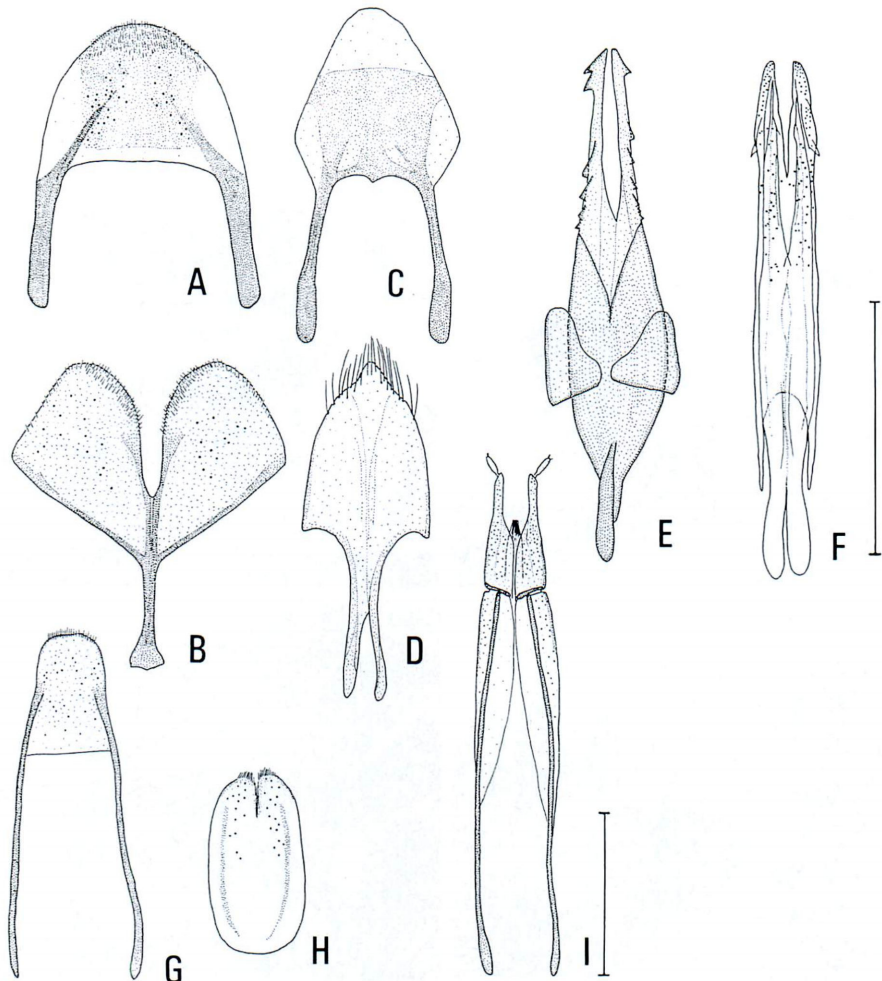
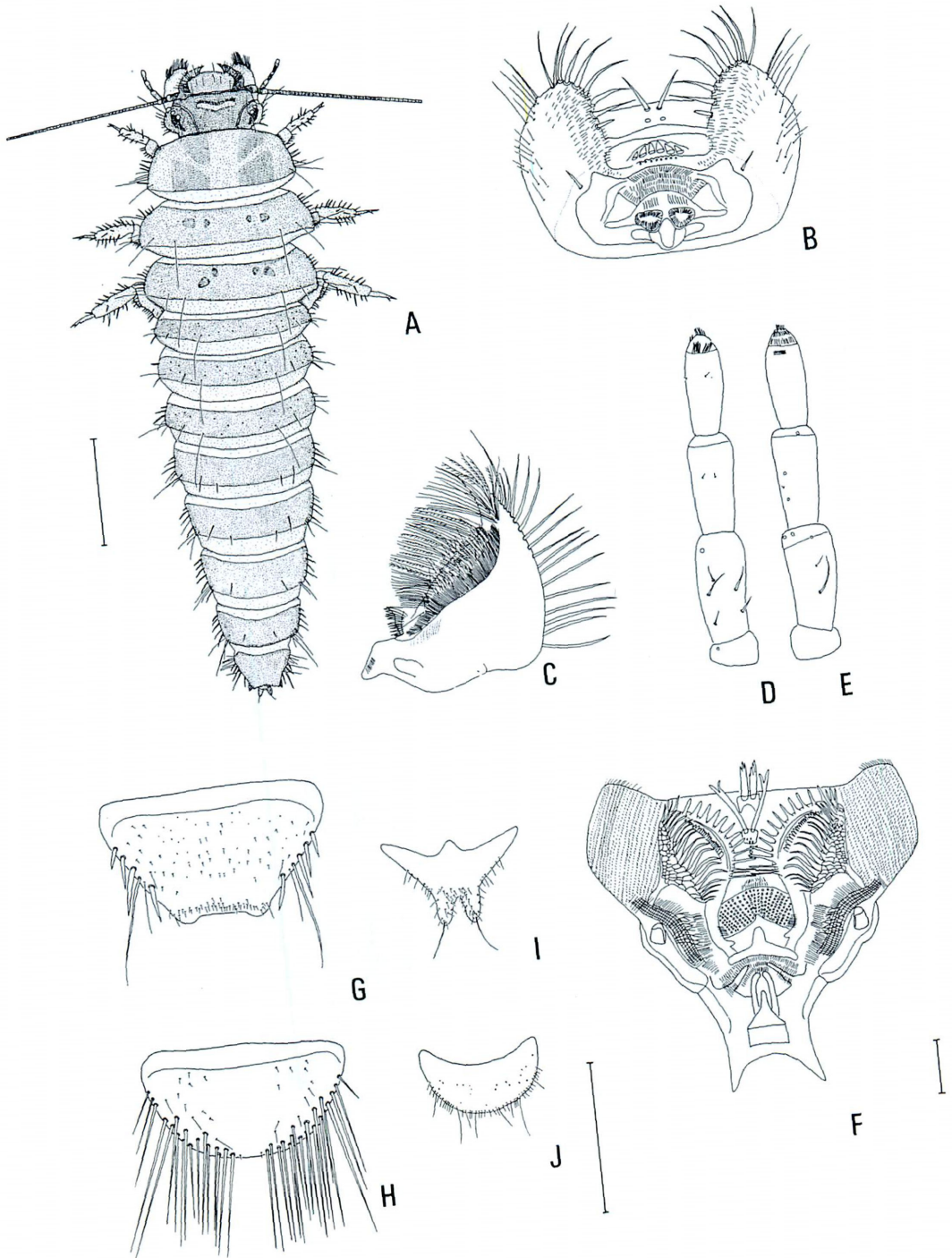


Fig. 7 (on p. 358). *Elodes inornata* LEWIS. — A–F: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen; F, penis, dorsal aspect. — G–I: Female genitalia; G, 8th tergite; H, 8th sternite; I, ovipositor. (Scales: 0.5 mm.)

(1.8) mm; PL: 0.6–1.0 (0.8) mm; EL: 2.2–2.8 (2.5) mm; PW: 1.2–1.5 (1.3) mm. Female (n=20). TL: 3.1–4.2 (3.7) mm; EW: 1.7–2.3 (2.0) mm; PL: 0.7–1.0 (0.9) mm; EL: 2.4–3.3 (2.8) mm; PW: 1.3–1.6 (1.5) mm.

Mature larva. Dorsal surface of body covered with very minute setae; lateral margins of head, thorax and abdomen with spinous short setae, but the setae situated at

Fig. 8 (on p. 359). *Elodes inornata* LEWIS, mature larva. — A, Dorsal aspect (scale: 1.0 mm). — B–F: Mouth parts (scale: 0.1 mm); B, labrum, ventral aspect; C, left mandible, ventral aspect; D, left maxillary palpus, dorsal aspect; E, ditto, ventral aspect; F, hypopharynx. — G–J: Abdominal segments (scale: 0.5 mm); G, 8th tergite; H, 8th sternite; I, 9th tergite; J, 9th sternite.

Elodes and Sacodes of Japan

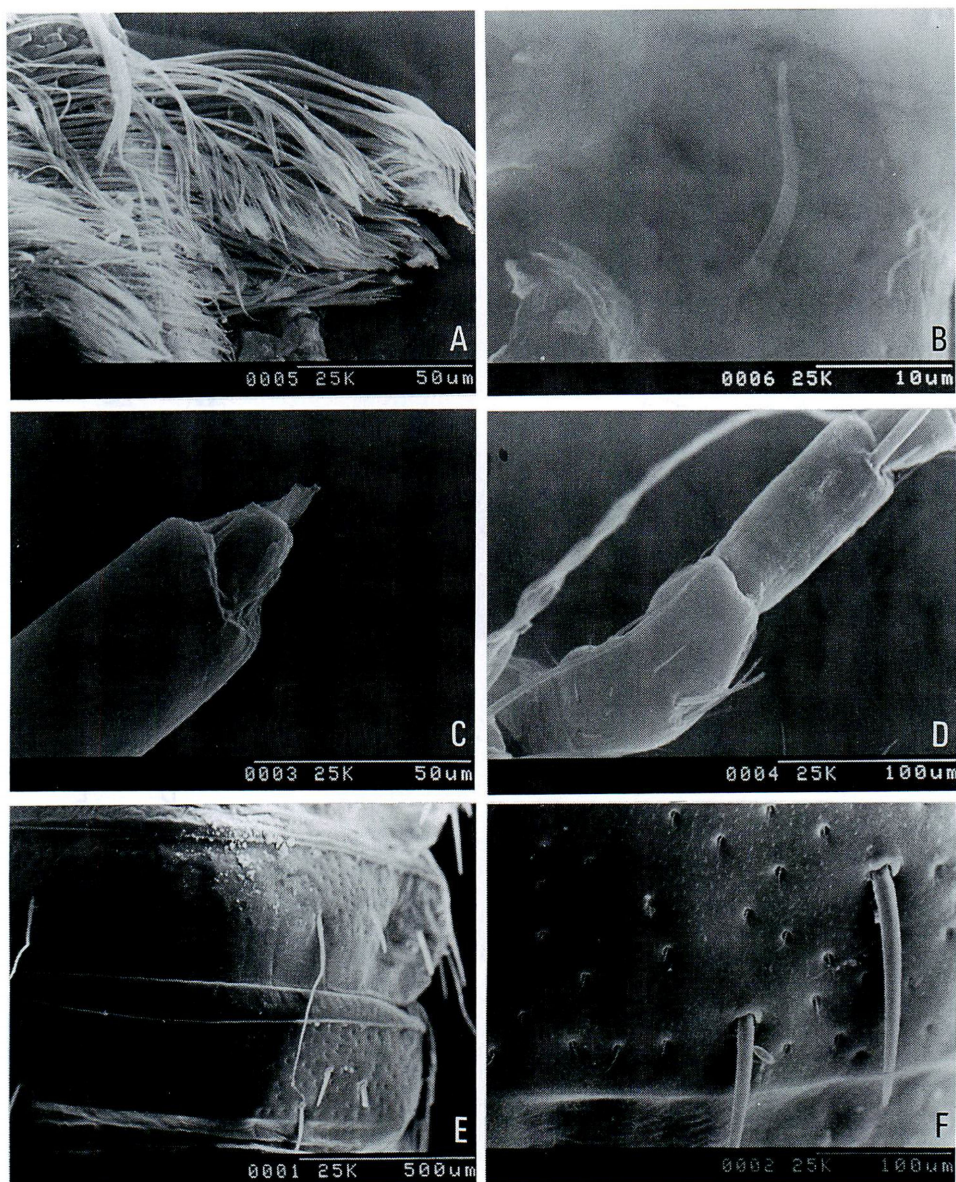


Fig. 9. *Elodes inornata* LEWIS, mature larva. — A, Bristles of mandible; B, left ventral seta; C, 4th segment of maxillary palpus, dorsal aspect; D, scape and pedicel of right antenna, ventral aspect; E, 2nd and 3rd abdominal segments, dorsal aspect; F, 5th abdominal segment, dorsal aspect.

posterior angles of each thoracic and abdominal segment are longer. Coloration almost brown, except for maxillae, legs and ventral surface of thorax all of which are paler, with black markings on postero-lateral parts of stemmata on head, with two pairs of

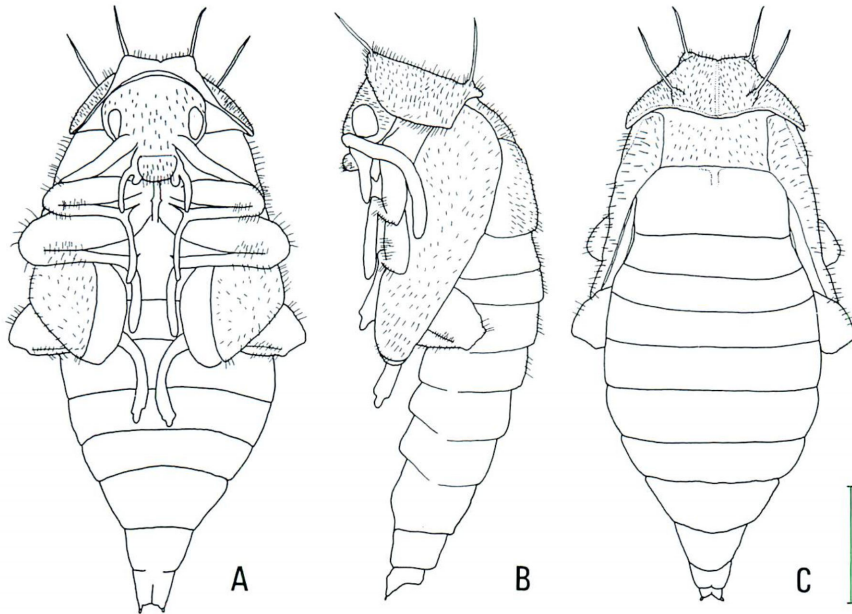


Fig. 10. *Elodes inornata* LEWIS, pupa; A, ventral aspect; B, lateral aspect; C, dorsal aspect. (Scale: 1.0mm.)

fuscous markings on thoracic segments.

Head transverse, with two pairs of setae just behind the base of labrum and in inner areas of stemmata; three pairs of non-melanized stemmata in dorso-lateral area of head, lined up diagonally. Antennae reaching metathorax; scape sparsely covered with some minute setae; pedicel slightly shorter than scape; flagellum 40–52 segmented ($n=4$). Labrum transverse, covered with many long setae on front and lateral margins; epipharynx covered with nine pairs of stout setae on inner margins of ventral lobes, with rather long ventral setae. Mandibles nearly triangular, pointed at apex, with many long feathered bristles bearing in interior area of ventral surface. Maxillary palpi rather short, with some short setae and punctures; approximate ratio of respective segments (1st to 4th) as 6.0 : 5.3 : 4.5 : 1.0. Hypopharynx tricornute at apices of tooth-bristles; a pair of setae on keel-sclerite long, bifid at apex; comb-teeth somewhat short; claw apparatus wide. Thorax widest at posterior margin of mesonotum; pronotum with two pairs of hairy setae on anterior margin and near posterior corners; meso- and metanota with two pairs of hairy setae just before posterior margin, its interior pair very long; legs covered with spinous setae. Abdomen tapering posteriorly; 1st to 5th tergites with two pairs of setae near posterior margin, its interior setae very long and hairy in 1st to 3rd segments; 6th and 7th tergites with a pair of short setae before posterior margin; 8th tergite trapezoidal, with four pairs of short and stout setae and two pairs of long and hairy setae on lateral margin, closely covered with minute setae; 8th

sternite semicircular, with many long setae on lateral margin; 9th tergite bilobed in apical area, with a pair of long apical setae, with short setae on lateral and apical margins; 9th sternite semicircular, with short and long setae on posterior margin, sparsely punctate.

Measurements of larva (n=9). HW: 1.0–1.2 mm; PL: 0.6–0.7 mm; PW: 1.5–1.6 mm; TL: 6.2–7.0 mm; TW: 1.6–1.9 mm.

Pupa. Body oblong, covered with minute spines; pronotal extra spines about 1/8 times as long as TL.

Measurements of pupa (n=5). TL: 3.7–5.1 mm; TW: 1.7–2.1 mm.

Specimens examined. Adult. 54 ♂♂, 48 ♀♀.

[Hokkaido] 4 ♂♂, Toyohirakyô, 4–VI–1979, Y. HIRANO leg. (YH, 1 ♂ genitalia on slides nos. HY 177–178); 1 ♀, Tôya-ko, 22–VI–1994, Y. HIRANO leg. (YH).

[Honshu] (Aomori Pref.) 3 ♂♂, 5 ♀♀, Towada, 3–VI–1960, K. SHIMOYAMA leg. (NWU). (Yamagata Pref.) 2 ♂♂, 1 ♀, Asahi-mura, 20–V–1995, S. SAKURAI leg. (SS); 1 ♀, Gassan, 13–VI–1982, S. SAKURAI leg. (SS); 1 ♀, ditto, 15–VI–1986, S. SAKURAI leg. (SS); 1 ♀, Tsuruoka-shi, 5–V–1987, S. SAKURAI leg. (SS); 1 ♂, Mayasan, 6–V–1990, S. SAKURAI leg. (SS); 1 ♂, 1 ♀, Chôkai-san, 29–V–1989, S. SAKURAI leg. (SS). (Fukushima Pref.) 2 ♀♀, Tateiwa-mura, 27–VI–1992, S. OHMOMO leg.; 2 ♀♀, Azumayama, 18–VI–1995, S. OHMOMO leg. (SO); 1 ♀, Ohmomo, 18–V–1995, M. HORIKAWA leg. (Tochigi Pref.) 3 ♂♂, 1 ♀, Mt. Kôshin, 30–V–1988, H. OHKAWA leg. (TPM, 1 ♀ genit. s. no. HY 185); 1 ♀, Yokokawa, Fujiwara-chô, 20–V–1989, S. OHMOMO leg. (SO); 1 ♂, 3 ♀♀, ditto, 3–VI–1990, S. OHMOMO leg. (SO); 3 ♂♂, 3 ♀♀, ditto, 6–VI–1992, S. OHMOMO leg. (SO, genit. s. no. HY 224); 1 ♀, Kobugahara, 26–V–1991, H. OHKAWA leg. (TPM); 1 ♀, Amemaki-yama, 6–V–1995, S. OHMOMO leg. (SO); 1 ♀, Itamuro, 18–VI–1994, K. SATÔ leg. (TPM). (Niigata Pref.) 1 ♀, Kurokawa, 5–VI–1972, K. BABA leg. (TN). (Nagano Pref.) 1 ♂, Kamikôchi, 23–VI–1951, T. NAKANE leg. (TN); 1 ♂, Kaida-mura, 14–V–1961, S. IMAFUKU leg. (TN); 2 ♂♂, Otari, 4–VI–1994, Y. HIRANO leg. (YH). (Aichi Pref.) 1 ♀, Mennoki-tôge, 13–VI–1989, M. HASEGAWA leg. (TMNH); 1 ♂, ditto, 21–V–1989, M. NAGASE leg.; 1 ♀, ditto, 22–V–1992, N. KANIE leg.; 5 ♂♂, ditto, 30–V–1993, N. KANIE leg.; 1 ♂, ditto, 5–V–1994, H. YOSHITOMI leg. 1 ♂, 1 ♀, ditto, 10–IV–1995, H. YOSHITOMI leg. (s. nos. HY 62–65, 85–87). (Gifu Pref.) 3 ♂♂, 1 ♀, Kishô-dani, 25–IV–1992, K. ISHIDA leg. (genit. s. no. HY 225); 1 ♂, Shiratani, 26–IV–1992, K. FUKUZUMI leg. (genit. s. nos. HY 10–12). (Mie Pref.) 1 ♂, Togashima, 14–V–1988, N. NARUKAWA leg.; 1 ♂, 1 ♀, Chichiga-tani, 5–V–1989, N. NARUKAWA leg. (1 ♀ genit. s. no. HY 184); 3 ♀♀, Ohdai, 11–VI–1995, K. AKITA leg. (genit. s. nos. HY 91–92); 1 ♀, Aoyama-kôgen, 2–VI–1996, H. YOSHITOMI leg. (Nara Pref.) 1 ♂, Kasugayama, 5–V–1951, K. SAWADA leg. (TN); 1 ♀, ditto, 6–VI–1995, H. YOSHITOMI leg. (genit. s. no. HY 183). (Kyoto Pref.) 1 ♂, 3 ♀♀, Serio, 29–V–1954, T. NAKANE leg. (TN); 1 ♀, Hira, 28–V–1956, T. NAKANE leg. (TN). (Okayama Pref.) 2 ♂♂, Onbara, Kamisaibara-son, 16–V–1993, Y. OKUSHIMA leg. (KMNH, Nos. 15315 & 15316).

[Shikoku] (Ehime Pref.) 1 ♀, Mt. Sara, 7–V–1950, M. MIYATAKE leg.; 1 ♂, 1 ♀, ditto, 29–V–1981, Y. SEIYAMA leg.; 1 ♂, Mt. Odami, 8–V–1994, N. OHBAYASHI leg.

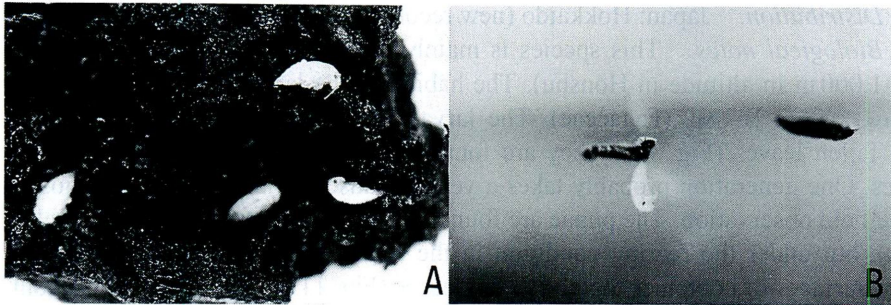


Fig. 11. *Elodes inornata* LEWIS, pupae; A, in the field; B, under the rearing condition.



Fig. 12. Larval habitat of *Elodes inornata* LEWIS, at the Mennoki-tôge, Aichi Pref., 10-IV-1995, photo by H. YOSHITOMI.

(EUM); 1 ♀, ditto, 31-V-1994, E. YAMAMOTO leg.; 1 ♂, ditto, 6-V-1995, K. AITA leg.; 1 ♂, Shiratsue, 11-V-1969, M. SAKAI leg.; 1 ♂, ditto, 3-V-1968, M. SAKAI leg.; 1 ♀, Komenono, 5-V-1976, Y. NOTSU leg.

[Kyushu] [Fukuoka Pref.] 1 ♂, Hiko, 3-V-1982, S. NAKAO leg. (TN). (Ôita Pref.) 1 ♂, Kyûsui-kei, 11-V-1993, S. IMASAKA leg. (Saga Pref.) 7 ♂♂, 2 ♀♀, Hiratani, Mt. Tara, 28-IV-1981, S. IMASAKA leg. (SI).

Larva and pupa. 12 mature larvae and larval skins, 9 pupae (reared from larvae collected on 7-IV-1995), Mennoki-tôge, Aichi Pref., 7 and 10-IV-1995, H. YOSHITOMI leg. (mouth parts of larva on slide no. HY 49; larval skin on slides nos. HY 301-302); 22 mature larvae, ditto, 16-XI-1996, H. YOSHITOMI leg.

Distribution. Japan: Hokkaido (new record), Honshu, Shikoku, Kyushu.

Biological notes. This species is mainly distributed in the mountain zone (ca. 500–1,000 m in altitude in Honshu). The habitat of the larvae is in a natural forest of *Fagus crenata* BLUME (Fagaceae). The larvae live in upperstreams densely covered with fallen leaves (Fig. 12). They are found sticking to the under surfaces of fallen leaves. One generation probably takes a year, because the larval stage is almost equal in the field observation. The pupae are found in very damp rotten trees in the field (Fig. 11 A), but under the rearing condition in the room, the pupation takes place on the under surfaces of container top and fallen leaves (Fig. 11 B). Pupal period is about 6–7 days under the room temperature. The adults occur from late April to June, and are sometimes collected from maple flowers of *Acer* spp. (Aceraceae).

Remarks. This species is easily discriminated from the other Japanese species of the *marginata* species-group by the small body and distinct concavities on the pronotum.

Elodes wilsoni PIC

[Japanese name: Kuro-maruhananomi]

(Figs. 2 B & C, 4 B, 5 B, 13–15, 20 B)

Elodes wilsoni PIC, 1918, Mém. Exot.-Ent., **29**: 17 (Type: Japan, Kioto, in Muséum National d'Histoire Naturelle, Paris ?, not examined).

Elodes sp.: HAYASHI, 1957, Akitu, Kyoto, **6**: 47, figs. 2 a–g, 5 a–b [description of larva and pupa].

Sarbandus monticola NAKANE, 1963, Icon. Ins. Japon. Col. nat. ed., **2**: 140, pl. 70, fig. 19 (Type: Yumoto, Nikko, in TN, examined, Fig. 2 B & C). — SATÔ, 1985, Coleopt. Japan Col., Osaka, **2**: 424. *Syn. nov.*

Adult. Body oval, moderately convex, shining, closely covered with yellowish white hairs. Vertex black; frons and clypeus yellow in male, brownish black to black in female; mouth parts yellowish brown, but somewhat darker in female; 1st antennal segment yellow in male, brownish black in female; 2nd to 11th antennal segments brownish black, but the 2nd to 7th antennal segments are paler in male; pronotum black, except for anterior and lateral margins, which are widely yellow in male, narrowly yellowish brown in female; scutellum black; elytra black, but sometimes becoming yellowish brown; ventral surface of body black, except for pale 7th abdominal sternite; fore and mid legs of male yellowish brown, with dusky tarsi and distal parts of femora; hind legs of male brownish black; female legs brownish black.

Head covered with minute punctures. Eyes moderate in size, weakly prominent in male, lightly prominent in female; the distance between eyes about 3.3 times the diameter of an eye in male, 2.6 times in female. Clypeus somewhat enlarged antero-laterally; front margin almost straight. Labrum transverse, closely covered with long hairs. Antennae moderate in length, reaching about proximal 1/4 of elytra, a little longer and broader in male, lightly serrate in 4th to 10th segments of male; approximate ratio of antennal segments as 3.4:2.4:1.0:4.2:3.9:4.2:4.1:4.1:3.9:3.6:4.2 in male (n=4,

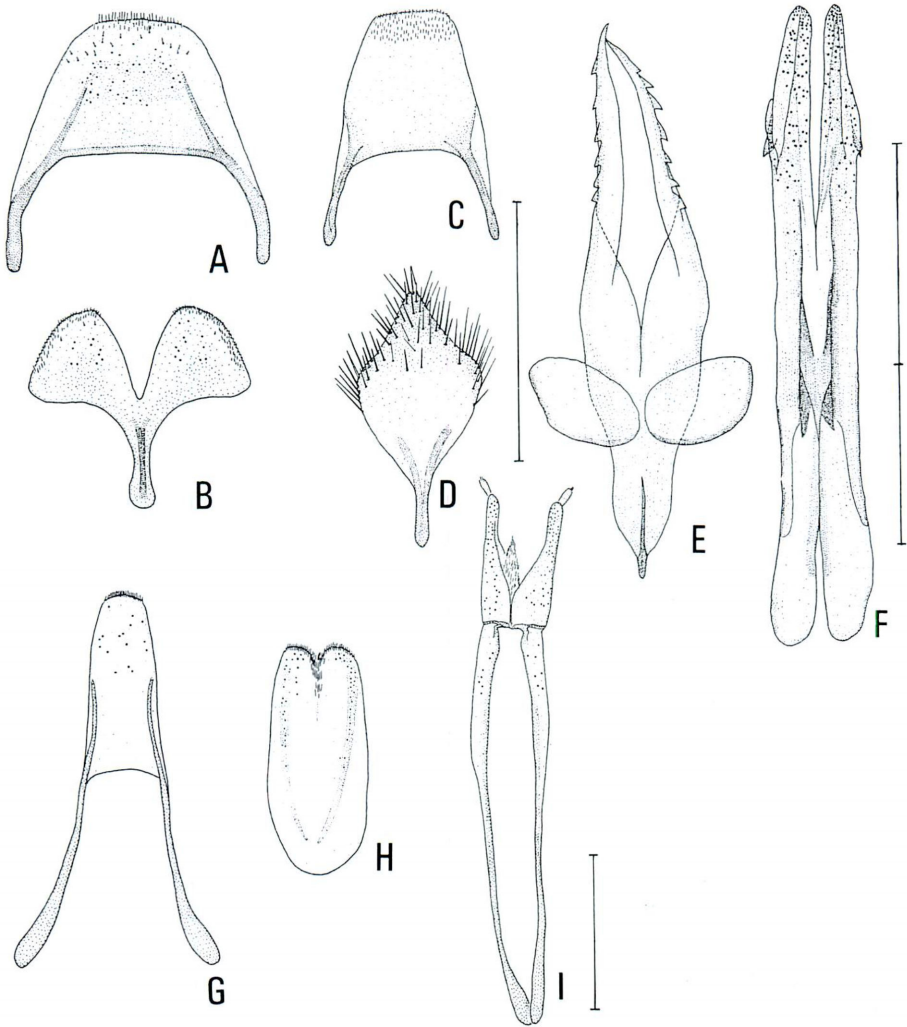


Fig. 13. *Elodes wilsoni* Pic. — A-F: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen; F, penis. — G-I: Female genitalia; G, 8th tergite; H, 8th sternite; I, ovipositor. (Scales: 0.5 mm.)

mean) and 3.4:2.3:1.0:3.6:3.3:3.5:3.2:3.1:3.2:2.9:3.5 in female (n=3, mean). Pronotum semicircular, broadest at the base, finely and sparsely punctate; PW/PL 1.5–1.8 (1.6) in male and 1.7–2.3 (1.9) in female. Scutellum punctate same as in pronotum. Elytra oval, broadest a little before the middle, punctate as in *E. inornata*; EL/EW 1.5–1.7 (1.6) in male and 1.4–1.7 (1.5) in female; EL/PL 3.2–3.9 (3.5) in male and 3.5–5.0 (4.0) in female; EW/PW 1.2–1.5 (1.4) in male and 1.2–1.5 (1.4) in female; TL/EW 2.0–2.2 (2.1) in male and 1.8–2.1 (1.9) in female. Ventral surface of the body closely

covered with fine punctures. Legs rather long.

Male. Apical margin of 7th abdominal sternite shallowly concave, the concavity corrugated. Eighth tergite trapezoidal, covered with minute spines on apical margin and minute setae in apical area; 8th sternite ginkgo-leaf shaped, covered with minute spines on apical and lateral margins, with some minute setae and punctures in apical areas, broader in posterior notch than that of *E. inornata*; 9th tergite trapezoidal, covered with minute spines in apical part, with a pair of short apodemes; 9th sternite oblong, covered with long setae in apical part. Tegmen bifid in about 1/2 (parameres), with pointed apices; lateral margins of parameres serrate continuously. Penis about 0.75 mm in length, covered with fine punctures in about apical 1/3, bifid in about apical 2/5 (parameroids), rounded at apices, with a pair of small hooks at about apical 3/5 of lateral margins of parameroids; dorso-proximal margin deeply concave; ventro-proximal margin deeply notched.

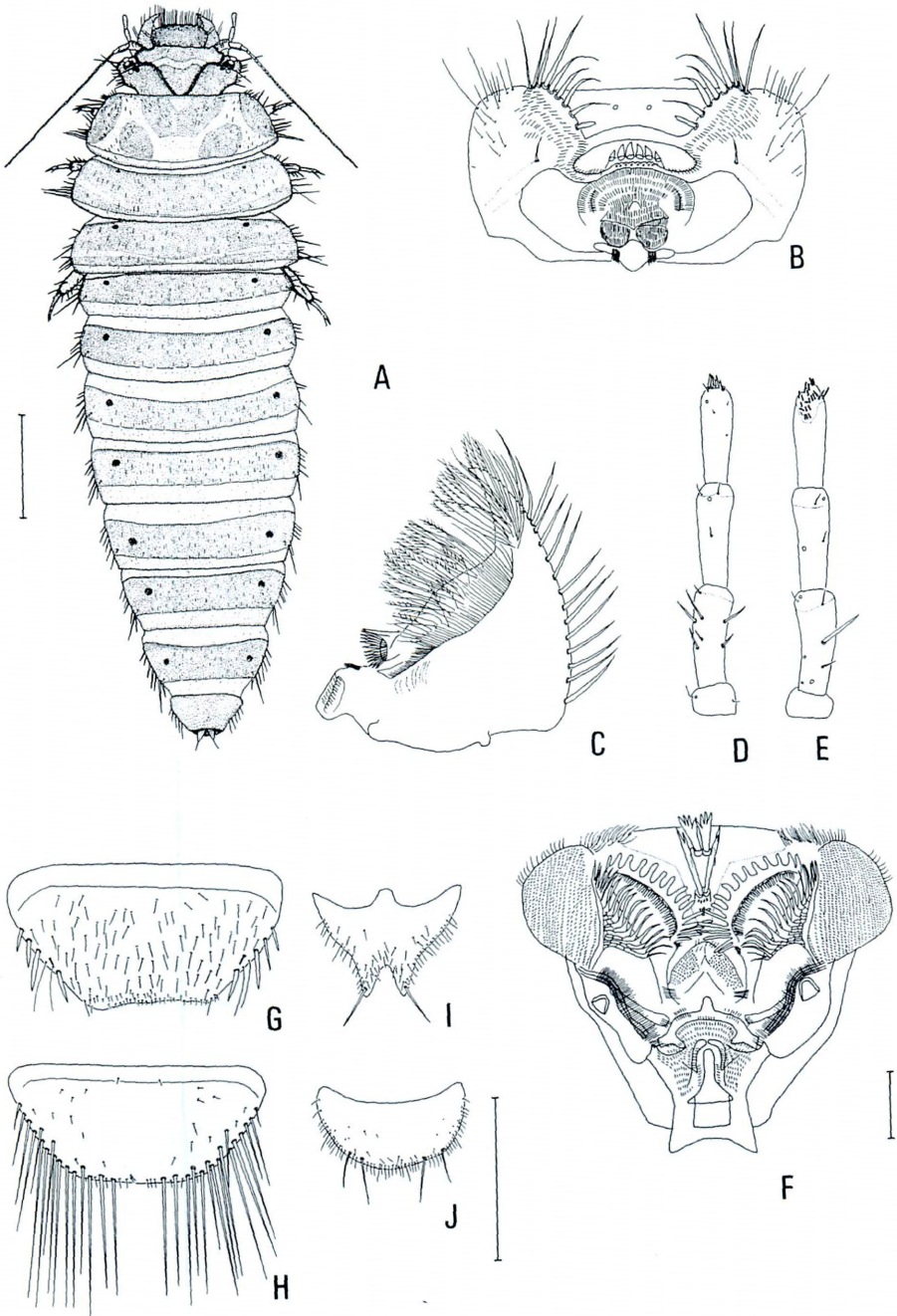
Female. Apical margin of 7th abdominal sternite almost straight. Eighth tergite moderately sclerotized, elongated trapezoidal, with a pair of long and stout apodemes, covered with short spines at apical margin; 8th sternite weakly sclerotized, oblong, covered with fine punctures in posterior part, notched at apical margin which is covered with short spines. Ovipositor elongated; stylus with two apical setae; coxite and baculus long, punctate finely and sparsely; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=2, mean):— 1.0 : 6.7 : 22.5.

Measurements of adult. Male (n=20). TL: 3.8–4.5 (4.3) mm; EW: 1.8–2.2 (2.1) mm; PL: 0.8–1.0 (0.9) mm; EL: 3.0–3.5 (3.3) mm; PW: 1.4–1.7 (1.6) mm. Female (n=20). TL: 3.6–4.8 (4.5) mm; EW: 1.7–2.6 (2.3) mm; PL: 0.7–1.0 (0.9) mm; EL: 2.9–3.8 (3.6) mm; PW: 1.3–1.8 (1.7) mm.

Mature larva. Body covered with short setae on dorsal surface, with short stout setae on lateral margins of body. Coloration almost brown, but the maxillae, legs and ventral surface of thorax are paler; pale part of pronotum conspicuous in living individuals.

Head transverse, with a pair of rather long setae in inner area of stemmata; three pairs of stemmata in dorso-lateral areas of head lined up diagonally. Antennae reaching mesothorax; scape strongly curved posteriad; pedicel slightly shorter than scape; flagellum long, 34–51 segmented (n=5). Labrum strongly transverse, covered with long setae on dorsal surface; epipharynx lightly protruding anteriad in ventral lobes which have nine pairs of stout setae on anterior margins, with rather long ventral setae. Maxillary palpi rather long, slender; 1st segment with some short setae on dorsal surface; 3rd segment bearing sensory organs in apical areas of ventral surface; 4th segments very short, indistinct in ventral aspect; approximate ratios of respective segments as

Fig. 14. *Elodes wilsoni* PIC, mature larva. — A, Dorsal aspect (scale: 1.0 mm). — B–F: Mouth parts (scale: 0.1 mm); B, labrum, ventral aspect; C, left mandible, ventral aspect; D, left maxillary palpus, dorsal aspect; E, ditto, ventral aspect; F, hypopharynx. — G–J: Abdominal segments (scale: 0.5 mm); G, 8th tergite; H, 8th sternite; I, 9th tergite; J, 9th sternite.



(1st to 4th) 8.0:8.5:7.5:1.0. Mandibles and hypopharynx very similar to those of *E. inornata*. Thorax widest at posterior margin of metanotum, lacking extra setae on dorsum. Abdomen with a pair of short spinous setae near postero-lateral corners of 1st to 7th segments. Eighth and 9th tergites and sternites similar to those of *E. inornata*, but the 8th and 9th tergites are somewhat broader and the hairy setae on the lateral margins of the 8th tergite are shorter.

Measurements of larva (n=6). HW: 1.0–1.2 mm; PL: 0.7–0.8 mm; PW: 1.7–1.8 mm; TL: 6.0–6.6 mm; TW: 2.0–2.1 mm.

Pupa. See HAYASHI (1957). TL is about 4.3 mm.

Specimens examined. Adult. 58 ♂♂, 55 ♀♀.

[Honshu] (Aomori Pref.) 1 ♂, Towada, 3–VI–1960, K. SHIMOYAMA leg. (NWU). (Yamagata Pref.) 2 ♀♀, Chôkai-san, 5–V–1938, K. SHIRAHATA leg. (TN); 1 ♂, ditto, 30–V–1987, S. SAKURAI leg. (SS); 3 ♂♂, 2 ♀♀, Mokari-yama, 3–V–1990, S. SAKURAI leg. (2 ♂♂ and 1 ♀ genitalia on slides No. HY 116–121); 1 ♀, ditto, 13–V–1990, S. SAKURAI leg. (SS). (Miyagi Pref.) 1 ♀, Akyu, 16–V–1954, Y. HIRANO leg. (YH); 1 ♀, Ohtakigawa, 5–VI–1978, M. TOMOKUNI leg. (Fukushima Pref.) 2 ♂♂, Eda, 13–V–1984, S. TSUYUKI leg. (NWU). (Tochigi Pref.) 1 ♀, Yokokawa, Fujiwara-chô, 11–VI–1994, S. OHMOMO leg. (SO); 1 ♀, Nakamiyori, 20–V–1989, S. TSUYUKI leg. (NWU); 1 ♂, Kuriyama-mura, 27–V–1989, K. ONDA & H. OHKAWA leg. (TPM); 1 ♀, Shiobara, 14–V–1988, S. OHMOMO leg. (TPM); 1 ♀, Shitashiobara, 20–V–1995, S. OHMOMO leg. (genit. s. no. HY 303); 2 ♀♀, Yumoto, Oku-Nikko, 20–VI–1960, T. NAKANE leg. (TN); 1 ♀ designated as the holotype of *E. monticola* NAKANE, 1963); 1 ♂, ditto, 17–VI–



Fig. 15. Larval habitat of *Elodes wilsoni* PIC, at Shiokawa, Nagano Pref., 6–XI–1994, photo by H. YOSHITOMI.

1990, H. YOSHITOMI leg.; 2 ♂♂, Yukawa, Nikkô, 27-V-1946, KISHII leg. (TN); 1 ♀, Itamuro, 29-V-1994, K. SATÔ leg. (TPM); 1 ♀, Keichô-kantaku, 26-V-1991, K. SATÔ leg. (TPM, genit. s. no. HY 115); 1 ♂, 1 ♀, Ozaku-san, 12-V-1963, S. SAKURAI leg. (SS); 1 ♂, Yoshû, 4-V-1989, H. YOSHITOMI leg.; 1 ♀, ditto, 14-V-1989, H. YOSHITOMI leg. (TPM); 1 ♂, ditto, 30-IV-1990, H. YOSHITOMI leg. (Ibaraki Pref.) 2 ♀♀, Okamisatomi, 28-V-1988, Y. HIRANO leg. (YH); 1 ♀, Okuzono, 25-V-1986, S. TSUYUKI leg. (NWU); 1 ♀, Kameyajii, 2-VI-1986, S. OHMOMO leg. (SO). (Saitama Pref.) 1 ♀, Urayama-dani, 3-V-1986, S. TSUYUKI leg. (NWU). (Kanagawa Pref.) 4 ♀♀, Ishizareyama, 6-V-1990, Y. HIRANO leg. (YH); 1 ♀, Tanzawa, 1-V-1968, Y. HIRANO leg. (YH); 1 ♂, 1 ♀, ditto, 4-V-1970, Y. HIRANO leg. (YH); 1 ♀, ditto, 18-V-1986, Y. HIRANO leg. (YH); 1 ♂, ditto, 4-V-1987, Y. HIRANO leg. (YH); 1 ♂, ditto, 5-V-1993, Y. HIRANO leg. (YH); 1 ♀, ditto, 20-V-1993, Y. HIRANO leg. (YH); 1 ♀, ditto, 10-V-1994, Y. HIRANO leg. (YH); 3 ♀♀, Hakone, 1-V-1974, Y. HIRANO leg. (YH). (Niigata Pref.) 1 ♂, Kuramitsu, 3-V-1963, K. BABA leg. (TN); 3 ♂♂, Kurokawa, 10-V-1966, K. BABA leg. (TN). (Yamanashi Pref.) 1 ♀, Ushiroyama-gawa, 3-V-1982, S. TSUYUKI leg. (NWU); 1 ♂, 2 ♀♀, Daibosatsu, 24-V-1969, K. MASUMOTO leg. (NWU, 1 ♀ genit. s. nos. HY 230-231). (Nagano Pref.) 1 ♀, Misuzu-ko, 4-V-1983, K. FUKUZUMI leg.; 2 ♂♂, 3 ♀♀, Fujimidai, 5-V-1955, T. KUBOTA leg. (NWU); 1 ♂, Shiokawa, Ohshikamura, 21-V-1994, H. YOSHITOMI leg.; 2 ♀♀, Kaida, 14-V-1961, S. IMAFUKU leg. (TN); 1 ♀, ditto, 7-V-1963, S. IMAFUKU leg. (TN); 2 ♂♂, Kisofukushima, 4-V-1994, H. YOSHITOMI leg.; 2 ♀♀, ditto, 14-V-1994, H. YOSHITOMI leg. (Shizuoka Pref.) 1 ♀, Sugio, 24-V-1986, M. SATÔ leg. (NWU); 1 ♂, Ikadaba-rindô, 1-V-1988, S. TSUYUKI leg. (NWU, genit. s. nos. HY 214-215). (Aichi Pref.) 1 ♀, Uradani, 11-VI-1995, H. YOSHITOMI leg. (TMNH). (Gifu Pref.) 1 ♀, Uchibami-dani, 1-VII-1973, Y. HORI leg. (NWU); 1 ♂, Shiratani, 26-IV-1992, K. FUKUZUMI leg.; 11 ♂♂, Kishô-dani, 3-V-1994, H. NAKANO leg. (genit. s. nos. HY 13-15); 12 ♂♂, ditto, 2-V-1995, H. YOSHITOMI leg. (9 ♂♂ genit. & antennae on slides nos. HY 38, 81-84, 216-223, 232-233). (Mie Pref.) 1 ♀, Ohdaigahara, 11-VI-1995, K. AKITA leg. (Okayama Pref.) 1 ♂, 1 ♀, Onbara, Kamisaibara-son, 16-V-1993, Y. OKUSHIMA leg. (KMNH, Nos. 15313 & 15314); 1 ♀, Shinjô, Notoro, 25-V-1963, H. OHNO leg. (TN). (Hiroshima Pref.) 3 ♂♂, Juppô-zawarindô, 23-V-1988, S. IMASAKA leg.

[Shikoku] (Tokushima Pref.) 1 ♂, Higashiiyayama, 21-V-1993, Y. OKUSHIMA leg. (KMNH, No. 15790).

[Kyushu] (Fukuoka Pref.) 1 ♂, Mt. Shoji, 3-V-1963, S. NAKAO leg. (TN). (Ôita Pref.) 2 ♀♀, Mt. Kurodake, 16-V-1989, S. IMASAKA leg. (SI); 1 ♂, ditto, 23-V-1995, S. IMASAKA leg.

Larva and pupa. 3 mature larvae and 4 larval skins, 2 pupae, Mt. Takao (near Biwadaki), Tokyo Pref., 10-V-1957, N. HAYASHI leg. (reported by HAYASHI, 1957: *Elodes* sp.); 1 mature larva, Shiokawa, Nagano Pref., 5-XII-1993, H. YOSHITOMI leg. (s. nos. HY 60-61); 20 mature larvae, ditto, 6-XI-1994, H. YOSHITOMI leg.; 20 mature larvae, Danto-gawa, Aichi Pref., 17-XI-1996, A. SHIRAGANE & H. YOSHITOMI leg.; 3 mature larvae, Odagi-gawa, Aichi Pref., 17-XI-1996, A. SHIRAGANE & H. YOSHITOMI

leg.

Distribution. Japan: Honshu, Shikoku (new record), Kyushu (new record).

Biological notes. This species mainly live in the mountain zone (ca. 500–1,000 m in altitude, in Honshu). The larvae are obtained from a clear stream (Fig. 15). They are found out from the under surface of fallen leaves in standing waters. HAYASHI (1957) reported that the larvae were collected from a basin of waterfall, the pupae were observed in rotten woods on the ground, and pupal period was 6 days under 20°C.

The adults generally occur in May and June, and are mainly collected from a flower of *Acer* spp. (Aceraceae) with *E. inornata*. The male is attracted to light (e.g., collected by a light trap at Kishô-dani, Gifu Pref., on 3 May 1994 and 2 May 1995).

Remarks. Judging from the body length and punctures on the pronotum in the original description of *E. wilsoni*, I regarded *Sarabandus monticola* NAKANE, 1963 as a junior synonym of this species.

The larva is similar to that of *E. inornata*. The different points are as follows: body broader; hairy long setae lacking on dorsal surface of body; dorsal surface of body covered with longer setae; spinous setae on lateral margins of body shorter; labrum strongly transverse, slightly projecting anteriorly in ventral lobes; maxillary palpi slender, with indistinct 4th segment.

The average length of body of this species is the largest of the Japanese members of the *marginata* species-group. In contrast, the male genitalia are the smallest of them (largest in *E. scapularis*).

Elodes scapularis LEWIS

[Japanese name: Kyushu-kuro-maruhananomi (new Japanese name for Kyushu-kimune-maruhananomi)]
(Figs. 2 D, 3 B, 4 C, 5 C, 16, 20 B)

Helodes scapularis LEWIS, 1895, 107 (Type: Japan, Nagasaki, in British Museum, London, not examined, Fig. 3 B). — KLAUSNITZER, 1974, Ent. Nachr., Dresden, **18**: 21, figs. 36–41 [redescription]; 1974, Zool. Jb. Syst., **101**: 479 [phylogeny].

Elodes scapularis: PIC, 1914, Coleopt. Cat., (58): 26.

Male adult. Body oval, moderately convex, shining, closely covered with yellowish white hairs. Head brownish black; mouth parts and 1st to 5th antennal segments brown, but dorsal surface of 1st and 5th antennal segments somewhat darker; 6th to 11th antennal segments brownish black; pronotum, scutellum and elytra brownish black; a pair of yellowish brown markings on humeral angles of elytra vague, reaching about proximal 1/4 of elytra; ventral surface of body black; fore legs brown except for dusky interior margin of femur; mid and hind legs brownish black, but proximal areas of femora paler.

Head slightly convex, sparsely covered with fine punctures. Clypeus finely punctate; front margin somewhat concave. Labrum transverse, closely covered with long hairs. Eyes moderate in size, lightly prominent; the distance between eyes about 3.2

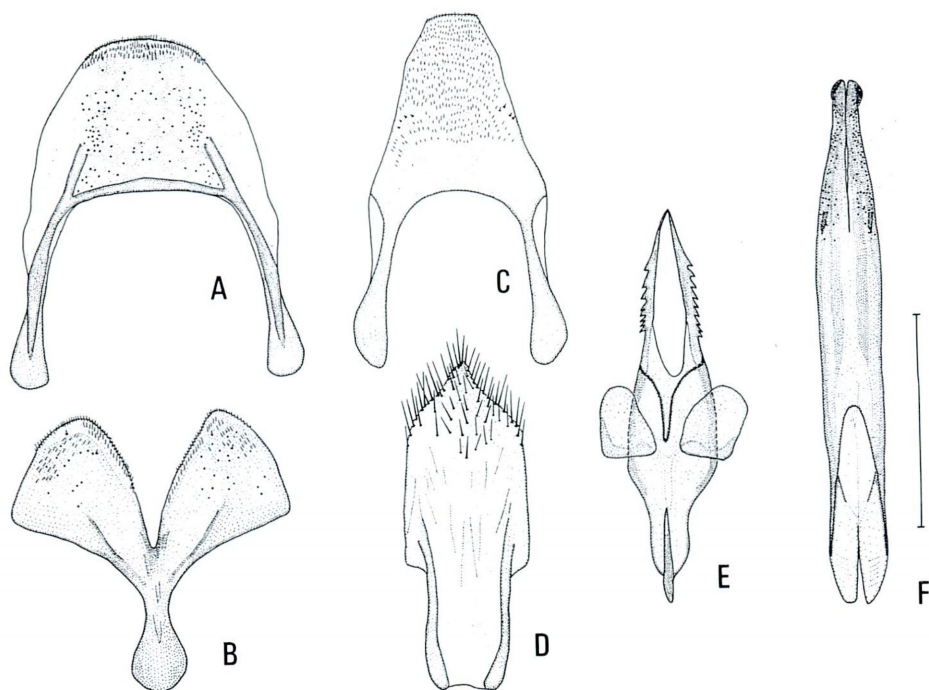


Fig. 16. *Elodes scapularis* LEWIS, male genitalia. — A, Eighth tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen; F, penis. (Scale: 0.5 mm.)

times as long as the diameter of an eye. Antennae moderate in length, reaching about proximal 1/3 of elytra; approximate ratio of antennal segments as 3.0 : 1.6 : 1.0 : 3.4 : 3.3 : 3.3 : 3.0 : 3.0 : 2.9 : 2.6 : 3.3 (n=1). Pronotum semicircular, broadest a little before the base, punctate finely and sparsely; PW/PL 1.5. Scutellum sparsely covered with fine punctures. Elytra oval, broadest at the middle, punctate as in *E. inornata*; EL/EW 1.4; EL/PL 2.8; EW/PW 1.3; TL/EW 1.9. Ventral surface of body closely covered with fine punctures and short hairs. Legs moderate in length.

Apical margin of 7th abdominal sternite deeply concave. Eighth tergite semicircular, covered with minute spines in apical area and punctures in interior area, with a pair of stout apodemes; 8th sternite ginkgo-leaf shaped, with minute spines on apical margin, sparsely covered with punctures and setae in apical area; 9th tergite trapezoidal, covered with minute spines in caudal area, with some minute setae near the middle of lateral margin, with a pair of strong apodemes; 9th sternite oblong, densely covered with long setae in caudal 1/3. Tegmen bifid in about apical 2/5 (parameres), with pointed apices, serrate in about apical 3/10 to 7/10 of lateral margins of parameres. Penis about 1.2 mm in length, bifid in about apical 1/3 (parameroids); parameroids punctate, rounded and curved ventrally in apices, with a pair of hooks near the bases of lateral margins of parameroids; dorso-proximal margin deeply notched; ventro-proxi-

mal margin narrowly notched.

Measurements. Male (n=1). TL: 3.8 mm; EW: 2.0 mm; PL: 1.0 mm; EL: 2.8 mm; PW: 1.5 mm.

Female and immature stages unknown.

Specimens examined. 2 ♂♂.

[Honshu] (Hiroshima Pref.) 1 ♂, Yoshiwa, Aki, Nakatsuya, 4-V-1968, J. SAWANO leg.

[Kyushu] (Ōita Pref.) 1 ♂, Handa-kôgen, 16-V-1989, R. & S. IMASAKA leg. (ant. s. no. HY 306, genit. s. nos. HY 308-310).

Distribution. Japan: Honshu (new record), Kyushu.

Biological notes. The collecting sites of the specimens recorded above are in the mountain zone. The other biological information is not available.

Remarks. This species resembles *E. wilsoni* in the body length and appearance, but is easily distinguished from it by the markings on the elytra and the shape of the tegmen and penis. In addition, the coloration of frons and clypeus and the shape of apical margin of the 7th sternite clearly separate the males of these two species.

Group of *Elodes minuta*

This species-group is characterized by the following features: body slender; antennae and legs long; parameres lacking distinct serra; apices of penis rather pointed; 8th and 9th tergites rod-like in some species. In addition to these characters, the 6th tergite lacks apodemes in the two Japanese species, and most species of the species-group have a well sclerotized prehensor, which provides a good taxonomic character for identification of the female (NYHOLM, 1984).

Elodes elegans YOSHITOMI, sp. nov.

[Japanese name: Hoso-ki-maruhananomi]

(Figs. 2 E & F, 4 D, 5 D, 17, 20 C)

Elodes sp.: SATOU, 1975, Gekkan-mushi, Tokyo, (48): 31.

Adult. Body oblong, slightly convex, closely covered with yellowish white hairs. Head yellowish brown, but vertex darker; mouth parts, antennae, pronotum and scutellum yellowish orange, but the 4th to 11th antennal segments and the anterior area of the pronotum are sometimes dusky; elytra with two types of color variations, yellowish orange (same color as pronotum) or brownish black, but often yellowish orange along elytral suture; legs and ventral surface of body yellowish orange, but sometimes dusky in hind legs and ventral surface of body.

Head slightly convex, punctate finely and sparsely. Clypeus rather long, with almost straight front margin. Labrum slightly wider than long, closely covered with long hairs. Eyes large, strongly prominent, larger in male than in female; the distance between eyes about 1.2 times as long as the diameter of an eye in male, 1.8 times in fe-

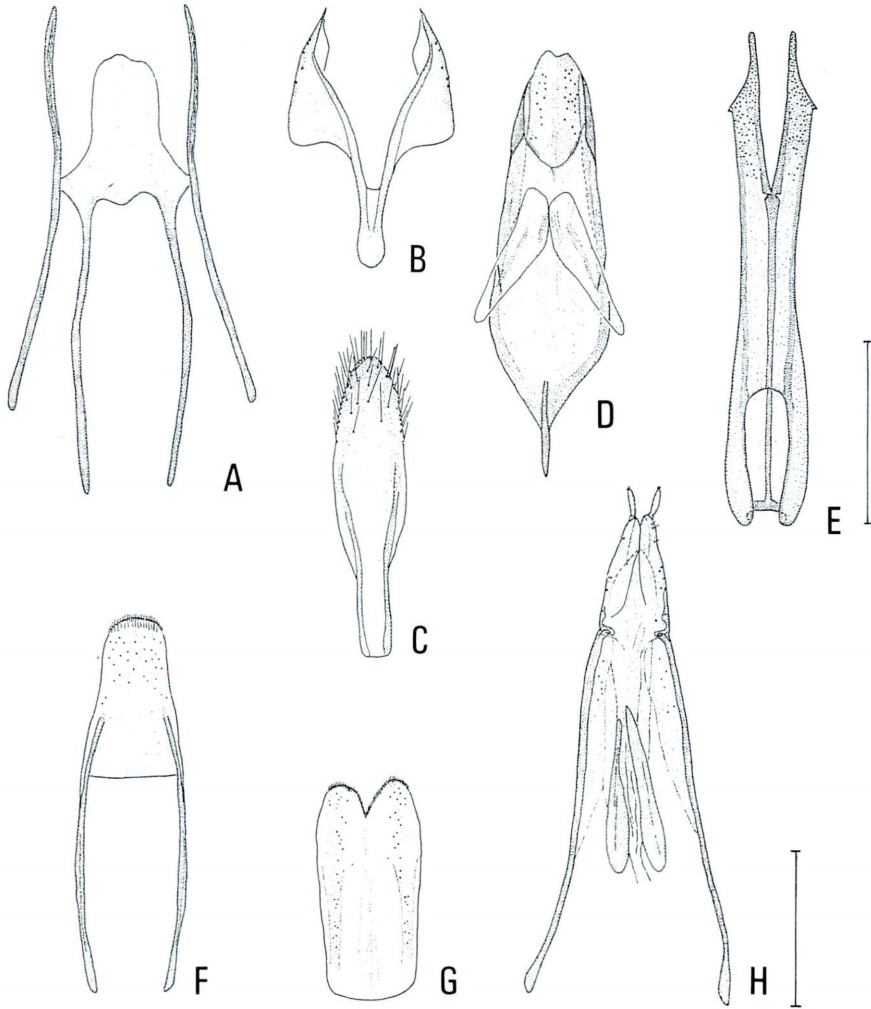


Fig. 17. *Elodes elegans* sp. nov. — A–E: Male genitalia, in a paratype; A, 8th and 9th tergites; B, 8th sternite; C, 9th sternite; D, tegmen; E, penis. — F–H: Female genitalia, in a paratype; F, 8th tergite; G, 8th sternite; H, ovipositor. (Scales: 0.5 mm.)

male. Antennae very long, reaching about proximal 5/8 of elytra, a little longer in male than in female; approximate ratio of antennal segments as 7.5 : 3.0 : 1.0 : 14.5 : 12.0 : 12.0 : 12.0 : 11.5 : 11.0 : 9.5 : 11.0 in male (n=1, paratype) and 5.0 : 2.7 : 1.0 : 7.7 : 6.7 : 7.0 : 7.0 : 6.7 : 6.3 : 5.7 : 7.0 in female (n=1, paratype). Pronotum lightly elongated semicircular, broadest a little before the base; PW/PL 1.4–1.6 (1.5) in male and 1.4–1.6 (1.5) in female. Scutellum punctate finely and sparsely. Elytra oblong, subparallel-sided near base to basal 2/3, punctate closely and distinctly; EL/EW 1.7–1.9 (1.8) in male and 1.6–1.8 (1.8) in female; EL/PL 3.3–3.9 (3.7) in male and 3.5–4.0 (3.8) in fe-

male; EW/PW 1.3–1.4 (1.4) in male and 1.4–1.5 (1.4) in female; TL/EW 2.2–2.4 (2.3) in male and 2.0–2.3 (2.2) in female. Legs very long; hind legs longer than the others.

Male. Apical margin of 7th abdominal sternite deeply concave. Eighth tergite long, rod-like (“hemitergites” in YOUNG & STRIBLING, 1990), pointed at apex, with oblique carinae in apical 1/3 of ventral surfaces; 8th sternite Y-shaped, pointed at apex, with some minute setae in postero-lateral areas of arms; 9th tergite widely membranous in caudal area, with a pair of long and well sclerotized apodemes protruding from anterior angles, almost of the same length as 8th tergite; 9th sternite oblong, covered with long setae in caudal area. Tegmen oblong, with a more heavily sclerotized plate protruding dorsally from about basal 1/3; parameres simple, more heavily sclerotized, lightly curved dorsad on both sides; internal surface of caudal opening sparsely punctate; apex rounded, shallowly concave; a pair of lightly sclerotized plates present on dorsal surface, about 0.5 times as long as tegmen. Penis long, bifid in about apical 1/4 (parameroids), subparallel-sided from basal 1/2 to 7/8, widened lightly from basal 1/2 to near base, broadest a little before the base; parameroids with a pair of small hooks at the middle of lateral margins, tapering from connecting points of hooks to apices, which are relatively rounded; median line more heavily sclerotized than the other parts; dorso-proximal margin widely concave to about basal 1/4; ventro-proximal margin shallowly concave.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite weakly sclerotized, elongated trapezoidal, covered with punctures in posterior area, with minute spines on posterior margin; 8th sternite weakly sclerotized, oblong, punctate sparsely, notched at posterior margin which is covered with minute spines. Ovipositor long; coxite and baculus sparsely covered with minute setae and punctures; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=1, in paratype):—1.0:4.1:12.8; prehensor well sclerotized, consisting of a pair of elongated elliptical plates, its length being about 0.5 times as long as baculus.

Measurements. Male (n=6). TL: 3.8–4.6 (4.1) mm; EW: 1.6–2.0 (1.8) mm; PL: 0.8–1.0 (0.9) mm; EL: 3.0–3.6 (3.2) mm; PW: 1.2–1.4 (1.3) mm. Female (n=6). TL: 3.6–4.9 (4.4) mm; EW: 1.8–2.2 (2.0) mm; PL: 0.8–1.0 (0.9) mm; EL: 2.8–3.9 (3.5) mm; PW: 1.3–1.5 (1.4) mm.

Immature stages unknown.

Specimens examined. 1 ♂ holotype and 12 ♂♂, 12 ♀♀ paratypes.

Holotype: ♂, Mennoki-tôge, Aichi Pref., 26–VI–1992, N. KANIE leg.

Paratypes: [Honshu] (Chiba Pref.) 1 ♂, Mt. Kiyosumi, 24–V–1976, M. TOMOKUNI leg. (Shizuoka Pref.) 1 ♂, Hinata, 9–V–1990, H. ISHIKAWA leg.; 1 ♂, Abe Pass, 8–VI–1991, S. TSUYUKI leg. (genit. s. nos. HY 31–32). (Aichi Pref.) 2 ♀♀, same locality as for the holotype, 26–VI–1992, N. KANIE leg.; 1 ♀, Jôkôji, 4–VI–1967, T. HOZUMI leg. (NWU). (Mie Pref.) 1 ♀, Ôsugidani, 13–VI–1952, TAKEUCHI leg. [Shikoku] (Tokushima Pref.) 1 ♂, Mt. Tsurugi, 7–VI–1970, M. TOMOKUNI leg. (EUM). (Kagawa Pref.) 1 ♂, Mt. Zouzu-san, 27–VI–1973, M. SATOU leg. (Ehime Pref.) 1 ♂, Odamiyama, 27–VI–1972, M. SAKAI leg. (EUM); 1 ♀, ditto, 12–VI–1994, N. OHBAYASHI leg. (genit.

s. no. HY 300). (Kôchi Pref.) 1 ♂, Sasayama, 27-V-1979, K. SASAGAWA leg.(EUM). [Kyushu] (Fukuoka Pref.) 1 ♀, Mt. Hiko, 7-VII-1957, M. MIYATAKE leg.; 1 ♂, Inugatake, 29-V-1974, Y. TAKAKURA leg.; 1 ♀, Mt. Shoji, 14-VI-1969, S. NAKAO leg. (Saga Pref.) 2 ♂♂, 3 ♀♀, Hiratani, Mt. Tara, 2-VI-1981, S. IMASAKA leg. (2 ♂♂ genit. s. nos. HY 263-265, 307; 1 ♀ s. nos. HY 251-256; 1 ♀ genit. s. nos. HY 304-305). (Nagasaki Pref.) 1 ♂, Mt. Kunimi, 16-VI-1950, T. SHIRÔZU leg. (Ôita Pref.) 1 ♂, Kyûsui-kei, Kokonoe-town, 11-V-1993, S. IMASAKA leg. (Miyazaki Pref.) 1 ♀, Kaedakeikoku, 28-V-1972, A. NAGAI leg. (Kagoshima Pref.) 1 ♀, Mt. Inaodake, 31-V-1992, S. TSUYUKI leg.

Distribution. Japan: Honshu, Shikoku, Kyushu.

Biological notes. Biological information is very scarce. The adults are collected from the basal zone to the mountain zone (ca. 200-1,000 m in altitude, in laurel and deciduous broadleaved forests) in May to July. SATOU (1975) reported that this species was obtained at a light trap.

Remarks. This species is closely related to *E. miaoershanensis* YOSHITOMI et M. SATÔ, 1997 described from South China and *E. rufotestacea* KLAUSNITZER, 1976 from Bhutan in the characteristics of the rod-like 8th tergite. It is, however, clearly distinguished from these species by the conformation of tegmen and penis.

Elodes kojimai NAKANE

[Japanese name: Munemon-maruhananomi]

(Figs. 2G-I, 4E, 5E, 18, 19, 20C)

Elodes kojimai NAKANE, 1963, Icon. Ins. Japon. Col. nat. ed., **2**: 140, pl. 70, fig. 20 (Type: Tokachi-mitsumata, in TN, examined, Figs. 10 & 11).

Helodes kojimai: SATÔ, 1985, Coleopt. Japan Col., Osaka, **2**: 421, pl. 77, fig. 5.

Flavohelodes nigrata KLAUSNITZER, 1982, Pol. Pismo Ent., **52**: 275, fig. 1-7 (Type: Kunashir, in Zoological Institute St. Petersburg, not examined). *Syn. nov.*

Helodes ohbayashii M. SATÔ, 1985, Trans. Shikoku ent. Soc., **17**: 55 (Type: Lake Onneto, Hokkaido, in NWU, examined, Fig. 2I); 1985, Coleopt. Japan Col., Osaka, **2**: 424, pl. 77, fig. 31. *Syn. nov.*

Adult. Body oblong, slightly convex, closely covered with yellowish white hairs. Head black, but clypeus somewhat paler; mouth parts yellowish brown, but sometimes darker; 1st to 4th antennal segments brownish black to yellowish brown, variable in color, but the 3rd antennal segment is always yellowish brown; 5th to 11th antennal segments brownish black; pronotum brownish black, but frequently colored widely with yellowish brown on lateral and anterior margins; scutellum brownish black; elytra and legs yellowish brown to brownish black, variable in color, but proximal part of elytra mostly paler than the other part; ventral surface of body brownish black, except for proximal area of elytral epipleura and apical end of 7th sternite brown, with yellowish brown pronotal hypomeron in the case that the lateral margins of pronotum are yellowish brown.

Head slightly convex, punctate finely and sparsely. Clypeus with almost straight

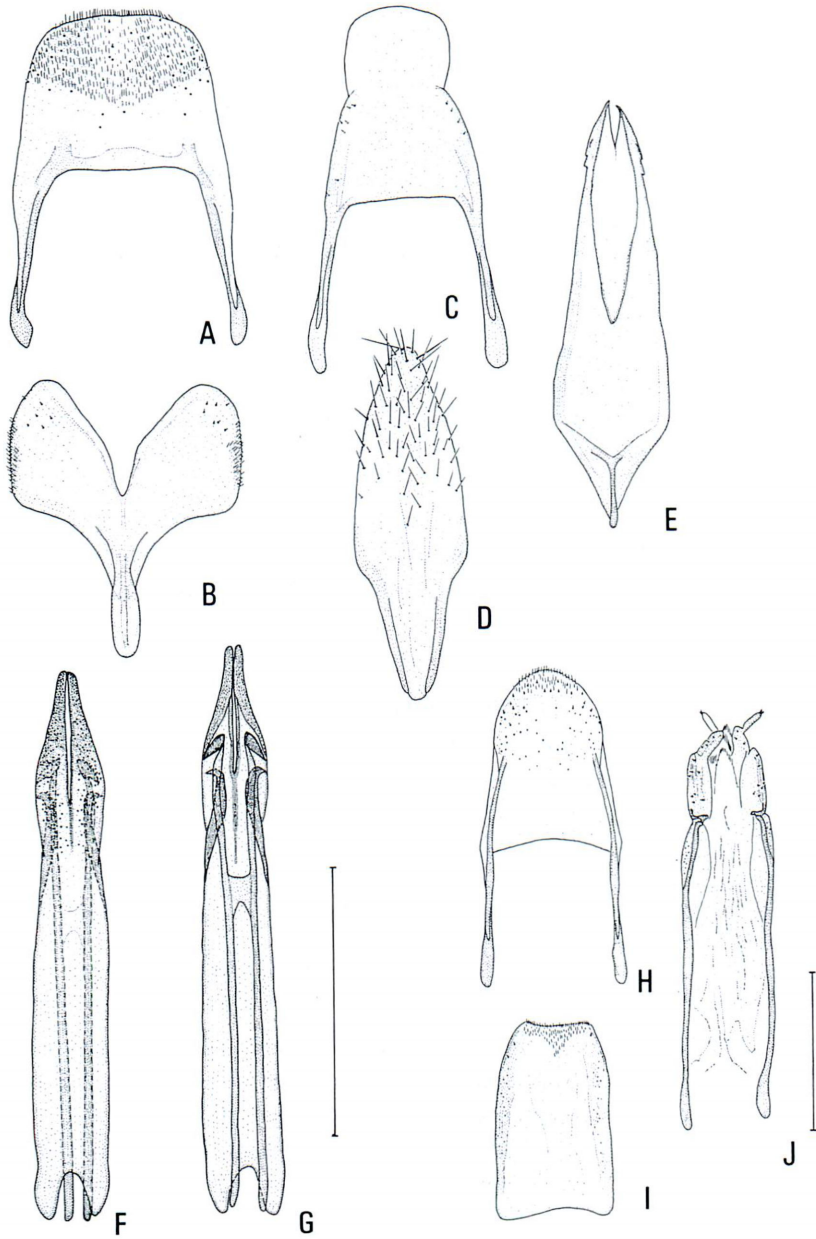


Fig. 18. *Elodes kojimai* NAKANE. — A–G: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen; F, penis, dorsal aspect; G, ditto, ventral aspect. — H–J, Female genitalia; H, 8th tergite; I, 8th sternite; J, ovipositor. (Scales: 0.5 mm.)

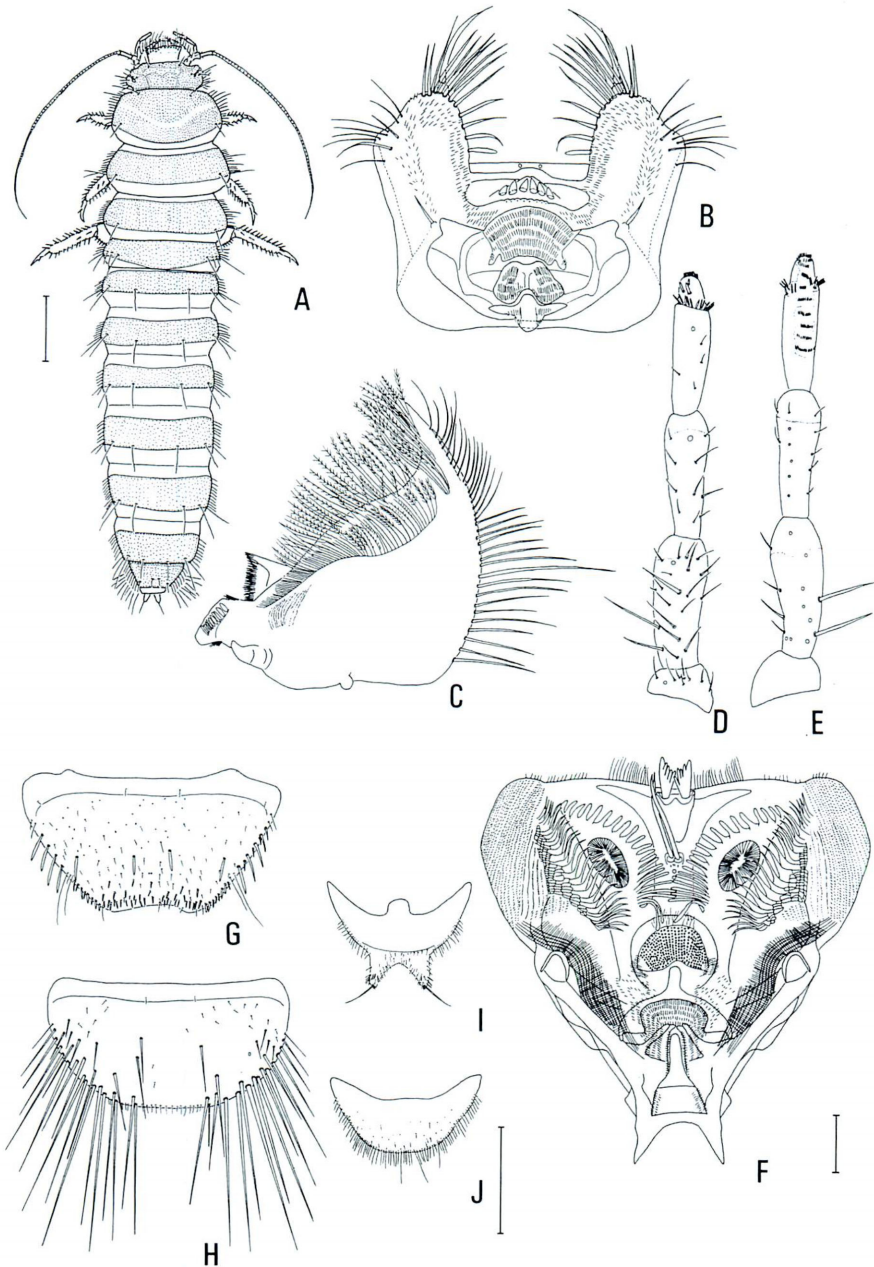


Fig. 19. *Elodes kojimai* NAKANE, mature larva. — A, Dorsal aspect (scale: 1.0 mm). — B–F: Mouth parts (scale: 0.1 mm); B, labrum, ventral aspect; C, left mandible, ventral aspect; D, left maxillary palpus, dorsal aspect; E, ditto, ventral aspect; F, hypopharynx. — G–J: Abdominal segments (scale: 0.5 mm); G, 8th tergite; H, 8th sternite; I, 9th tergite; J, 9th sternite.

front margin. Labrum transverse, with somewhat concave front margin, closely covered with long hairs. Eyes moderate in size, prominent; the distance between eyes about 3.2 times as long as the diameter of an eye in both sexes. Antennae rather long, reaching about proximal 1/3 of elytra; approximate ratio of antennal segments as 4.8:2.4:1.0:8.0:6.8:6.8:7.2:8.0:7.6:6.8:8.0 in male (n=1) and 4.0:2.2:1.0:5.4:4.4:4.6:5.0:4.8:4.6:4.0:5.2 in female (n=1). Pronotum semicircular, broadest a little before the base; PW/PL 1.4–1.6 (1.5) in male and 1.5–1.9 (1.6) in female. Scutellum punctate finely and sparsely. Elytra oblong, subparallel-sided from near bases to basal 2/3, closely covered with shallow but distinct punctures; EL/EW 1.8–1.9 (1.8) in male and 1.7–1.9 (1.8) in female; EL/PL 3.3–3.6 (3.5) in male and 3.5–4.6 (3.9) in female; EW/PW 1.2–1.3 (1.3) in male and 1.2–1.4 (1.3) in female; TL/EW 2.3–2.4 (2.3) in male and 2.2–2.4 (2.3) in female. Ventral surface of body closely covered with short hairs. Legs rather long.

Male. Apical margin of 7th abdominal sternite shallowly concave. Eighth tergite trapezoidal, closely covered with minute spines, sparsely with minute setae and punctures in posterior area; 8th sternite ginkgo-leaf shaped, with minute setae in postero-lateral areas, covered with minute spines on lateral margins; 9th tergite moderately sclerotized in proximal half, membranous in caudal half, covered with some minute setae in lateral areas; 9th sternite oblong, covered with long and short setae in distal half. Tegmen broadest at about proximal 1/3, about 3.5 times as long as wide; caudal opening wide; parameres pointed at apex, with two pairs of serrae on lateral margins and a pair of dull and low serrae in dorso-lateral area. Penis long, about 1.3 times as long as tegmen, consisting of dorsal and ventral pieces; dorsal piece concave in proximal margin, lightly tapering to apex, but somewhat expanded in about apical 1/5, with a pair of large hooks protruding anteriorly from about 2/3 to 3/4 of intero-lateral margin, punctate closely in caudal 1/3, bifid in caudal 1/4 (parameroids), rounded at apex; ventral piece about 0.8 times as long as the length of penis, consisting of a pair of rod-like lobes, but connecting to each other in proximal 2/3, with a pair of hooks at apex of each lobe.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite lightly sclerotized, triangular, covered with minute spines in apical area and minute setae and punctures in distal 1/2; 8th sternite weakly sclerotized, trapezoidal, punctate in lateral area, covered with minute spines in apical area, with some minute setae near postero-lateral corners. Ovipositor moderate in length; stylus with some apical setae; coxite sparsely covered with minute setae; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=2, mean):— 1.0:3.8:11.7.

Measurements of adult. Male (n=4). TL: 3.5–3.9 (3.7) mm; EW: 1.5–1.7 (1.6) mm; PL: 0.8–0.9 (0.8) mm; EL: 2.7–3.0 (2.9) mm; PW: 1.2–1.3 (1.3) mm. Female (n=11). TL: 3.8–5.3 (4.3) mm; EW: 1.7–2.4 (1.9) mm; PL: 0.7–1.1 (0.9) mm; EL: 3.0–4.2 (3.4) mm; PW: 1.3–1.7 (1.4) mm.

Mature larva. Body almost parallel-sided, closely covered with very minute setae on dorsal surface, with short setae on lateral margins. Coloration almost brown;

prothorax with a transverse white band; ventral surface of body paler.

Head moderate in size, with three pairs of non-melanized stemmata in dorso-lateral areas of head. Antennae filiform, reaching 1st abdominal segment; scape rather long, distinctly curved posteriad; pedicel somewhat shorter than scape; flagellum rather long, 63–80 segmented ($n=8$). Labrum transverse, with almost straight front margin. Epipharynx with ventral lobes protruding anteriorly, with long and stout setae on inner and anterior margins of ventral lobes; a pair of very long and strong setae on anterior margins, which are not excised; ventral setae long, not granulate in the surrounding parts of its setal sockets. Mandibles nearly triangular, pointed at apices, with feathered bristles bearing closely from interior area of ventral surface. Maxillary palpi rather long; palpifer with short setae on dorsal surface; 1st segment closely covered with rather long setae on dorsal surface, with some large punctures on ventral surface; 2nd segment with a row of punctures on ventral surface; 3rd segment with five rows of sensory organs in ventral surface; 4th segment with many sensory organs and short and stout setae, indistinctly separated from 3rd in ventral area. Hypopharynx with tooth-bristles which have four notches at anterior margins, with a pair of long setae on keel-sclerite which is not bifid at apex. Thorax widest at posterior margin of mesonotum, with a pair of rather long setae situated near postero-lateral corners; pronotum with a pair of hairy setae near anterior margins. Legs rather long, covered with spinous setae; tarsungulus with a pair of setae at the middle. Abdomen with somewhat longer setae at postero-lateral angles; 1st segment with three pairs of setae near posterior corners; 2nd to 7th segments with two pairs of hairy setae near posterior margins and corners; 8th tergite trapezoidal, with two pairs of short and stout setae in the middle, closely covered with short stout setae at the margins; 8th sternite semicircular, with very long setae at lateral margins; 9th tergite bilobed and closely covered with short setae in apical area, with a pair of long apical setae; 9th sternite semicircular, with short setae on posterior margin, sparsely covered with minute setae and fine punctures in apical area.

Measurements of larva ($n=4$). HW: 1.3–1.4 mm; PL: 1.0–1.1 mm; PW: 1.8–2.0 mm; TL: 8.7–9.2 mm; TW: 2.1–2.3 mm.

Pupa not examined.

Specimens examined. Adult. 10 ♂♂, 28 ♀♀.

Holotype: 1 ♀, Tokachi-mitsumata, 13–VI–1949, K. KOJIMA leg. (TN, Fig. 10, labeled as in Fig. 11).

[Hokkaido] 2 ♂♂, 2 ♀♀, same data as for the holotype, (TN); 1 ♂, same locality as the holotype, 7–VII–1989, Y. HIRANO leg. (YH); 2 ♀♀, ditto, 21–VI–1995, K. MIYASHITA leg.; 2 ♀♀, Lake Onneto, 16–VII–1976, N. OHBAYASHI leg. (1 ♀ was designated as the holotype of *H. ohbayashii* M. SATŌ, NWU, genit. s. nos. HY 132–133); 1 ♀, Sapporo, 29–VI–1959, K. MASUMOTO leg. (NWU, genit. s. nos. HY 134–135); 1 ♀, Yukomanbetsu, 2–VII–1958, F. TAKECHI leg. (NWU); 1 ♀, Akkeshi, 4–VII–1958, T. NAKANE leg. (TN); 1 ♀, Akkeshi, 4–VII–1958, T. NAKANE leg. (TN); 1 ♀, Jōzankei, 30–VI–1958, S. ASAHINA leg. (TN); 2 ♂♂, Daisetsu, 11–VII–1970, T. NAKANE leg.; 1 ♀,

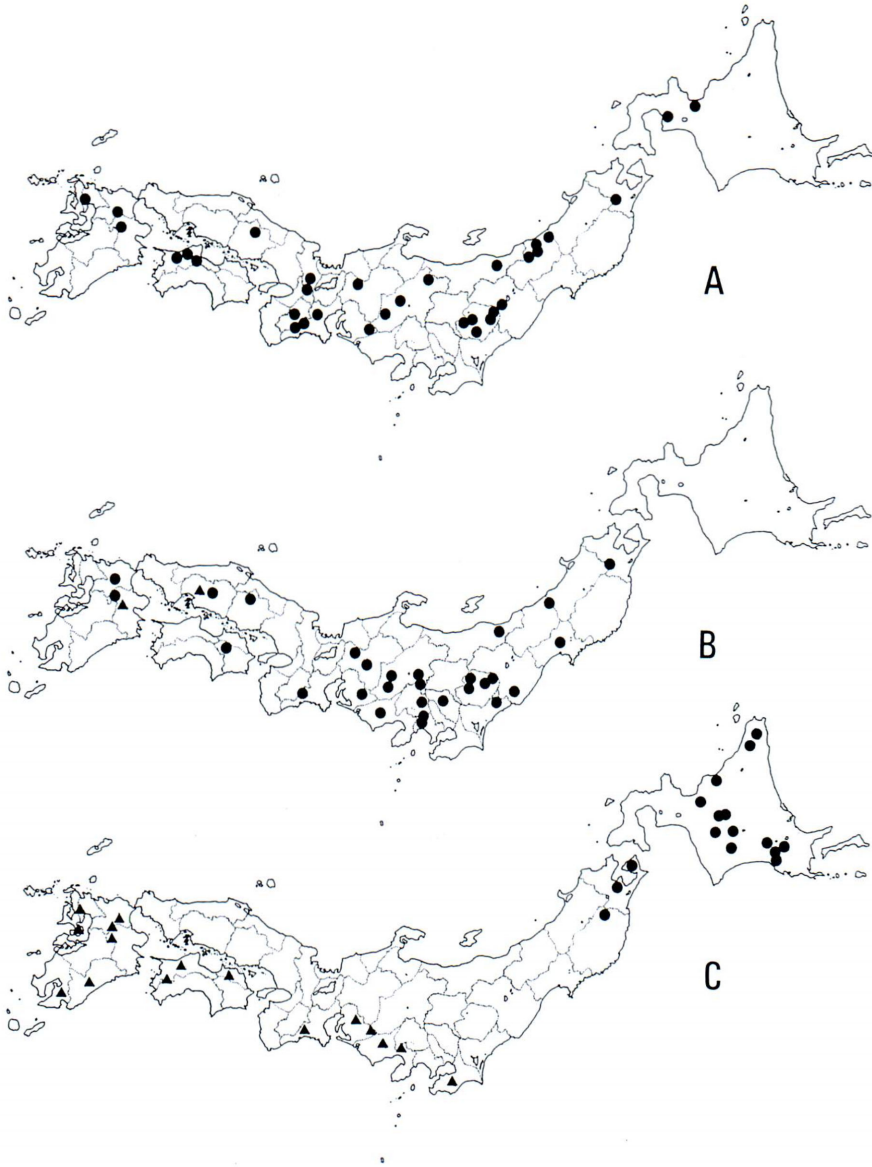


Fig. 20. Maps showing the distribution of *Elodes* spp. — A, *E. inornata* LEWIS; B, *E. wilsoni* PIC (circles) and *E. scapularis* LEWIS (triangles); C, *E. kojimai* NAKANE (circles) and *E. elegans* sp. nov. (triangles).

ditto, 6–VII–1989, Y. HIRANO leg. (YH); 3 ♀♀, Poroshiridake, Hidaka, 27–VII–1971, J. AOKI leg. (TN); 1 ♂, Tōyako, 22–VI–1994, Y. Hirano leg. (YH); 1 ♂, 1 ♀, Betsukari, Rumoi, 20–23–VII–1971, K. YAMAGISHI leg. (1 ♀ s. nos. HY 311–315; male genit. s.

nos. HY 316–318); 1 ♀, Akanko, 6–VII–1958, F. TAKECHI leg. (NWU); 1 ♀, Onnenai, Kushiro, 17–VII–1994, K. MIYASHITA leg.; 2 ♀♀, Sôunkyô, 3–VII–1958, F. TAKECHI leg. (NWU); 1 ♀ genit. s. nos. HY 151–152); 1 ♀, Teshinakagawa, Souya, 6–VIII–1995, S. OHMOMO leg.; 2 ♂♂, Meguro, Erimo-chô, 19–VI–1992, K. MIYASHITA leg.

[Honshu] (Aomori Pref.) 1 ♀, Osorezan, 20–VI–1983, S. YAMAUCHI leg. (TN); 3 ♀♀, Sukayu, Aomori Pref., 21–VII–1961, N. HAYASHI leg. (Iwate Pref.) 1 ♂, 2 ♀♀, near Hachimantai, 10–13–VII–1995, H. YOSHITOMI leg. (1 ♂ genit. s. no. HY 59).

Larva. 8 mature and 2 younger larvae, Sukayu, Aomori Pref., 21–VII–1961, N. HAYASHI leg.

Distribution. Japan: Hokkaido, Honshu (northern part).

Biological notes. The larvae are obtained from the under surfaces of stones in a stream (pers. comm. from N. HAYASHI). HAYASHI (1986) wrote that the larvae were collected from a clear stream where a sulfur spring flows in, and suggested that the larva might feed on sulfur bacteria. The adults are collected near small streams by beating and sweeping from June to early August.

Remarks. KLAUSNITZER (1982) described a new species, *nigrata* (a junior synonym of *kojimai*) under the genus *Flavohelodes* based on characteristics of the penis separated into dorsal and ventral pieces. This character state has been regarded as one of autapomorphies of the genus *Flavohelodes* (KLAUSNITZER, 1974, 1980 a). Judging from other characteristics of the adult and larva, I place this species in the genus *Elodes*.

Genus *Sacodes* LECONTE

[Japanese name: Kimune-maruhananomi Zoku]

Sacodes LECONTE, 1853, Proc. Acad. nat. Sci. Phila., **6**: 356. Type species: *Elodes thoracica* GUÉRIN-MÉNEVILLE, 1843 (designated in the present paper).

Elodes: PIC, 1914, Coleopt. Cat., (58): 21.

Flavohelodes KLAUSNITZER, 1980, Ent. Bl., **76**: 61.—HANNAPPEL & PAULUS, 1987, Zool. Beitr., (N. F.), **31**: 80. Type species: *Elodes flavicollis* KIESENWETTER, 1859. *Syn. nov.*

Adult. Body moderate in size for scirtid beetles, TL 2.2–6.5 mm, oval, convex above, shining, closely covered with hairy setae. Most species with brownish black body and yellowish orange pronotum. Head rather small, slightly convex, covered with short setae; surrounding parts of setal sockets distinctly elevated. Eyes moderate in size, lightly to moderately prominent. Antennae filiform, covered with short setae, more or less longer in male; scape ovate, broadest; pedicel ovate, small; 3rd the smallest, with diagonal distal margin, larger in female; 4th the longest in most species; 11th elongated oblong. Pronotum covering head completely, covered with easily removed setae; surrounding parts of setal sockets lightly elevated. Scutellum triangular, moderately sized, visible from above; surrounding parts of setal sockets same as in pronotum. Legs moderate in length. Elytra oval, strongly convex near or at the middle, closely covered with easily removed long setae, with a deep and distinct puncture situated at

posterior end of each setal socket. Abdominal sternites covered with short setae.

Male genital organ. Eighth tergite well sclerotized, with a pair of somewhat short apodemes; 8th sternite moderately sclerotized, Y- or U-shaped; 9th tergite lightly sclerotized, with a pair of apodemes; 9th sternite lightly sclerotized, oblong or oval. Tegmen moderately to heavily sclerotized, with rather indistinct parameres. Penis well sclerotized, consisting of dorsal and ventral pieces; proximal half closed circular or open at proximal end.

Female genital organ. Eighth tergite moderately sclerotized, with a pair of apodemes; 8th sternite lightly to well sclerotized. Ovipositor with rather short baculus.

Larva. Very similar to that of the genus *Elodes*, but distinguishable from it by a combination of the following characters: antennae with almost straight scape; anterior margin of labrum somewhat concave; epipharynx with long stout setae and some pectinate setae in anterior area of ventral lobes, granulate at surrounding parts of sockets of ventral setae; mandibles with simple bristles; maxillary palpi rather long, with many long setae in ventro-lateral area of 1st segment; hypopharynx with fused keel-sclerite and socket of tooth-bristles, bicornute at apices of tooth-bristles (sometimes tricornute at only one side or both), with a pair of rather short simple setae on keel-sclerite; posterior margin of 9th tergite simply arcuate.

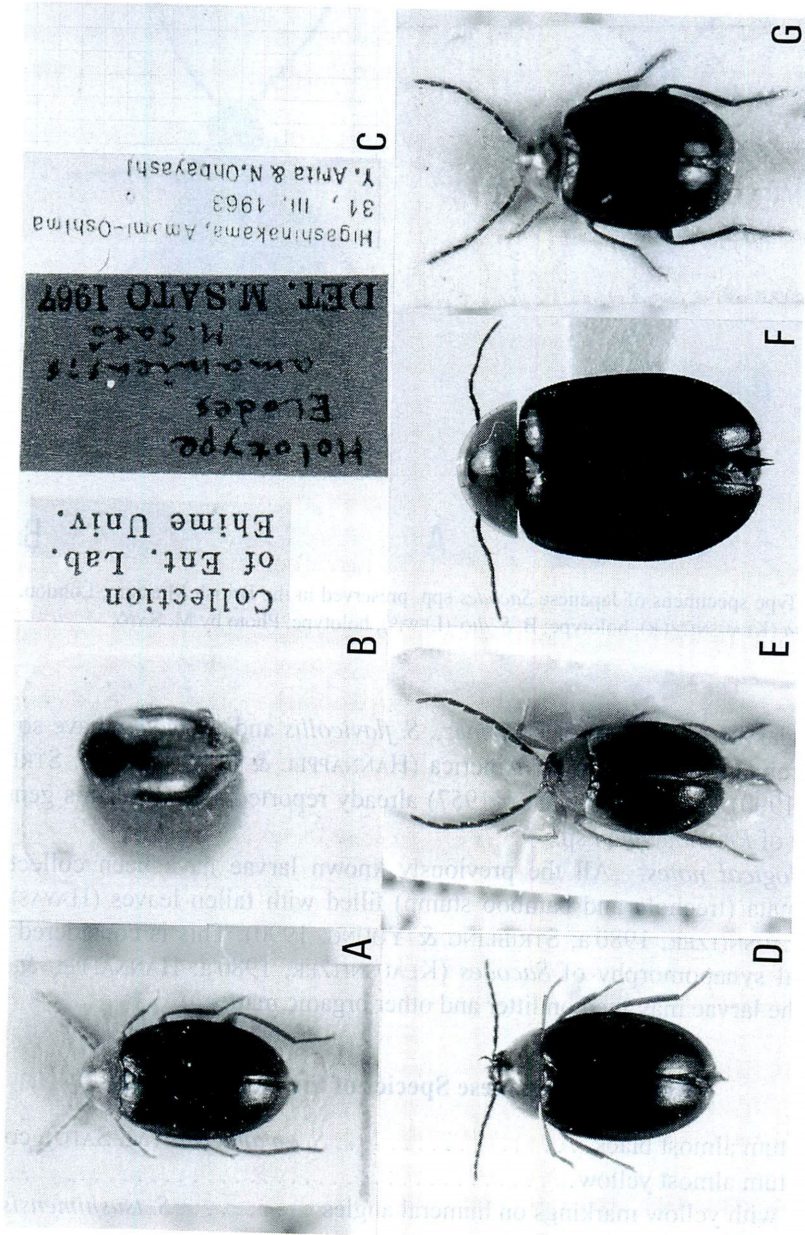
Pupa. Very similar to that of the genus *Elodes*, particularly in the presence of two pairs of long pronotal spines, and indistinguishable from it.

Remarks. LECONTE (1853) established the genus *Sacodes* for three American species, *S. pulchella* (GUÉRIN-MÉNEVILLE, 1843), *S. fuscipennis* (GUÉRIN-MÉNEVILLE, 1843) and *S. thoracica* (GUÉRIN-MÉNEVILLE, 1846) without designation of the type species. I selected *S. thoracica* as the type species of the genus, taking into consideration the presence of good descriptions of the adult and larva (KLAUSNITZER, 1973; STRIBLING & YOUNG, 1990).

This genus has been represented by seventeen species from the Holarctic and Oriental Regions currently regarded as the member of the genus *Flavohelodes*. Of these, four Oriental species, which compose a species-group based on male genitalic characters (KLAUSNITZER, 1980 b), are easily separated from the other species by the shape of body and so on. In the future, closer examinations will lead these four species to a different combination.

From Japan, four species of the genus have been recorded (KLAUSNITZER, 1973). In the list of the Scirtidae from China, KLAUSNITZER (1995) introduced *Flavohelodes kaszabi* not only from Korea but also from Japan. However, I was unable to find any specimen of this species bearing collecting data in Japan, and concluded that KLAUSNITZER's record is doubtful. In this paper, I omitted the species from the Japanese fauna.

Fig. 21. Habitus of *Sacodes* spp. — A, *S. nakanei* (KLAUSNITZER), male; B, *S. amamiensis* (M. SATO), holotype, female; C, ditto, labels; D, *S. minima* (KLAUSNITZER), female; E, *S. tsushimensis* sp. nov., holotype, male; F, *S. protecta* HAROLD, male; G, *S. dux* (LEWIS), male.



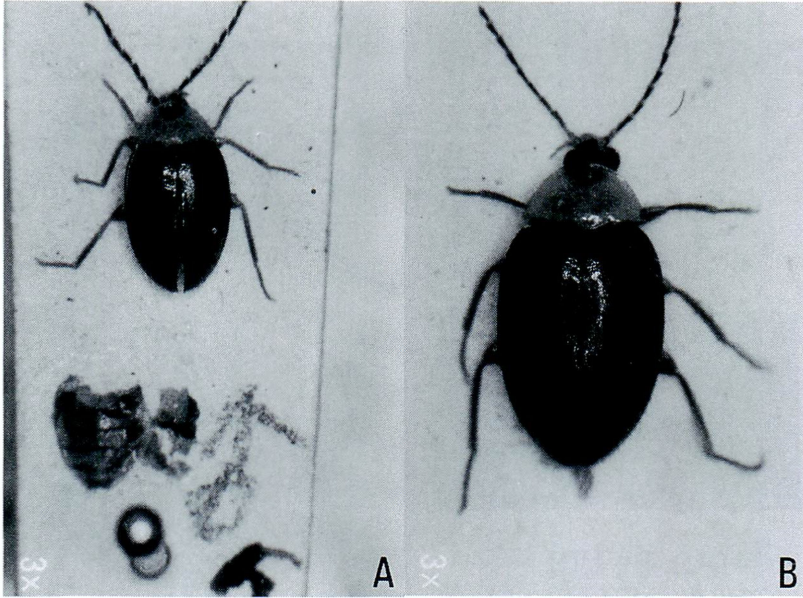


Fig. 22. Type specimens of Japanese *Sacodes* spp. preserved in the British Museum, London. — A, *S. minima* (KLAUSNITZER), holotype; B, *S. dux* (LEWIS), holotype. Photo by M. SATÔ.

The larvae of only two species, viz., *S. flavicollis* and *thoracica*, have so far been known from Europe and North America (HANNAPPEL & PAULUS, 1987; STRIBLING & YOUNG, 1990). However HAYASHI (1957) already reported a larva of this genus under the name of *Prionocyphon* sp.

Biological notes. All the previously known larvae have been collected from phytotelmata (treehole and bamboo stump) filled with fallen leaves (HAYASHI, 1957, 1986; KLAUSNITZER, 1980 a; STRIBLING & YOUNG, 1990). This is considered to be an ecological synapomorphy of *Sacodes* (KLAUSNITZER, 1980 a; HANNAPPEL & PAULUS, 1987). The larvae may feed on litter and other organic matter.

Key to the Japanese Species of the Genus *Sacodes*

1. Pronotum almost black. *S. amamiensis* (M. SATÔ), comb. nov.
— Pronotum almost yellow. 2.
2. Elytra with yellow markings on humeral angles *S. tsushimensis* sp. nov.
— Elytra all black 3.
3. Tibiae and tarsi yellow, TL 2.2–4.8 mm 4.
— Legs almost black (sometimes brown), TL 3.7–6.2 mm 5.
4. All antennal segments yellow, apical margin of male 7th sternite protruding
. *S. nakanei* (KLAUSNITZER), comb. nov.

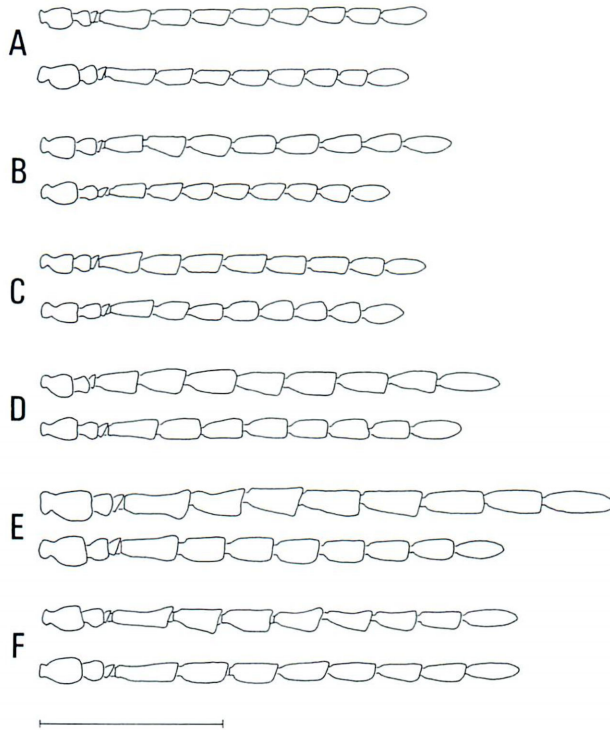


Fig. 23. Antennae of *Sacodes* spp. (above, male; below, female).— A, *S. nakanei* (KLAUSNITZER); B, *S. amamiensis* (M. SATŌ); C, *S. minima* (KLAUSNITZER); D, *S. tsushimensis* sp. nov.; E, *S. protecta* HAROLD; F, *S. dux* (LEWIS). (Scale: 0.5 mm.)

- Fourth to 11th antennal segments black (sometimes brown), apical margin of male 7th sternite shallowly concave *S. minima* (KLAUSNITZER), comb. nov.
- 5. Apical margin of male 7th sternite deeply concave, 6th tergite lacking apodeme, prehensor indistinct *S. dux* (LEWIS), comb. nov.
- Apical margin of male 7th sternite almost straight, 6th tergite with short apodemes, prehensor consisting of a pair of heavily sclerotized plates *S. protecta* HAROLD, comb. rev.

***Sacodes nakanei* (KLAUSNITZER), comb. nov.**

[Japanese name: Ko-kimune-maruhananomi]

(Figs. 21 A, 23 A, 24 A, 25–29, 40 A)

Helodes nakanei KLAUSNITZER, 1973, Ent. Nachr., Dresden, **17**: 107, figs. 20–25; 1974, Zool. Jb. Syst., **101**: 479 [phylogeny]; 1974, Ent. Nachr., Dresden, **18**: 76 [key].

Flavohelodes nakanei: KLAUSNITZER, 1980, Ent. Bl., **76**: 61.

Helodes protecta: SATŌ, 1985, Coleopt. Japan Col., Osaka, **2**: 421, pl. 77, pl. 7.

Adult. Body oval, moderately convex, closely covered with yellowish white

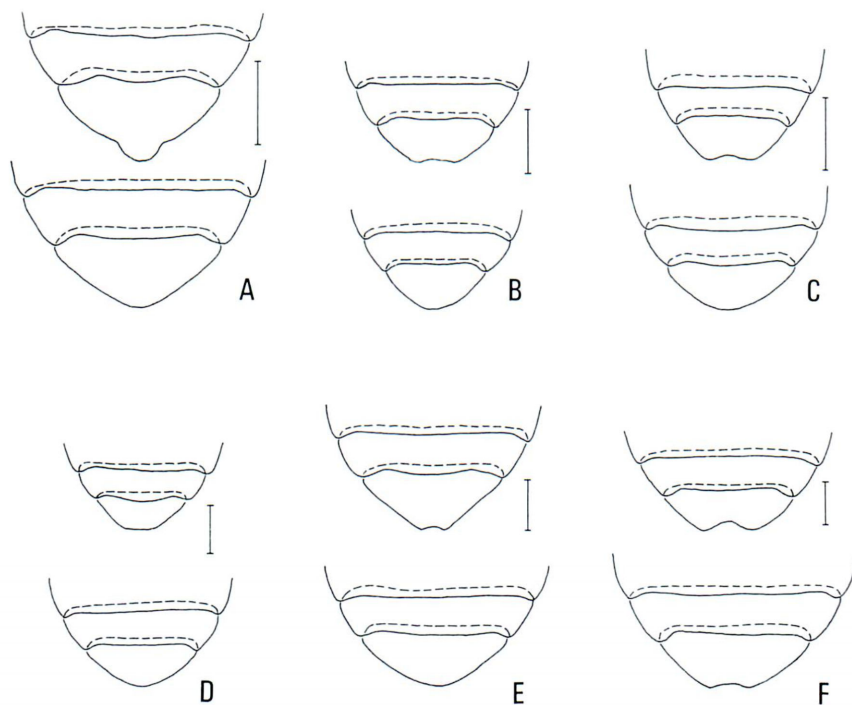


Fig. 24. Sixth to 7th abdominal sternites of *Sacodes* spp. (above, male; below, female).— A, *S. nakanei* (KLAUSNITZER); B, *S. amamiensis* (M. SATŌ); C, *S. minima* (KLAUSNITZER); D, *S. tsushimensis* sp. nov.; E, *S. protecta* HAROLD; F, *S. dux* (LEWIS). (Scales: 0.5 mm.)

hairs. Head yellowish orange, but vertex darker; mouth parts, antennae and pronotum yellowish orange; scutellum and elytra brownish black; ventral surface of body brownish black, but 7th abdominal sternite somewhat paler; legs yellowish orange, except for coxae and middle area of mid and hind femora, which are fuscous.

Head slightly convex, punctate finely and sparsely. Front margin of clypeus somewhat concave. Labrum transverse, closely covered with long hairs. Eyes large, prominent; the distance between eyes about 1.8 times as long as the diameter of an eye in both sexes. Antennae moderate in length, reaching about proximal 1/3 of elytra; approximate ratio of antennal segments as 5.1 : 2.6 : 1.0 : 6.7 : 5.0 : 5.2 : 4.8 : 5.0 : 4.7 : 4.5 : 5.9 in male (n=2, mean) and 4.2 : 2.1 : 1.0 : 5.1 : 4.5 : 4.1 : 3.9 : 3.8 : 3.5 : 3.1 : 4.6 in female (n=2, mean). Pronotum semicircular, broadest at the base; PW/PL 1.6–2.0 (1.7) in male and 1.6–2.0 (1.8) in female. Elytra oval, broadest a little before the middle; EL/EW 1.3–1.5 (1.4) in male and 1.3–1.5 (1.4) in female; EL/PL 3.2–4.4 (3.5) in male and 3.1–4.3 (3.5) in female; EW/PW 1.4–1.6 (1.5) in male and 1.4–1.5 (1.4) in female; TL/EW 1.7–1.9 (1.8) in male and 1.7–1.9 (1.8) in female.

Male. Apical margin of 7th abdominal sternite distinctly projecting posteriad. Eighth tergite covered with minute setae and spines in caudal area, with a pair of slen-

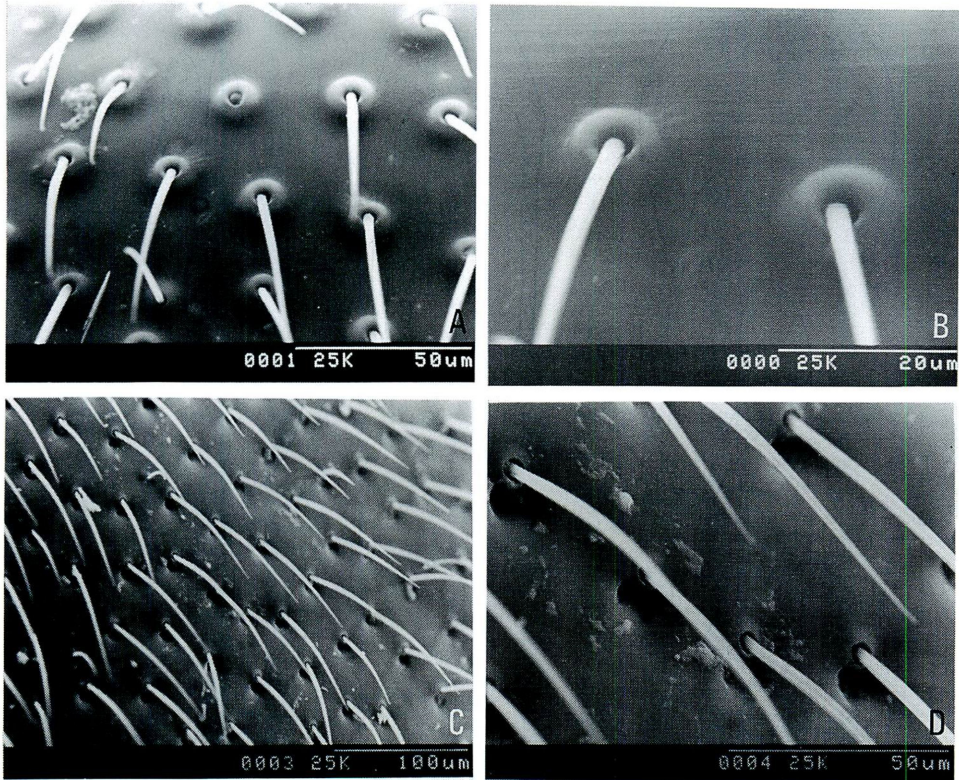


Fig. 25. *Sacodes nakanei* (KLAUSNITZER); A, pronotum; B, setal sockets on pronotum; C, caudal area of elytron; D, ditto, setae.

der apodemes; 8th sternite Y-shaped, punctate in apical area of each arm; 9th tergite short trapezoidal, with a pair of long and stout apodemes; 9th sternite oblong, covered with short setae in apical area. Tegmen well sclerotized, oblong, with a pair of fan-shaped plates on dorsum; anterior part projecting anteriorly; apical area sparsely punctate on ventral surface, notched at apical margin. Penis long, relatively flat, about 4.7 times as long as wide; dorsal piece elongated ovate in proximal half, more heavily sclerotized and closely punctate in lateral parts of distal half; ventral piece projecting posteriorly in apical part.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite lightly sclerotized, triangular, covered with punctures in anterior area, with minute setae in posterior area and short spines on posterior margin; 8th sternite oblong, sparsely covered with punctures and short setae in postero-lateral area, notched shallowly at posterior margin which is covered with short spines. Ovipositor moderate in length; coxite covered rather closely with short setae; approximate ratio of the lengths of stylus, coxite and baculus as follows ($n=2$, mean):—1.0 : 3.5 : 12.1.

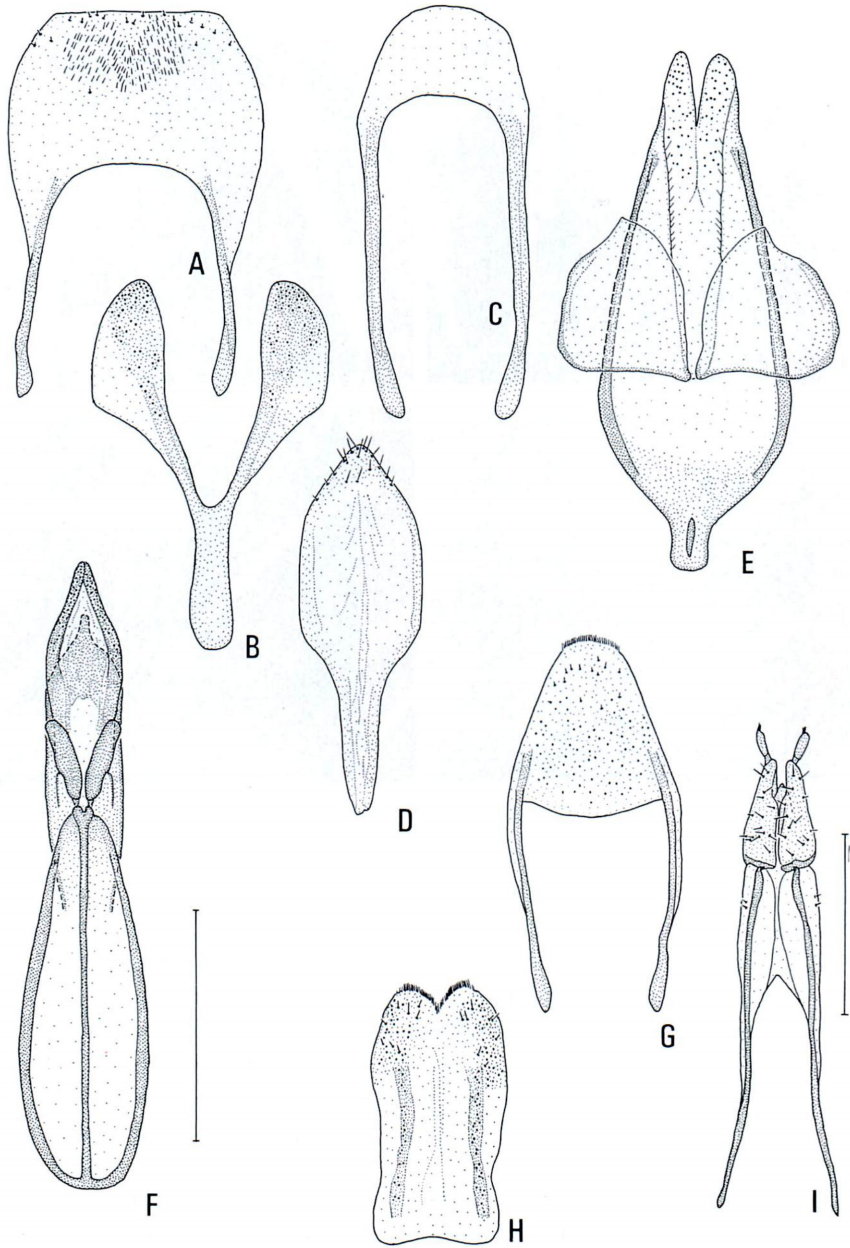


Fig. 26. *Sacodes nakanei* (KLAUSNITZER). — A–F: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen, dorsal aspect; F, penis, dorsal aspect. — G–I: Female genitalia; G, 8th tergite; H, 8th sternite; I, ovipositor. (Scales: 0.5 mm.)

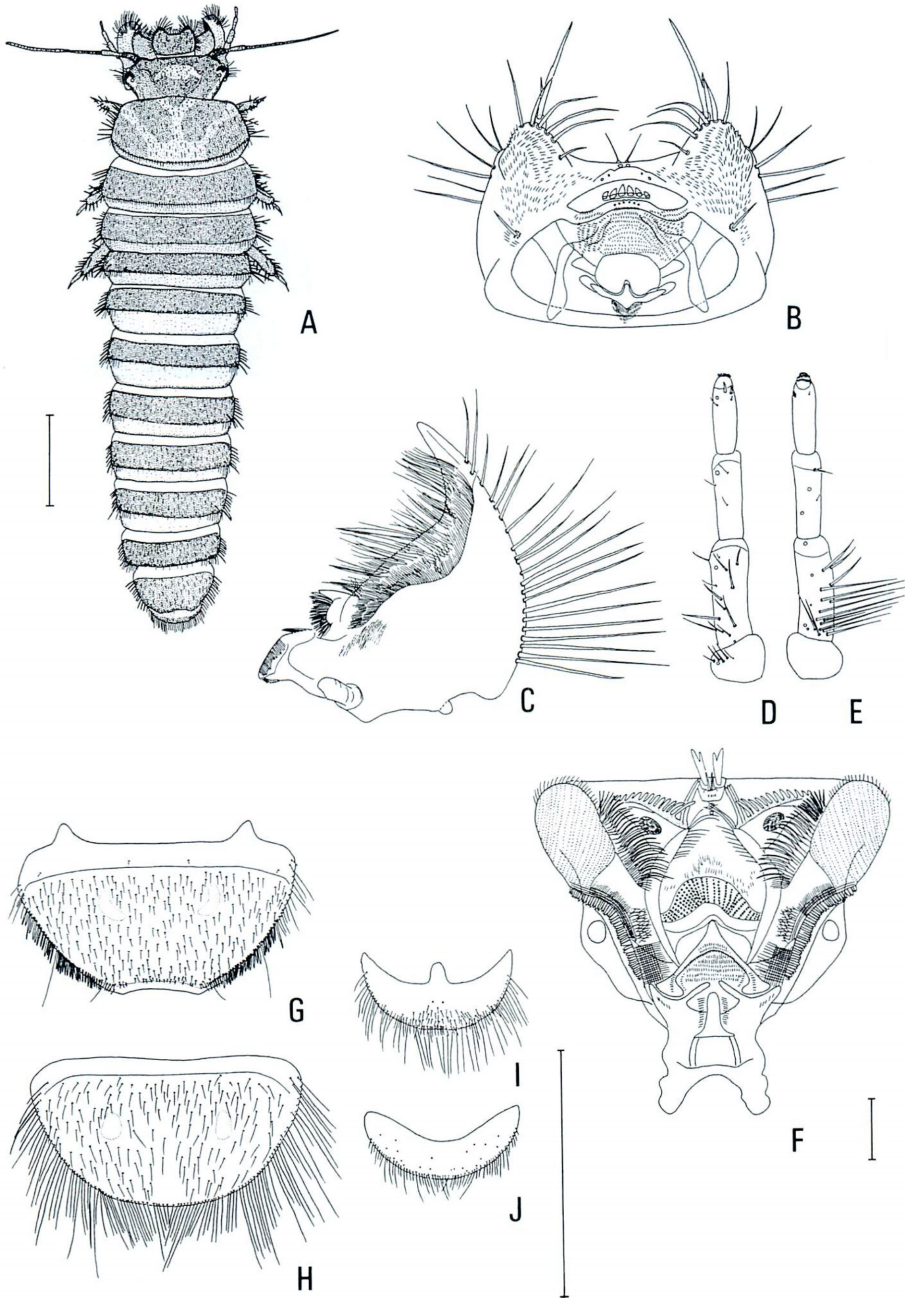


Fig. 27. *Sacodes nakanei* (KLAUSNITZER), mature larva. — A, Dorsal aspect (scale: 1.0 mm). — B–F: Mouth parts (scale: 0.1 mm); B, labrum, ventral aspect; C, left mandible, ventral aspect; D, left maxillary palpus, dorsal aspect; E, ditto, ventral aspect; F, hypopharynx. — G–J: Abdominal segments (scale: 0.5 mm); G, 8th tergite; H, 8th sternite; I, 9th tergite; J, 9th sternite.

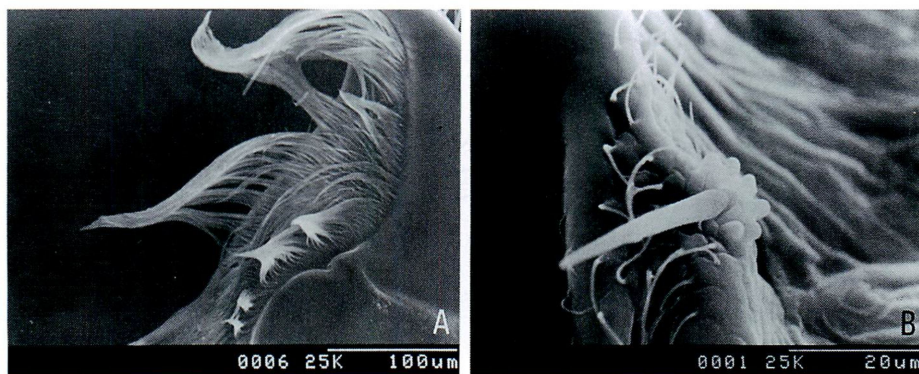


Fig. 28. *Sacodes nakanei* (KLAUSNITZER), mature larva; A, bristles of mandible, ventral aspect; B, right ventral seta.

Measurements of adult. Male (n=20). TL: 3.3–4.7 (4.1) mm; EW: 2.0–2.5 (2.3) mm; PL: 0.7–1.0 (0.9) mm; EL: 2.8–3.7 (3.2) mm; PW: 1.3–1.7 (1.5) mm. Female (n=20). TL: 3.5–4.8 (4.0) mm; EW: 2.0–2.6 (2.3) mm; PL: 0.7–1.0 (0.9) mm; EL: 2.7–3.8 (3.1) mm; PW: 1.3–1.8 (1.6) mm.

Mature larva. Body closely covered with minute setae on dorsal surface, with short spinous setae on lateral margins. Coloration almost brownish black, but the legs and ventral surfaces of the thoraces are paler.

Head transverse, lightly protruding laterad, with three pairs of non-melanized stemmata in dorso-lateral parts of head. Antennae filiform, reaching mesothorax; scape somewhat curved posteriorly, sparsely covered with short setae; pedicel longer than scape; flagellum 24–30 segmented (n=4). Labrum transverse, concave at front margin; epipharynx with ventral lobes protruding anteriorly, with six pairs of simple and stout setae at anterior margins of ventral lobes, with a pair of very long and excised setae situated on dorsal parts of ventral lobes, with long ventral setae. Mandibles pointed at apices, with rather short bristles. Maxillary palpi long; palpifer with short setae in outer area; 1st covered with short setae in outer area, with long setae at outer side of ventral surface; approximate ratio of respective segments (1st to 4th) as 8.7:6.7:6.0:1.0. Hypopharynx with a pair of tooth-bristles bicornuted, but sometimes tricornuted in single or both; a pair of setae on keel-sclerite short and simple. Thorax widest at posterior margin of mesonotum; pro- and metanota a little narrower than mesonotum. Legs moderate in length, covered with spinous setae. Abdomen with extra short setae near postero-lateral corners of 1st to 7th tergites; 8th tergite semicircular, with a pair of short apodemes, covered with short setae on lateral margins, shallowly concave at posterior margin; 8th sternite semicircular, with long setae on lateral and posterior margins; 9th tergite gently arcuate in posterior margin, protruding anteriorly in the middle of anterior margin, closely covered with short setae in apical part, with long setae on posterior margin; 9th sternite gently arcuate in posterior margin, closely covered with

short setae on posterior margin.

Measurements of larva (n=6). TL: 6.0–7.0 mm; HW: 1.1–1.3 mm; PL: 0.7–0.8 mm; PW: 1.7–1.8 mm; TW: 1.9–2.2 mm.

Pupa not examined.

Specimens examined. Adult. 42 ♂♂, 64 ♀♀ (specimens preserved in 70% ethanol are omitted).

Paratypes: 1 ♂, Uchiage, Saga, Kyushu, 15–V–1953, H. YAMAGUTI (TN); 1 ♂, Kasuga, Nara, 13–VI–1958, T. NAKANE (TN); 1 ♂, Kasuga, Pref. Nara, 20–V–1951, K. SAWADA (TN).

[Hokkaido] 1 ♀, Ohnuma, 21–VI–1994, Y. HIRANO leg.

[Honshu] <Yamagata Pref.> 1 ♂, Gassan, 17–VI–1985, S. SAKURAI leg. (SS); 1 ♂, Dokko-mura, Zaô-san, 2–VIII–1988, S. SAKURAI leg. (genitalia on slides No. HY 124–125). <Fukushima Pref.> 1 ♂, 1 ♀, Kidogawa, Abukuma, 9–VI–1991, S. OHMOMO leg. (SO). <Tochigi Pref.> 2 ♂♂, Itamuro, Kuroiso, 19–21–V–1990, A. NISHIYAMA leg. (genit. s. nos. HY 105 and 108); 1 ♀, Kinugawa, 31–V–1987, Y. HIRANO leg.; 1 ♂, Tsuruta-numa, Utsunomiya-shi, 6–V–1991, K. SATÔ leg. (TPM, genit. s. no. HY 104); 1 ♂, Kido, Motegi-machi, 7–V–1994, S. OHMOMO leg. (genit. s. no. HY 106); 1 ♂, Nagusashita-machi, Ashikaga-shi, 29–IV–1992, H. OHKAWA leg. (TPM, genit. s. no. HY 37); 1 ♀, Azusa-chô, Tochigi-shi, 20–V–1989, H. YOSHITOMI leg.; 3 ♀♀, ditto, 31–XII–1995 (larvae coll.), –IV–1996 (emerge), H. YOSHITOMI (s. nos. HY 284–292). <Ibaraki Pref.> 1 ♂, 1 ♀, Tamazukuri-chô, 27–V–1995, S. OHMOMO leg.; 1 ♀, Daigo-machi, 25–V–1986, S. OHMOMO leg. (SO). <Izu Isls.> 1 ♂, Mihara-rindô, Hachijô-jima, 22–IV–1978, J. OKUMA leg. (NWU, genit. s. nos. HY 128–129). <Tokyo Pref.> 1 ♂, Jindaiji, 17–V–1982, T. & T. NAKANE leg. (TN); 1 ♀, Mt. Takao, 12–V–1968, K. MASUMOTO leg. (TN); 1 ♀, ditto, 22–VI–1968, K. MASUMOTO leg. (TN); 1 ♀, ditto, 24–V–1987, S. TSUYUKI leg. <Kanagawa Pref.> 1 ♂, 1 ♀, Toonosawa, Hakone, 1–V–1975, Y. HIRANO leg. (YH); 1 ♀, Mitake, Hakone, 16–V–1982, Y. HIRANO leg. (YH); 1 ♀, Daiyutake, Hakone, 1–V–1983, Y. HIRANO leg. (YH); 1 ♀, Hatajuku, Hakone, 2–VII–1983, Y. HIRANO leg. (YH); 1 ♂, Miyanoshta, Hakone, 9–V–1983, Y. HIRANO leg. (YH); 1 ♂, Mt. Kamihakone, 2–VII–1957, Y. HIRANO leg. (YH); 1 ♀, Kannogawa, Tanzawa, 17–V–1986, Y. HIRANO leg. (YH); 1 ♀, Odawara, 13–VI–1974, Y. HIRANO leg. (YH); 1 ♀, Miurafuji, 14–V–1988, Y. HIRANO leg. (YH); 1 ♀, Yamato, 29–IV–1989, Y. HIRANO leg. (YH); 1 ♀, Manazuru, 2–IV–1978, Y. HIRANO leg. (YH); 1 ♀, Sawaia, 17–VI–1990, S. TSUYUKI leg. <Shizuoka Pref.> 1 ♂, Akane-rindô, 2–VI–1984, S. TSUYUKI leg.; 1 ♂, Suishôchi, 7–VII–1985, S. TSUYUKI leg. <Aichi Pref.> 1 ♀, Toyokawa-shi, 30–IV–1994, M. HASEGAWA leg. (TMNH); 1 ♀, Mennoki-tôge, 22–V–1992, N. KANIE leg.; 1 ♀, ditto, 26–VI–1994, H. YOSHITOMI leg.; 1 ♀, Uradani, 16–VI–1993, H. YOSHITOMI leg.; 3 ♂♂, 5 ♀♀, Mt. Sanage-yama, Toyota-shi, 12–XII–1994 (larvae coll.), 4–20–V–1995 (emerge), H. YOSHITOMI leg. (s. nos. HY 24–26, 47–48, 51, 101). <Gifu Pref.> 1 ♂, Midori-dani, 5–VI–1983, M. SATÔ leg. (NWU, figured in M. SATÔ, 1985 b). <Mie Pref.> 1 ♀, Nonobori-yama, Kameyama-shi, 17–VI–1993, N. NARUKAWA leg.; 1 ♂, Hirakura, 27–V–1988, N. KANIE leg.; 1 ♂, ditto, 23–VI–1988, N. KANIE leg.; 1 ♂, 2 ♀♀, Minami-

mata-yama, Ohuchi-yama, 20-V-1995, N. NARUKAWA leg.; 1 ♂, ditto, 17-VI-1995, N. NARUKAWA leg.; 3 ♀♀, Mikisaki, Owase-shi, 3-V-1995, N. NARUKAWA leg.; 1 ♂, 4 ♀♀, Togashima, Owase-shi, 14-V-1988, N. NARUKAWA leg.; 2 ♂♂, Kukizaki, Owase-shi, 5-VI-1994, N. NARUKAWA leg. (Nara Pref.) 1 ♂, Kasuga-yama, 20-V-1951, K. SAWADA leg. (TN); 1 ♂, ditto, 6-VI-1984, N. KANIE leg. (genit. s. nos. HY 136-137); 1 ♂, ditto, 6-VI-1995, H. YOSHITOMI leg. (Kyoto Pref.) 2 ♀♀, Kitashirakawa, 9-V-1964, T. NAKANE leg. (TN).

[Shikoku] (Kagawa Pref.) 1 ♂, Zouzu-san, 30-IV-1989, K. ISHIDA leg. (EUM). (Tokushima Pref.) 1 ♀, Shiroyama, 9-VI-1973, M. SAKAI leg. (EUM). (Ehime Pref.) 1 ♀, Odami-yama, 5-VI-1994, M. SATÔ leg.; 1 ♂, Nomura-dam, Nomura, 27~28-V-1994, OHBAYASHI, OKADA & FUJIOKA leg. (EUM); 1 ♂, Sakase, 17-VII-1977, M. TOMOKUNI leg.; 1 ♀, Mt. Takanawa, 24-V-1974, Y. NOTSU leg. (Kôchi Pref.) 1 ♀, Ashizurimisaki, 25-V-1975, M. SAKAI leg. (EUM).

[Kyushu] (Fukuoka Pref.) 1 ♀, Mt. Adachi, 1-V-1979, S. NAKAO leg. (TN). (Ôita Pref.) 1 ♀, Mt. Kurodake, 19-V-1991, S. OHMOMO leg.; 1 ♂, 1 ♀, ditto, 12-VI-1993, S. OHMOMO leg. (male genit. s. no. HY 107, female genit. s. no. HY 109); 1 ♂, 3 ♀♀, ditto, 23-V-1995, S. IMASAKA leg. (SI). (Nagasaki Pref.) 1 ♀, Todoroki Fall, Mt. Taradake, 6-V-1989, S. IMASAKA leg.; 1 ♀, Mt. Unzen, 9-VI-1982, S. IMASAKA leg.; 3 ♀♀, ditto, 12-VI-1986, S. IMASAKA leg. (SI); 1 ♂, Akamatsu Valley, Shimabara, 30-IV-1979, S. IMASAKA leg.; 2 ♀♀, Yahirodake, Sasebo-dake, 14-IV-1981, J. OKUMA leg.; 1 ♀, Mt. Shijiki, Hirado-shi, 30-IV-1979, M. SAKAI & A. ODA leg.; 1 ♂, Tanoo, 22-IV-1980, S. IMASAKA leg. (Miyazaki Pref.) 1 ♀, Koike, Kirishima, 3-V-1983, MIZOGUCHI leg. (TN); 1 ♀, Inohae, 24-V-1987, T. & T. NAKANE leg. (TN). (Kagoshima Pref.) 1 ♀, Sata, 27-V-1952, T. NAKANE leg. (TN); 1 ♂, Kurino, 7-VI-1980, T. NAKANE leg. (TN).



Fig. 29. Larval habitat of *Sacodes nakanei* (KLAUSNITZER), on Sanage-yama, Aichi Pref., 16-X-1996, photo by H. YOSHITOMI.

[Ryukyu Isls.] (Yaku-shima) 1 ♂, Anbō, 29-IV-1967, Y. HIRANO leg. (genit. s. nos. HY 296-297).

Larva. 10 mature larvae, Sanage-yama, 12-XII-1994, H. YOSHITOMI leg.; 7 mature larvae, ditto, 16-X-1996, H. YOSHITOMI leg.; 1 mature larva, Muroto-misaki, Kōchi Pref., 14-II-1997, H. NAKANO leg.

Distribution. Japan: Hokkaido (new record), Honshu, Hachijō-jima (new record), Shikoku (new record), Kyushu (new record), Yaku-shima (new record).

Biological notes. This species is common in laurel forests (below ca. 1,000 m alt. in Honshu). The larvae are collected from treeholes of *Quercus acutissima* CARRUTH. on Azusa-chō, Tochigi Pref.; *Zelkova serrata* (THUMB.) MAKINO on Mt. Sanage-yama, Aichi Pref. (Fig. 29), and *Quercus* sp. at Muroto-misaki, Kōchi Pref. One generation probably requires several years, because the larval stage is not equalized in field observation. Under the rearing condition in a room temperature, the pupation occurred in the sand and the pupal period was about 2-3 days.

The adults occur from April to early August, and are obtained by beating or sweeping flowers of *Acer* spp. (Aceraceae).

Remarks. This species is clearly separated from the other Japanese species by the yellow antennae and legs, and the presence of a projection on the male 7th sternite. The last character state is much specialized in the genus. It was considered that this species shows a sister-group relationship with other species of the genus (KLAUSNITZER, 1974 a).

Sacodes amamiensis (M. SATŌ), comb. nov.

[Japanese name: Katamon-maruhananomi]

(Figs. 21 B & C, 23 B, 24 B, 30, 40 A)

Elodes amamiensis M. SATŌ, 1966, Bull. Japan ent. Acad., 2: 13 (Type: Higashi-nakama, Amami-ōshima, in EUM, examined).—SATŌ & CHŪJŌ, 1972, Mem. Fac. Educ. Kagawa Univ., (II), (207-210): 19.

Helodes amamiensis: SATŌ, 1985, Coleopt. Japan Col., Osaka, 2: 421, pl. 77, fig. 6.

Adult. Body oval, strongly convex above, closely covered with yellowish white hairs. Head brownish black; anterior part of clypeus, mouth parts and 1st to 3rd antennal segments yellowish brown; 4th to 11th antennal segments brownish black, except for yellowish brown proximal and distal ends of each segment; pronotum brown to brownish black, more or less colored with yellowish brown on anterior and lateral margins; scutellum brownish black. Elytra brownish black, with three yellowish brown markings; two of these markings situated on humeral angles oblique, reaching about proximal 1/3 of elytra, the remaining one rectangular, situated at about proximal 1/2 to 4/5 of sutural area, variable in size, sometimes connected with humeral ones by oblique and obscure yellowish brown lines. Ventral surface of body brownish black, but apical margin of 7th abdominal sternite paler; pronotal hypomera and about proximal 1/3 of elytral epipleura yellowish brown; legs yellowish brown, but femora somewhat dusky in the middle area.

Head slightly convex; front margin of clypeus almost straight. Labrum transverse, with somewhat concave front margin. Eyes large, prominent; the distance between eyes about 2.2 times as long as the diameter of an eye in both sexes. Antennae moderate in length, reaching about proximal 1/4 of elytra; approximate ratio of antennal segments as 4.3:2.7:1.0:5.0:5.3:5.7:5.7:5.3:5.3:5.0:6.0 in male (n=1) and 3.3:2.0:1.0:3.3:3.5:3.3:3.5:3.5:3.3:3.0:3.8 in female (n=1). Pronotum semicircular, broadest at the base; PW/PL 1.7–2.0 (1.9) in male and 1.6–2.0 (1.8) in female. Elytra broadest at the middle, covered with somewhat shallow punctures; EL/EW 1.4 in male and 1.3–1.4 (1.4) in female; EL/PL 3.6–4.0 (3.8) in male and 3.3–3.7 (3.5) in female; EW/PW 1.4–1.6 (1.5) in male and 1.4–1.5 (1.4) in female; TL/EW 1.7–1.8 (1.8) in male and 1.7–1.8 (1.8) in female.

Male. Apical margin of 7th abdominal sternite shallowly concave. Eighth tergite trapezoidal, sparsely covered with minute setae and punctures, with minute setae on posterior margin; 8th sternite V-shaped, with two short setae in apical area of arms; 9th tergite trapezoidal, covered with minute spines in posterior part, with a few minute setae near postero-lateral corners; 9th sternite oval, covered with short setae in about caudal 1/3. Tegmen long, moderately sclerotized, broadest at about proximal 1/3, punctate sparsely in apical half. Penis long, well sclerotized, a little shorter than tegmen; dorsal piece ovate in proximal half, curved dorsally in caudal half; ventral piece a little shorter than dorsal piece.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite lightly sclerotized, trapezoidal, covered with minute setae and punctures in postero-lateral part, with minute spines on posterior margin; 8th sternite weakly sclerotized, oblong, covered with minute setae and punctures near postero-lateral corners, notched at posterior margin which is covered with minute spines. Ovipositor moderate in length; coxite sparsely covered with short setae and punctures; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=1):—1.0:3.9:10.7.

Measurements of adult. Male (n=4). TL: 3.0–3.7 (3.4) mm; EW: 1.7–2.1 (1.9) mm; PL: 0.6–0.8 (0.7) mm; EL: 2.4–2.9 (2.7) mm; PW: 1.2–1.5 (1.3) mm. Female (n=4). TL: 3.0–3.7 (3.4) mm; EW: 1.7–2.1 (1.9) mm; PL: 0.7–0.8 (0.8) mm; EL: 2.3–2.9 (2.6) mm; PW: 1.2–1.5 (1.4) mm.

Immature stages unknown.

Specimens examined. 7 ♂♂, 8 ♀♀.

Holotype: 1 ♀, Higashinakama, Amami-Oshima, 31–III–1963, Y. ARITA & N. OHBAYASHI leg. (EUM).

Paratypes: 1 ♀, same data as for the holotype (NWU); 1 ♂, same locality as for the holotype, 29–III–1963, N. OHBAYASHI leg. (NWU); 1 ♀, ditto, 1–IV–1963, Y. ARITA leg. (NWU); 1 ♂, Hatsuno, 7–IV–1965, K. UEDA leg. (NWU).

[Ryukyu Isls.] <Amami-ôshima> 1 ♀, Shinmura, 11–IV–1971, M. SAKAI leg. (genit. s. nos. HY 149–150); 1 ♀, ditto, 15–IV–1971, M. SAKAI leg.; 1 ♂, Yuwandake, 23–IV–1994, Y. HIRANO leg. (YH). <Tokuno-shima> 1 ♀, Mikyô, 10–IV–1968, K. IOKI leg. (NWU, genit. s. nos. HY 340, 342); 1 ♂, 1 ♀, ditto, 11–IV–1968, M. TOMOKUNI leg.

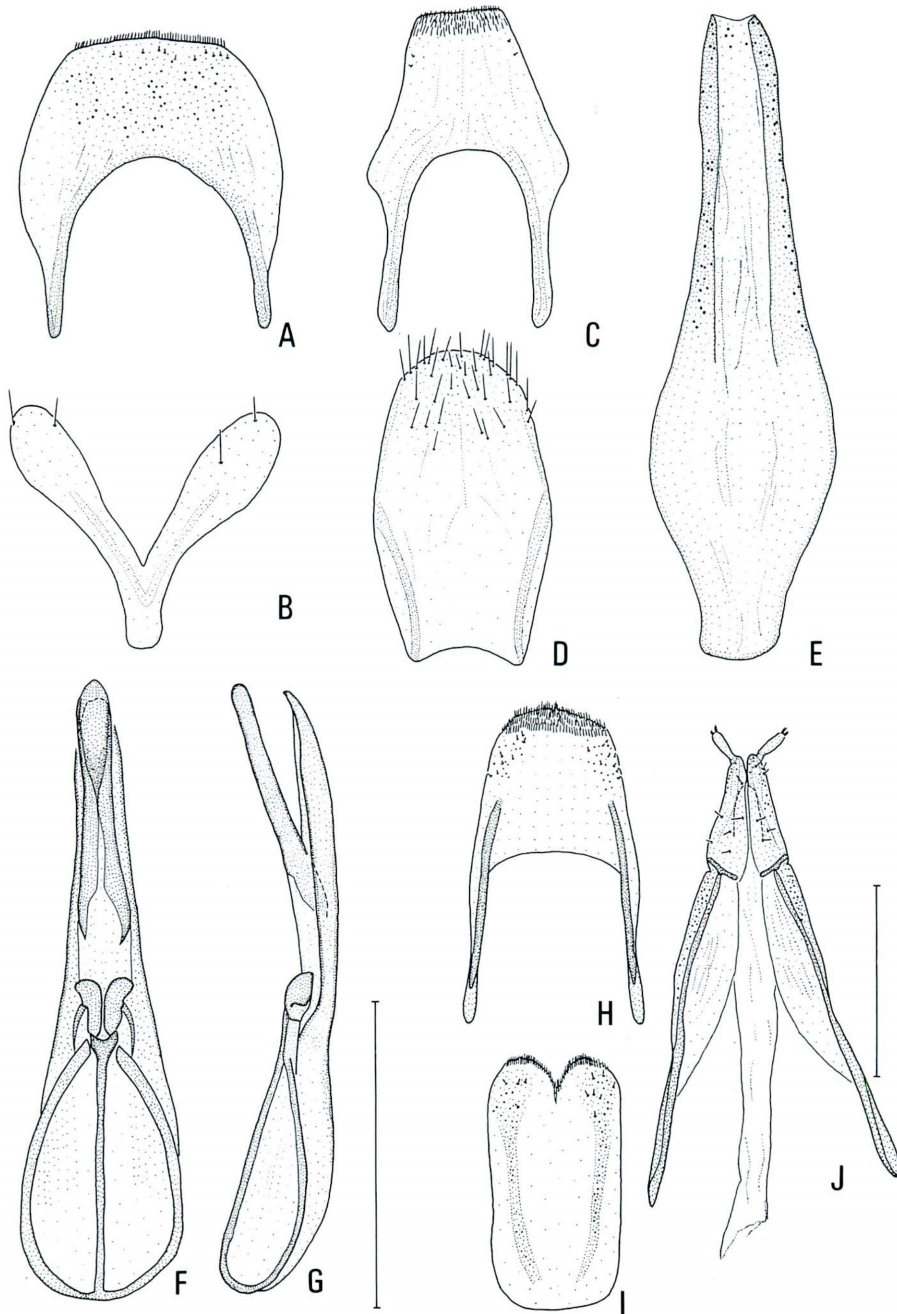


Fig. 30. *Sacodes amamiensis* (M. SATÔ). — A–G: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen, dorsal aspect; F, penis, dorsal aspect; G, ditto, lateral aspect. — H–J: Female genitalia; H, 8th tergite; I, 8th sternite; J, ovipositor. (Scales: 0.5 mm.)

(EUM). (Okinawa-hontô) 1 ♀, Haji, 29–III–1986, M. SAWAI leg. (genit. s. nos. HY 167–168); 1 ♂, Yona, 13–I–1973, T. TERUYA leg. (TN); 1 ♂, ditto, 27–III–1995, S. SUGIMURA leg. (genit. s. nos. HY 88–90); 1 ♂, Ôkuni-rindô, 28–III–1986, M. SAWAI leg.

Distribution. Japan: Amami-ôshima, Tokuno-shima, Okinawa-hontô (new record).

Biological notes. Biological knowledge is very few. The adults occur in March and April, and are collected from a bush and some tree-flowers by beating and sweeping. I collected many larvae of a *Sacodes* from treeholes of *Quercus* sp. in Okinawa-hontô, and have been rearing them in our laboratory. They probably belong to this species.

Remarks. The holotype has been regarded as a male from the original description. It turned out to be a female according to my close examination.

This species is easily distinguished from the other Japanese species by the coloration of pronotum and markings of elytra. At the present time, this is the only species known from the Ryukyu Islands.

***Sacodes minima* (KLAUSNITZER), comb. nov.**

[Japanese name: Hime-kimune-maruhananomi]

(Figs. 21 D, 22 A, 23 C, 24 C, 31, 40 B)

Helodes minima KLAUSNITZER, 1973, Ent. Nachr., Dresden, **17**: 107, figs. 14–19 (Type: Japan, in British Museum, London, not examined). — KLAUSNITZER, 1974, Zool. Jb. Syst., **101**: 484 [phylogeny]; 1974, Ent. Nachr., Dresden, **18**: 76 [key].

Flavohelodes minima: KLAUSNITZER, 1980, Ent. Bl., **76**: 61.

Adult. Body oval, moderately convex, closely covered with yellowish white hairs. Head brownish black; labrum and maxillary palpi brown; mandibles and labial palpi yellowish brown; antennae brownish black, but the 2nd and 3rd segments and distal margin of each segment are yellowish brown; pronotum yellowish orange; scutellum and elytra brownish black; ventral surface of body brownish black, with yellowish orange pronotal hypomera and with caudal area of 7th abdominal sternite paler; legs yellowish brown, but mid and hind femora darker.

Head lightly convex; front margin of clypeus almost straight. Labrum transverse, somewhat concave at front margin. Eyes large, prominent; the distance between eyes about 2.5 times as long as the diameter of an eye in both sexes. Male antennae rather long, reaching about proximal 1/2 of elytra, serrate lightly in 4th to 10th segments; approximate ratio of antennal segments as 3.4 : 2.7 : 1.0 : 4.5 : 4.4 : 4.5 : 4.7 : 4.5 : 4.5 : 4.0 : 4.9 (n=2, mean). Female antennae rather short, reaching about proximal 1/5 of elytra; approximate ratio of antennal segments as 3.4 : 2.1 : 1.0 : 3.8 : 3.2 : 3.1 : 3.1 : 3.0 : 3.0 : 2.8 : 3.6 (n=2, mean). Pronotum semicircular, broadest at the base; PW/PL 1.7–2.0 (1.9) in male and 1.7–2.2 (2.0) in female. Elytra oval, broadest at the middle; EL/EW 1.4–1.5 (1.5) in male and 1.3–1.5 (1.4) in female; EL/PL 3.5–4.5 (3.8) in male and 3.4–4.1 (3.7) in female; EW/PW 1.3–1.5 (1.4) in both sexes; TL/EW 1.8–1.9 (1.9) in male and 1.7–1.8 (1.8) in female.

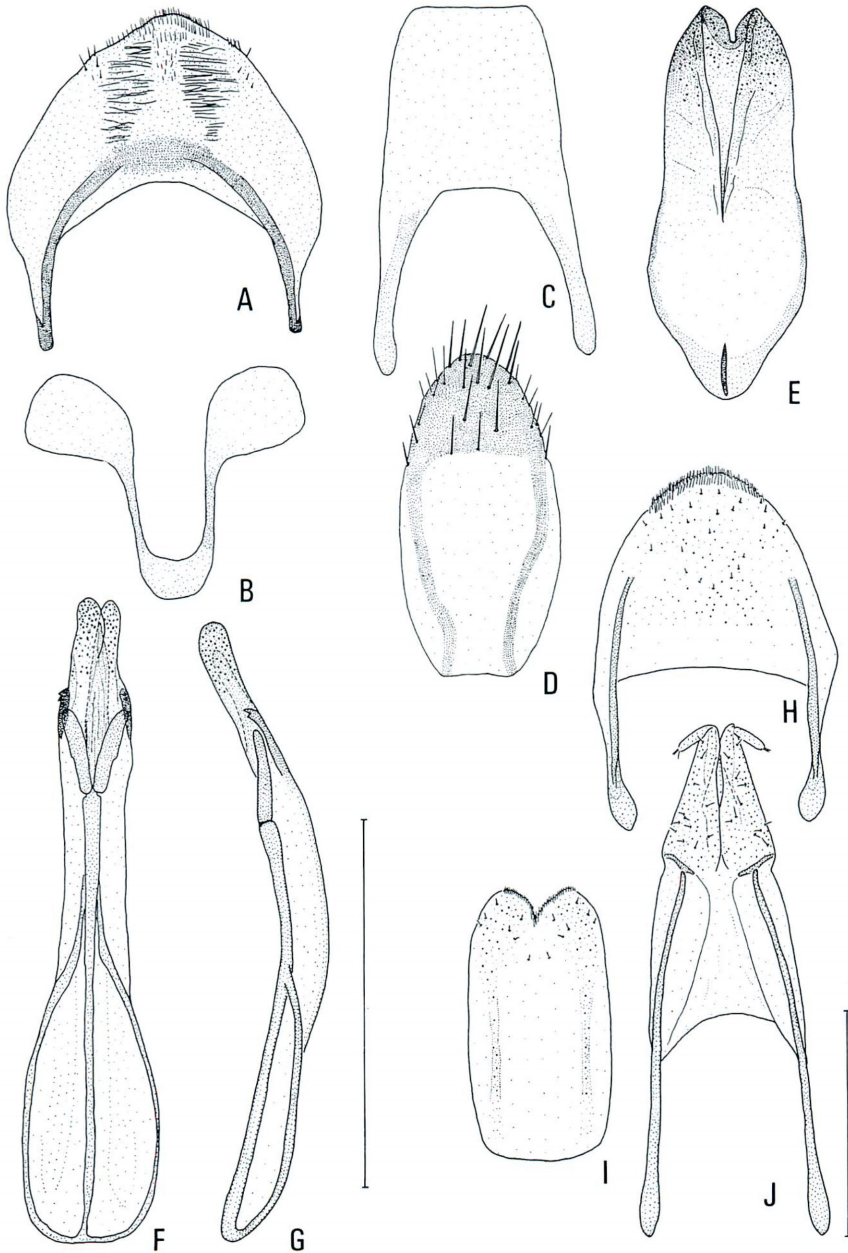


Fig. 31. *Sacodes minima* (KLAUSNITZER). — A–G: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen, dorsal aspect; F, penis, dorsal aspect; G, ditto, lateral aspect. — H–J: Female genitalia; H, 8th tergite; I, 8th sternite; J, ovipositor. (Scales: 0.5 mm.)

Male. Apical margin of 7th abdominal sternite very shallowly concave. Eighth tergite semicircular, covered with many furrows in the middle area, with minute spines in apical area; 8th sternite U-shaped, enlarging postero-laterally in caudal parts of arms; 9th tergite trapezoidal; 9th sternite oblong, with short setae in about caudal 1/3. Tegmen oval, broadest at about proximal 1/3, notched at apical margin, closely covered with fine punctures on caudal area. Penis long, about 1.7 times as long as tegmen, lightly curved dorsad; dorsal piece ovate in proximal half, movable toward lateral sides in apical portion of distal half; ventral piece pointed at apex; a pair of long hooks present in about apical 1/6 of lateral margins, bidentate at apex.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite triangular, sparsely covered with minute setae and fine punctures in posterior area, with minute spines in apical part; 8th sternite slightly sclerotized, oblong, covered with minute setae and fine punctures in caudal area, with notched posterior margin which is covered with minute spines. Ovipositor somewhat shortened; coxite sparsely covered with short setae and fine punctures; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=2, mean):—1.0 : 3.3 : 8.7; prehensor indistinct.

Measurements of adult. Male (n=6). TL: 2.2–2.9 (2.7) mm; EW: 1.2–1.6 (1.5) mm; PL: 0.4–0.6 (0.6) mm; EL: 1.8–2.3 (2.2) mm; PW: 0.8–1.2 (1.1) mm. Female (n=15). TL: 2.8–4.1 (3.2) mm; EW: 1.5–2.3 (1.8) mm; PL: 0.6–0.9 (0.7) mm; EL: 2.2–3.2 (2.5) mm; PW: 1.1–1.7 (1.3) mm.

Immature stages unknown.

Specimens examined. 17 ♂♂, 34 ♀♀ (specimens preserved in 70% ethanol are omitted).

Paratype: 1 ♂, Mt. Kasuga, Pref. Nara, 5–V–1951, coll. Kohei SAWADA (TN).

[Hokkaido] 1 ♀, Hakodate, 23–VI–1994, Y. HIRANO leg. (YH); 1 ♂, Tôyako, 22–VI–1994, Y. HIRANO leg. (YH); 1 ♀, Yukomanbetsu, 2–VII–1958, F. TAKECHI leg.

[Honshu] (Iwate Pref.) 2 ♂♂, 1 ♀, near Hachimantai, 10–13–VII–1995, H. YOSHITOMI leg. (1 ♀ genit. s. no. HY 345). (Yamagata Pref.) 1 ♀, Katta-tôge, Zaô-zan, 4–VIII–1988, S. SAKURAI leg. (genit. s. nos. HY 122–123); 1 ♀, Chôkai-zan, 12–VI–1988, S. SAKURAI leg. (SS). (Fukushima Pref.) 1 ♂, Yunohana, 27–VI–1992, S. OHMOMO leg. (SO, genit. s. no. HY 110); 1 ♀, Tateiwa-mura, 27–VI–1992, S. OHMOMO leg.; 1 ♂, Nagusa, 29–IV–1992, H. OHKAWA leg. (TPM, genit. s. no. HY 37). (Gumma Pref.) 1 ♀, Konroku Pass, 5–VII–1986, S. TSUYUKI leg. (Kanagawa Pref.) 1 ♀, Daiyuzan, Hakone, 5–V–1975, Y. HIRANO leg. (YH); 1 ♀, ditto, 1–V–1983, Y. HIRANO leg. (YH); 1 ♀, ditto, 6–V–1991, Y. HIRANO leg. (YH); 1 ♀, Toonosawa, Hakone, 1–V–1975, Y. HIRANO leg. (YH); 1 ♀, Tsukuinakano, 27–IV–1968, Y. HIRANO leg. (YH); 1 ♀, Mikuniyama, 27–VI–1993, Y. HIRANO leg. (YH); 1 ♂, Ishizare-yama, 6–V–1990, Y. HIRANO leg. (YH). (Niigata Pref.) 1 ♀, Iide, 4–VI–1966, K. BABA leg. (TN); 1 ♀, Shinbotake, 25–V–1972, K. BABA leg. (TN). (Nagano Pref.) 1 ♀, Uguigawa, 26–VI–1992, M. YAMAMOTO leg. (Aichi Pref.) 1 ♂, Mennoki-tôge, 30–V–1985, N. KANIE leg. (genit. s. no. HY 42); 1 ♀, Fujioka, 3–V–1983, M. SATÔ leg. (NWU). (Gifu Pref.) 1 ♀, Ena-san, 29–V–1976, Y. HORI leg. (NWU); 1 ♀, Hiwada, 30–VI–1996, K. FUKUZUMI

leg. (s. nos. HY 274–278). (Mie Pref.) 1 ♀, Hikodani, 15–VI–1969, T. OHKAWA leg. (NWU); 1 ♀, Chichigatani, 5–V–1989, N. NARUKAWA leg.; 2 ♀♀, Hirakura, 27~28–V–1989, M. HASEGAWA leg. (TMNH); 1 ♀, ditto, 23–V–1993, K. AKITA leg. (ant. s. no. HY 343); 1 ♀, ditto, 28–V–1994, K. AKITA leg.; 1 ♂, Shôda, 10–V–1991, K. AKITA leg. (ant. s. no. HY 344). (Kyoto Pref.) 1 ♀, Kibune, 3–V–1956, T. NAKANE leg. (TN); 1 ♀, ditto, 5–V–1956, T. SHIBATA leg. (TN). (Okayama Pref.) 1 ♂, Kuroiwa, 24–V–1986, T. AONO leg. (KMNH, No. JI 4771); 1 ♀, Sakazu, Kurashiki, 20–IV–1989, T. AONO leg. (KMNH, No. 9773).

[Shikoku] (Tokushima Pref.) 1 ♀, Bizan, 23–IV–1966, M. SAKAI leg. (EUM). (Ehime Pref.) 1 ♀, Ohnogahara, 28–V–1978, M. SAKAI leg. (EUM); 1 ♀, Komi, 8–V–1994, N. OHBAYASHI *et al.* (EUM); 1 ♂, Omogokei, 4–V–1958, M. OKADA leg. (EUM); 1 ♀, ditto, 12–V–1994, Y. OKUSHIMA leg. (KMNH, No. 18117).

[Kyushu] (Fukuoka Pref.) 1 ♀, Shôji, 9–V–1971, S. NAKAO leg. (TN). (Ôita Pref.) 1 ♀, Kurodake, 23–V–1995, S. IMASAKA leg. (Saga Pref.) 1 ♂, Hiratani, 28–IV–1989, S. IMASAKA leg. (s. nos. HY 325–330, 337–338). (Nagasaki Pref.) 2 ♂♂, Yahiro-dake, 8–IV–1980, J. OKUMA leg.; 1 ♂, Notori, 4–IV–1989, S. IMASAKA leg. (SI). (Kagoshima Pref.) 1 ♂, Shiroyama, 1–IV–1981, T. NAKANE leg. (TN); 1 ♂, Kirishima-yama, 13–V–1991, S. IMASAKA leg.

Distribution. Japan: Hokkaido (new record), Honshu, Shikoku (new record), Kyushu (new record).

Biological notes. This species dwells from plains to the subalpine zone, and is especially dominant in the subalpine zone and the northern part of Japan. The adults occur from April to early August, and are usually collected by beating and sweeping.

Remarks. This species is similar to *S. nakanei* in the size of body and the coloration of legs, but is distinguished from it by the coloration of antennae.

Sacodes tsushimensis YOSHITOMI, sp. nov.

[Japanese name: Tsushima-kimune-maruhananomi]

(Figs. 21 E, 23 D, 24 D, 32, 40 B)

Adult. Body oval, moderately convex, closely covered with yellowish white hairs. Head brownish black; mouth parts and 1st to 3rd antennal segments yellowish orange, but 1st antennal segments somewhat darker; 4th to 11th antennal segments brownish black; pronotum yellowish orange; scutellum and elytra brownish black; a pair of yellowish orange markings situated on humeral angles of elytra, reaching about proximal 1/5 of elytral margin in the holotype and two paratypes (male and female), 1/3 in two paratypes (male and female), 1/10 in a male paratype; ventral surface of body brownish black, but the pronotal hypomera and about proximal 1/5 of the elytral epipleura are yellowish orange, apical margin of 7th abdominal sternite somewhat paler; legs yellowish orange, with somewhat dusky mid and hind femora.

Head lightly convex, punctate finely and sparsely, with front margin of clypeus almost straight. Labrum transverse, with somewhat concave front margin. Eyes large,

lightly prominent; the distance between eyes about 2.5 times as long as the diameter of an eye in both sexes. Male antennae long, serrate lightly in 4th to 10th segments, reaching about proximal 1/2 of elytra; approximate ratio of antennal segments as 4.0:2.0:1.0:5.7:5.7:6.7:6.3:6.7:6.3:6.3:8.0 (n=1, in paratype). Female antennae rather short, reaching about proximal 1/5 of elytra; approximate ratio of antennal segments as 2.8:1.4:1.0:3.8:3.4:3.2:3.4:3.0:3.2:3.0:4.0 (n=1, in paratype). Pronotum semicircular, broadest at the base; PW/PL 1.8–1.9 (1.8) in male and 1.4–1.6 in female. Scutellum sparsely covered with shallow punctures. Elytra oval, broadest a little before the middle, covered with somewhat shallow punctures; EL/EW 1.4 in male and 1.4–1.5 in female; EL/PL 3.1–3.8 (3.4) in male and 3.1–3.4 in female; EW/PW 1.3–1.5 (1.4) in male and 1.3–1.7 in female; TL/EW 1.7–1.9 (1.8) in male and 1.8–1.9 in female.

Male. Apical margin of 7th abdominal sternite almost straight. Eighth tergite semicircular, with minute spines on apical margin, sparsely covered with minute setae, punctures and many furrows in the middle part; 8th sternite U-shaped, enlarging in apical area of each arm; 9th tergite trapezoidal; 9th sternite oblong, covered with short setae in apical 1/3. Tegmen oval, broadest at about proximal 1/4, notched at apical margin, closely covered with fine punctures at apical end. Penis long, about 2.0 times as long as tegmen, curved dorsally; proximal half of dorsal piece elongated ovate; apical part of dorsal piece elongated; apex of ventral piece elongated and pointed; a pair of long hooks present at about apical 1/3 of lateral margin, pointed at apex.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite lightly sclerotized, pentagonal, sparsely covered with minute setae and fine punctures in posterior part, with minute spines at apex; 8th sternite oblong, covered with fine punctures and minute setae in caudal area, with notched posterior margin which is covered with minute spines. Ovipositor somewhat shortened; coxite sparsely covered with short setae and fine punctures; approximate ratio of the lengths of stylus, coxite and baculus as follows (n=1, in paratype):—1.0:3.0:9.4; prehensor well sclerotized, consisting of a pair of semicircular plates.

Measurements of adult. Male (n=4). TL: 2.9–3.4 (3.3) mm; EW: 1.7–1.9 (1.8) mm; PL: 0.6–0.8 (0.8) mm; EL: 2.3–2.6 (2.5) mm; PW: 1.1–1.5 (1.4) mm. Female (n=2). TL: 3.3 & 4.0 mm; EW: 1.7 & 2.2 mm; PL: 0.8 & 0.9 mm; EL: 2.5 & 3.1 mm; PW: 1.3 mm.

Immature stages unknown.

Specimens examined. 1 ♂ holotype and 3 ♂♂, 2 ♀♀ paratypes.

Holotype: 1 ♂, Ariake-san, Izuhara-chô, Tsushima Isls., 9–V–1996, H. YOSHITOMI leg.

Paratypes: 3 ♂♂, same data as for the holotype. (left antenna and genit. s. nos. HY 239–241 and 336); 1 ♀, same locality as for the holotype, 30–IV–1973, Y. HIRANO leg. (genit. s. no. HY 173); 1 ♀, Mt. Mitake, Tsushima Isls., 17–V–1984, S. IMASAKA leg. (right antenna and genit. s. nos. HY 298, 334–335).

Distribution. Japan: Tsushima.

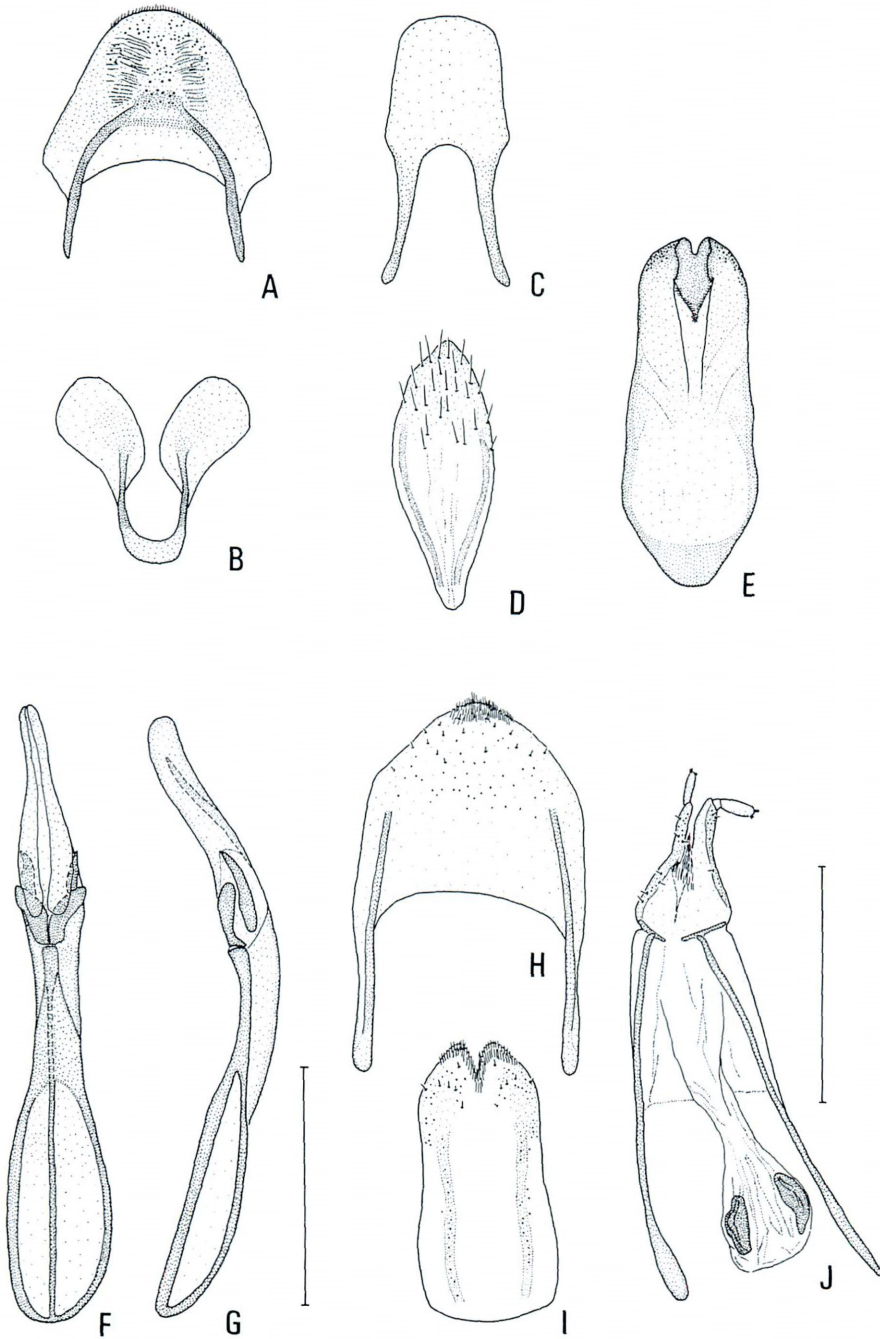


Fig. 32. *Sacodes tsushimensis* sp. nov. — A–G: Male genitalia, paratype; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen, dorsal aspect; F, penis, dorsal aspect; G, ditto, lateral aspect. — H–J: Female genitalia; H, 8th tergite; I, 8th sternite; J, ovipositor. (Scales: 0.5 mm.)

Biological notes. The adults occur in April and May, and are collected by beating foliage in a natural forest of laurel trees. I collected many larvae, which appear to belong to this species, from some treeholes of *Quercus* sp., and have been still rearing them in our laboratory.

Remarks. Judging from configuration of the male and female genitalia, this species is closely related to *S. minima*, but is easily distinguished from it by the humeral margins and distinct prehensor.

Sacodes protecta HAROLD, comb. rev.

[Japanese name: Kimune-maruhananomi]

(Figs. 21 F, 23 E, 24 E, 33, 34 A, 35, 40 C)

Sacodes protecta HAROLD, 1881, Mitt. münch. Ent. Ver., **4**: 169 (Type: Tokio, in Zoologisches Museum Berlin, not examined).

Helodes flavicollis: LEWIS, 1895, Ann. Mag. nat. Hist., (6), **16**: 106.

Elodes flavicollis: PIC, 1914, Coleopt. Cat., (58): 22.

Helodes protecta: KLAUSNITZER, 1973, Ent. Nachr., Dresden, **17**: 106, figs. 1–6 [redescription]; 1974, Zool. Jb. Syst., **101**: 484 [phylogeny]; 1974, Ent. Nachr., Dresden, **18**: 76 [key]; 1977, Ent. Nachr., Dresden, **21**: 167.

Flavohelodes protecta: KLAUSNITZER, 1980, Ent. Bl., **76**: 61; 1995, Water Beetles of China, **1**: 287.

Adult. Body oval, strongly convex dorsad, closely covered with short and fine brown hairs, except for pronotum which is covered with yellowish white hairs. Head brownish black, with somewhat pale clypeus; mouth parts and 1st to 3rd antennal segments dark brown; 4th to 11th antennal segments black; pronotum yellowish orange; scutellum and elytra brownish black; ventral surface of body brownish black, except for yellowish orange pronotal hypomera; legs brownish black, but tarsi usually brown.

Head almost flat, punctate finely and sparsely. Labrum transverse, with somewhat concave front margin. Eyes large, prominent; the distance between eyes about 2.5 times as long as the diameter of an eye in both sexes. Male antennae moderate in length, reaching about proximal 1/4 of elytra, serrate lightly in 4th to 10th segments; approximate ratio of antennal segments as 4.8:2.0:1.0:6.3:5.3:5.5:5.5:6.0:5.5:6.8 (n=1). Female antennae rather short, reaching about proximal 1/6 of elytra; approximate ratio of antennal segments as 3.4:1.8:1.0:4.2:3.6:3.6:3.6:3.4:3.4:3.2:3.8 (n=1). Pronotum broadest at the base, covered with shallow punctures; PW/PL 1.7–2.1 (1.9) in male and 1.9–2.0 (2.0) in female. Scutellum sparsely punctate. Elytra oval, broadest at the middle; EL/EW 1.2–1.4 (1.4) in male and 1.3–1.4 (1.4) in female; EL/PL 3.0–3.5 (3.2) in male and 3.2–3.3 (3.3) in female; EW/PW 1.2–1.4 (1.3) in male and 1.2–1.3 (1.2) in female; TL/EW 1.6–1.9 (1.8) in male and 1.8 in female. Sixth tergite with a pair of short apodemes.

Male. Apical margin of 7th abdominal sternite concave narrowly and shallowly. Eighth tergite pentagonal with anterior angles protruded anteriorly, covered with minute spines, minute setae and punctures in caudal area; 8th sternite Y-shaped, shortened in proximal part, with short setae on apical and interior margins of each arm; 9th

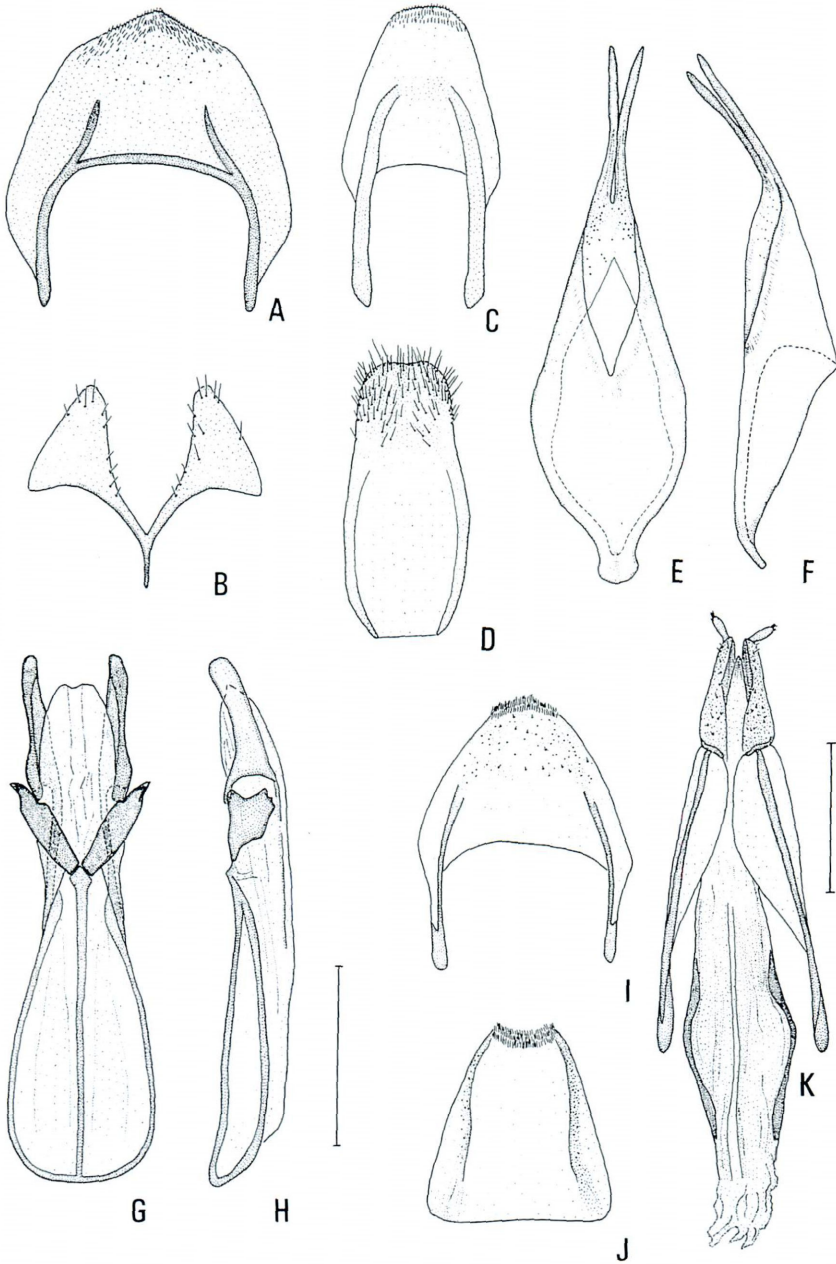


Fig. 33. *Sacodes protecta* HAROLD. — A–H: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen, dorsal aspect; F, ditto, lateral aspect; G, penis, dorsal aspect; H, ditto, lateral aspect. — I–K: Female genitalia; I, 8th tergite; J, 8th sternite; K, ovipositor. (Scales: 0.5 mm.)

tergite trapezoidal, covered with minute spines on posterior margin; 9th sternite oblong, closely covered with short setae in about caudal 1/3. Tegmen long, well sclerotized, broadest at about proximal 1/3; about apical 1/3 bifid, elongated posteriorly, curving dorsally. Penis large, as long as tegmen; proximal half of dorsal piece ovate, broadest near the base; apical part of dorsal piece movable toward lateral sides; apex of ventral piece rounded, weakly sclerotized.

Female. Apical margin of 7th abdominal sternite arcuate. Eighth tergite semi-circular, covered with minute setae and fine punctures in apical half, with minute spines in apical area; 8th sternite moderately sclerotized, trapezoidal, punctate in lateral area, covered with minute spines on posterior margin. Ovipositor moderate in length; coxite sparsely covered with minute setae and fine punctures; approximate ratio of the lengths of stylus, coxite and baculus as follows ($n=1$):—1.0 : 5.0 : 12.9; prehensor well sclerotized, consisting of a pair of long plates, almost of the same length as baculus.

Measurements of adult. Male ($n=4$). TL: 4.5–6.0 (5.2) mm; EW: 2.5–3.8 (2.9) mm; PL: 1.0–1.5 (1.3) mm; EL: 3.5–4.5 (3.9) mm; PW: 2.1–2.5 (2.3) mm. Female ($n=4$). TL: 4.7–6.2 (5.3) mm; EW: 2.6–3.4 (3.0) mm; PL: 1.1–1.5 (1.3) mm; EL: 3.6–4.7 (4.1) mm; PW: 2.2–2.8 (2.4) mm.

Mature larva. Body almost parallel-sided, closely covered with minute setae on dorsal surface, with rather short spinous setae on lateral margins. Coloration almost brown, but the ventral surface of body is paler.

Head moderate in size, with lateral margins rather projecting laterally, with three pairs of stemmata on dorso-lateral parts of head. Antennae filiform, reaching mesothorax; scape short, almost straight, covered sparsely with short setae; pedicel almost of the same length as scape; flagellum 40–45 segmented ($n=3$). Labrum transverse, with shallowly concave front margin; epipharynx with ventral lobes not protruding anteriorly, bearing six pairs of long setae and four pairs of short setae in anterior areas of

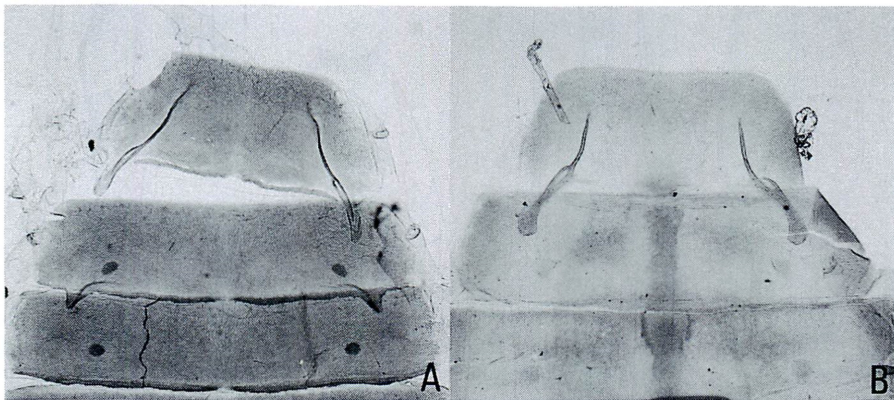


Fig. 34. Fifth to 7th abdominal tergites of *Sacodes* spp. — A, *S. protecta* HAROLD; B, *S. dux* (LEWIS).

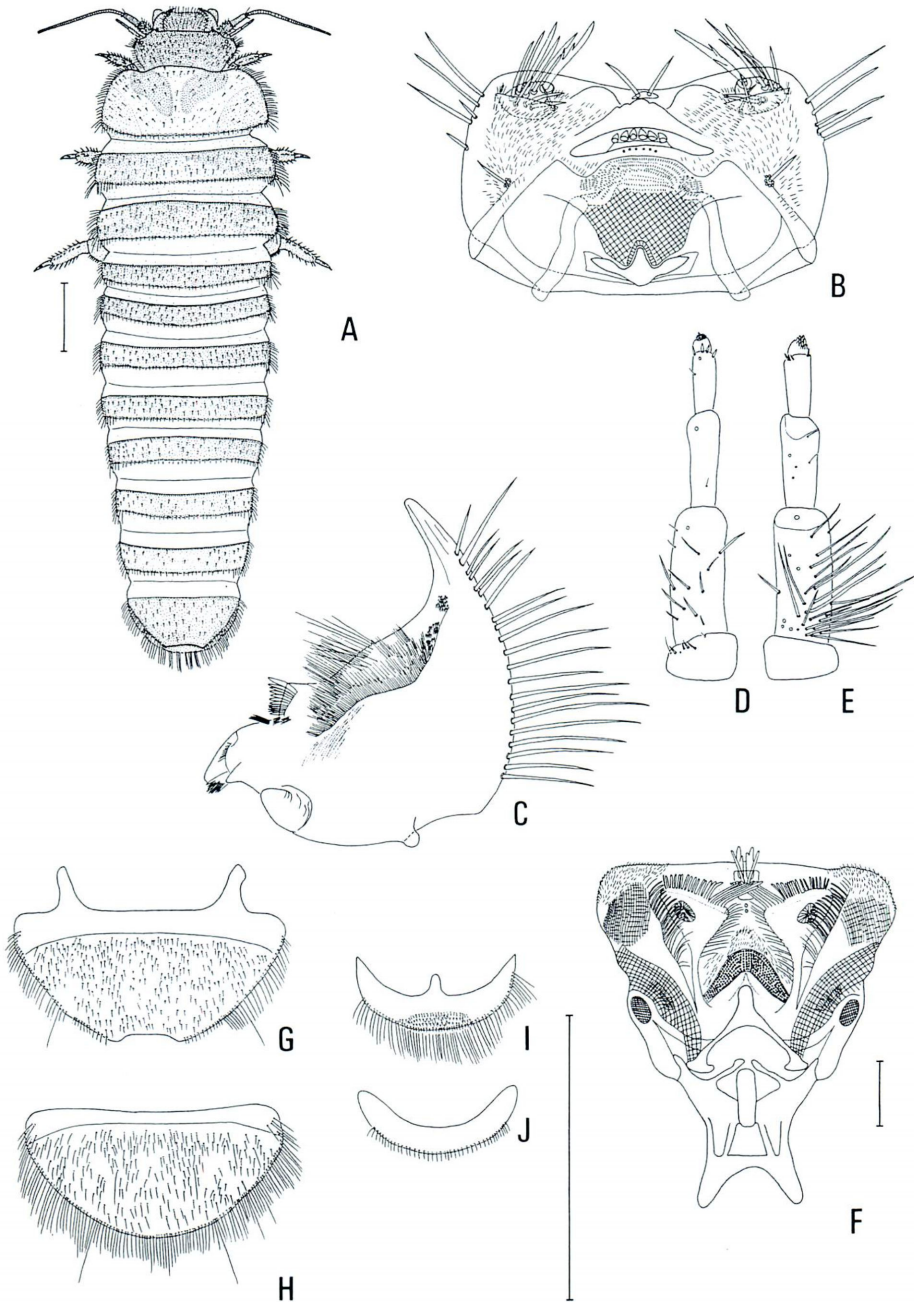


Fig. 35. *Sacodes protecta* HAROLD, mature larva. — A, Dorsal aspect (scale: 1.0 mm). — B–F: Mouth parts (scale: 0.1 mm); B, labrum, ventral aspect; C, left mandible, ventral aspect; D, left maxillary palpus, dorsal aspect; E, ditto, ventral aspect; F, hypopharynx. — G–J: Abdominal segments (scale: 0.5 mm); G, 8th tergite; H, 8th sternite; I, 9th tergite; J, 9th sternite.

ventral lobes, with long ventral setae. Mandibles with rather short bristles in basal area, with very short bristles in apical part. Maxillary palpi long; palpifer with some short setae in dorso-lateral area; 1st broad, about twice as wide as 2nd, covered with short setae on dorsum, with long setae on outer parts of ventral surface, 3rd with short stout setae on anterior margin; approximate ratio of respective segments (1st to 4th) as 8.2 : 5.5 : 3.8 : 1.0. Hypopharynx with a pair of short tooth-bristles bicornute at apices; a pair of setae on keel-sclerites long and simple. Thorax widest at posterior margin of mesonotum; pro- and metanota a little narrower than mesonotum; legs moderate in length, covered with spinous setae. Abdomen lacking extra setae on dorsum; 8th tergite semicircular, with short apodemes near antero-lateral corners, with apical margin shallowly concave; 8th sternite semicircular, covered with many short and some long setae, with long setae on lateral and posterior margins; 9th tergite arcuate in posterior margin, with long setae on posterior margin, protruding distinctly in the middle of anterior margin; 9th sternite arcuate in posterior margin, with short setae on posterior margin.

Measurements of larva (n = 3). TL: 8.8–9.0 mm; HW: 1.6–1.7 mm; PL: 1.1–1.2 mm; PW: 2.5–2.8 mm; TW: 2.8–3.0 mm.

Pupa (n=3). TL: 6.2–6.7 mm; TW: 2.3–2.5 mm.

Specimens examined. Adult. 12 ♂♂, 7 ♀♀.

[Honshu] <Tochigi Pref.> 1 ♀, Nishinasuno, 15–V–1988, S. OHMOMO leg. (SO, ant. s. no. HY 349); 1 ♀, Shiobara, 17–V–1992, S. OHMOMO leg. (SO, genit. s. nos. HY 113–114); 1 ♂, Ôhira-san, Tochigi-shi, 30–IV–1988, H. YOSHITOMI leg. (genit. s. nos. HY 140–142). <Chiba Pref.> 2 ♂♂, Nokogiri-yama, 10–V–1989, T. & T. NAKANE leg. (TN). <Kanagawa Pref.> 1 ♂, Hayama, 21–IV–1992, T. & T. NAKANE leg. (TN); 2 ♂♂, Is. Saru-shima, 15–IV–1979, N. OHBAYASHI leg.; 1 ♂, Komayama, Hiratsuka, 16–V–1981, Y. NOTSU leg. (NWU, genit. s. no. HY 339); 1 ♂, Suzaki, Izu Pen., 14–IV–1968, Y. HIRANO leg. (YH); 1 ♂, Takeyama, 1–V–1988, Y. HIRANO leg. (YH); 1 ♀, Koajiro, 5–V–1988, Y. HIRANO leg. (YH, genit. s. no. HY 175); 1 ♀, Ôiso, 25–IV–1982, Y. HIRANO leg. (YH, genit. s. no. HY 176). <Aichi Pref.> 1 ♂, Atsuta-jingû, Nagoya-shi, 27–IV–1975 (NWU). <Mie Pref.> 1 ♀, Hirakura, 28–V–1989, K. AKITA leg. (genit. s. nos. HY 138–139). <Nara Pref.> 1 ♂, Kasuga, 3–V–1951, N. YATO leg. (TN). <Kyoto Pref.> 1 ♂, Iwakura, 10–V–1970, S. IMASAKA leg. <Okayama Pref.> 1 ♀, Mt. Gagyû, 8–V–1988, T. AONO leg. (KMNH, No. JI 7366).

[Kyushu] <Kagoshima Pref.> 1 ♀, Kirishima, 24–VI–1968, H. MAKIHARA leg.

Larva and pupa. 4 mature larvae, 3 pupae and larval skins, Sagamihara, Kanagawa Pref., 6–IV–1970, N. HAYASHI leg.

Distribution. Japan: Honshu, Kyushu; Russian Far East (Primorsky).

Biological notes. This species is mainly collected from laurel forests below 500 m in altitude. The adults occur from April to June. The larvae are obtained from treeholes of *Quercus acutissima* CARRUTH.

Remarks. This species is superficially similar to *S. dux* in the large body and coloration of legs and antennae. It is, however, easily distinguished by the specialized

tegmen and penis, the presence of apodemes of the 6th tergite and well sclerotized prehensor.

The larva is very similar to that of *S. thoracica* in the characters of mouth parts (STRIBLING & YOUNG, 1990).

***Sacodes dux* (LEWIS), comb. nov.**

[Japanese name: Ruisu-kimune-maruhananomi]

(Figs. 21 G, 22 B, 23 F, 24 F, 36–39, 40 C)

Helodes dux LEWIS, 1895, Ann. Mag. nat. Hist., (6), **16**: 106 (Japan, Hitoyoshi, in British Museum, London, not examined). — KLAUSNITZER, 1973, Ent. Nachr., Dresden, **17**: 106, figs. 7–13 [redescription]; 1974, Zool. Jb. Syst., **101**: 484 [phylogeny]; 1974, Ent. Nachr., Dresden, **18**: 76 [key].

Elodes dux: PIC, 1914, Coleopt. Cat., (58): 22.

Flavohelodes dux: KLAUSNITZER, 1980, Ent. Bl., **76**: 61.

Prionocyphon sp.: HAYASHI, 1957, Akitu, Kyoto, **6**: 48, figs. 1 a–g [description of larva].

Elodes flavicollis: NAKANE, 1963, Icon. Ins. Japon. Col. nat. ed., **2**: 140, pl. 70, fig. 17.

Adult. Body oval, strongly convex dorsad, closely covered with short yellowish white hairs, but fuscous in elytra. Head and labrum brownish black, except for anterior margin of labrum brown; mouth parts, and 2nd and 3rd antennal segments yellowish brown; 1st and 4th to 11th antennal segments brownish black, but the 1st segment and the proximal and distal margins of each segment are somewhat paler; pronotum yellowish orange, though the lateral and distal areas are somewhat whitish; scutellum, elytra, ventral surface of body and legs brownish black, except for pronotal hypomera, prosternum, trochanters and coxae of fore legs which are yellowish orange, and for 7th abdominal sternite, and 4th and 5th tarsal segments which are brown.

Head lightly convex, sparsely punctate, with front margin of clypeus shallowly concave. Labrum transverse, with somewhat concave front margin. Eyes large, prominent; the distance between eyes about 3.0 times as long as the diameter of an eye in both sexes. Antennae moderate in length, reaching about proximal 1/4 of elytra, serrate lightly in 4th to 10th segments of male; approximate ratio of antennal segments as 5.0:2.7:1.0:7.7:6.0:6.3:6.0:6.3:5.7:5.7:7.0 in male (n=1) and 4.3:2.0:1.0:6.0:5.0:4.8:4.8:4.5:4.3:4.3:5.3 in female (n=1). Pronotum broadest at the base; PW/PL 1.7 in male and 1.7–2.0 (1.8) in female. Scutellum shallowly punctate. Elytra oval, broadest at the middle; EL/EW 1.2–1.3 in male and 1.3–1.4 (1.4) in female; EL/PL 3.0–3.1 in male and 3.2–3.9 (3.5) in female; EW/PW 1.4–1.5 in male and 1.3–1.5 (1.4) in female; TL/EW 1.6–1.7 in male and 1.7–1.8 (1.8) in female.

Male. Apical margin of 7th abdominal sternite distinctly concave. Eighth tergite similar in shape to that of *S. protecta*, covered with minute setae and punctures in apical half, with minute spines in apical area; 8th sternite Y-shaped, laterally spread in each arm, with a minute seta on lateral margin of each arm; 9th tergite trapezoidal, with some setae and fine punctures near lateral margins, with a pair of long apodemes; 9th sternite somewhat broad oblong, with long setae in about apical 1/3. Tegmen large,

well sclerotized, very specialized, elongated circular in about proximal 5/6, broadest at about proximal 1/5; distal 1/6 more heavily sclerotized, with three concavities at apical margin, of which the middle one is deeper than the others; a reverse Y-shaped plate on dorsum, connected with penis at the anterior point. Penis large, very specialized; dorsal piece longer than ventral piece; proximal area of dorsal piece Y-shaped, with posterior arms concave on posterior margins; caudal area of dorsal piece widely membranous, sclerotized in lateral and apical parts, with an apical projection bearing a row of serrae at apical end, though this row of serrae is variable in number and sometimes lacks serrae; proximal half of ventral piece reverse U-shaped; caudal half of ventral piece projecting posteriorly, with a hook on ventral margin of apex.

Female. Apical margin of 7th abdominal sternite very shallowly concave. Eighth tergite semicircular, sparsely covered with minute setae and punctures in caudal area, with minute spines in apical area; 8th sternite well sclerotized, trapezoidal, punctate in lateral area, with some small setae on postero-lateral part, more heavily sclerotized in the middle area, notched deeply on posterior margin, which is covered with minute spines. Ovipositor with coxite covered with minute setae and fine punctures; approximate ratio of the lengths of stylus, coxite and baculus as follows ($n=2$, mean):— 1.0 : 3.8 : 11.6; prehensor indistinct.

Measurements of adult. Male ($n=3$). TL: 3.7–4.8 mm; EW: 2.3–4.8 mm; PL: 0.9–1.2 mm; EL: 2.8–3.6 mm; PW: 1.5–2.0 mm. Female ($n=4$). TL: 4.4–6.0 (5.0) mm; EW: 2.5–3.5 (2.9) mm; PL: 1.0–1.4 (1.1) mm; EL: 3.4–4.6 (3.9) mm; PW: 1.7–2.5 (2.1) mm.

Mature larva. Body relatively short, covered with very minute setae on dorsal surface, with short spinous setae on lateral margins. Coloration almost brown, but ventral surface paler.

Head large, distinctly projecting laterad, somewhat projecting anteriorly at the bases of antennae, with three pairs of stemmata in dorso-lateral parts of head. Antennae filiform, reaching metathorax; scape long, almost straight, sparsely covered with short setae; pedicel shorter than scape; flagellum 37–51 segmented ($n=4$). Labrum a little broader than long, with front margin deeply concave. Epipharynx covered with minute spines; ventral lobes strongly protruding anteriorly, closely covered with long stout setae in anterior parts, with five pairs of short setae on interior margin; a pair of strong and excised setae situated in antero-dorsal parts of ventral lobes; epipharyngeal teeth small; ventral setae short. Mandibles nearly triangular, pointed at apex; bristles rather short and simple. Maxillary palpi long; palpifer with some short setae in dorso-lateral areas; 1st covered with short setae in dorso-lateral part, with long setae in outer area and some punctures in ventro-inner area; 2nd with some short setae in ventro-outer area; 3rd with a row of minute setae and two rows of sensory organs in caudal area; approximate ratio of respective segments (1st to 4th) as 20.0 : 14.0 : 11.0 : 1.0. Hypopharynx very specialized in the presence of a pair of lateral filter apparatuses which are semicircular and very wide; tooth-bristles bicornute at apices; a pair of setae on keel-sclerite short and simple; claw apparatus narrow; chitin dent protruding pos-

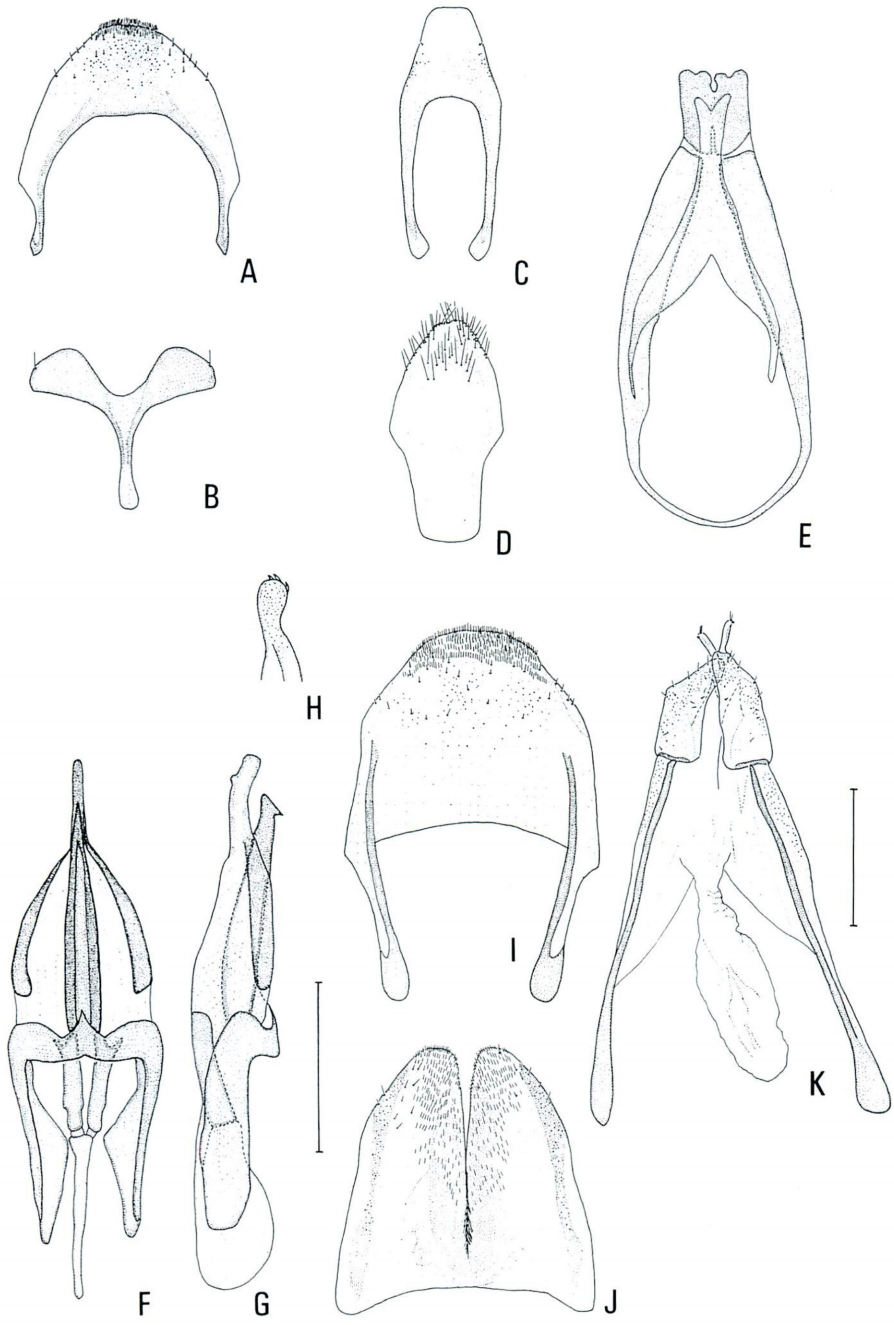


Fig. 36. *Sacodes dux* (LEWIS). — A–H: Male genitalia; A, 8th tergite; B, 8th sternite; C, 9th tergite; D, 9th sternite; E, tegmen, dorsal aspect; F, penis, ventral aspect; G, ditto, lateral aspect; H, ditto, apex of dorsal piece. — I–K: Female genitalia; I, 8th tergite; J, 8th sternite; K, ovipositor. (Scales: 0.5 mm.)

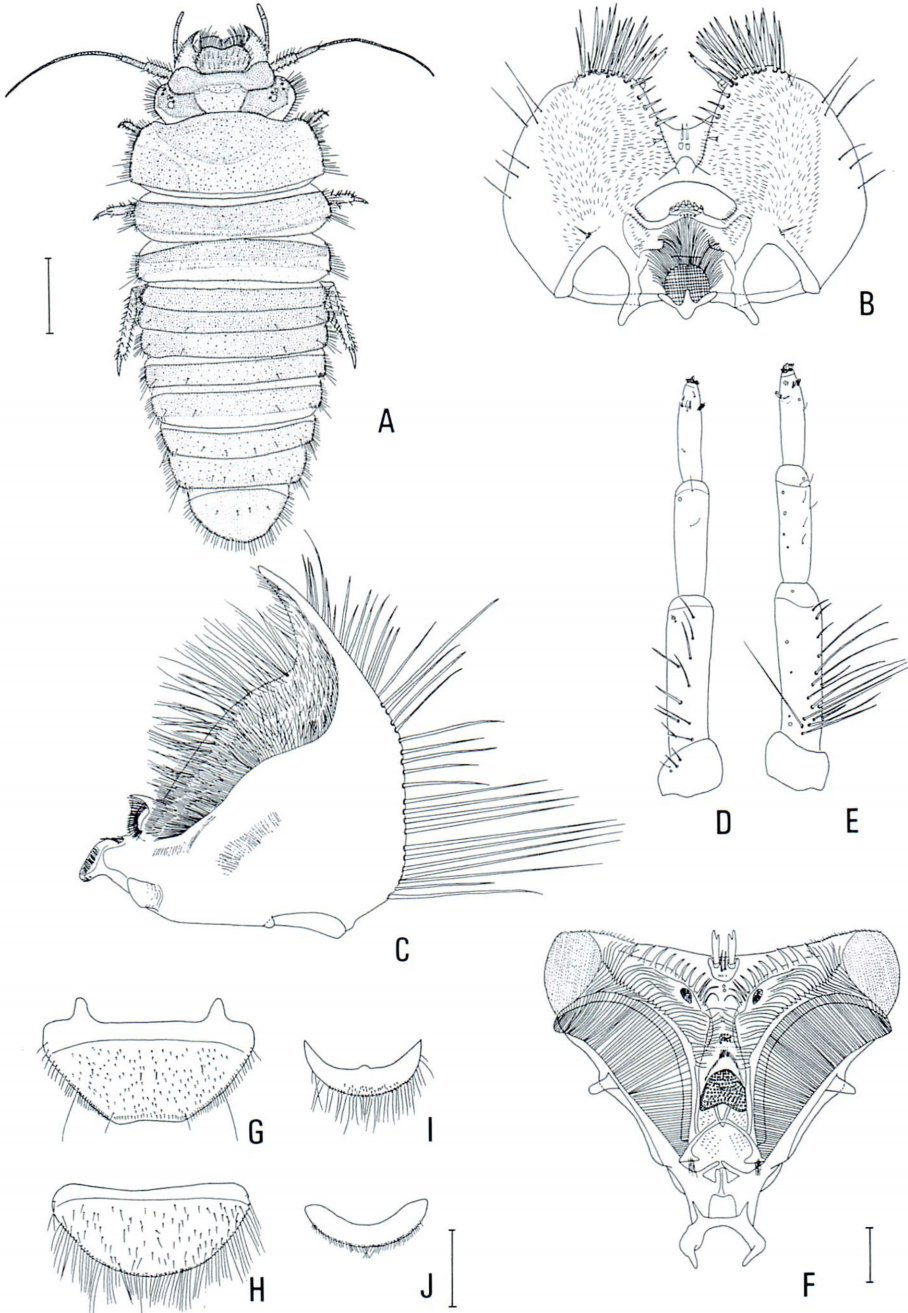


Fig. 37. *Sacodes dux* (LEWIS), mature larva. — A, Dorsal aspect (scale: 1.0 mm). — B–F: Mouth parts (scale: 0.1 mm); B, labrum, ventral aspect; C, left mandible, ventral aspect; D, left maxillary palpus, dorsal aspect; E, ditto, ventral aspect; F, hypopharynx. — G–J: Abdominal segments (scale: 0.5 mm); G, 8th tergite; H, 8th sternite; I, 9th tergite; J, 9th sternite.

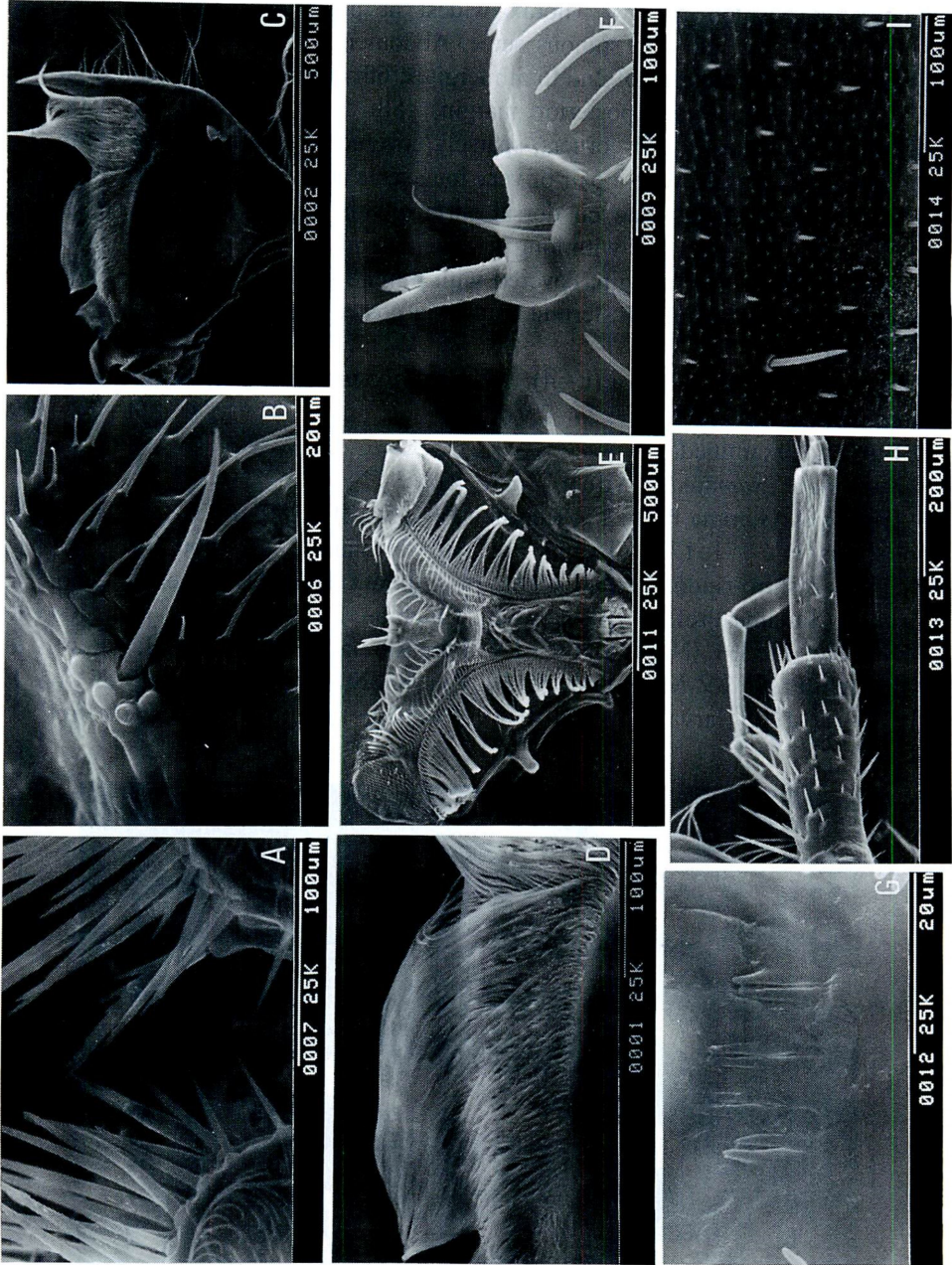


Fig. 38. *Sacodes dux* (LEWIS), mature larva.— A, Ventral lobes; B, left ventral seta; C, left mandible, ventral aspect; D, bristles of left mandible, ventral aspect; E, hypopharynx; F, tooth-bristles; G, sensory organs on keel-sclerite; H, scape and pedicel of right antenna, dorsal aspect; I, dorsal surface of 2nd abdominal segment.

tero-laterally; cushion narrow. Thorax widest at posterior margins of pro- and mesonota; legs covered with spinous setae. Abdomen with two pairs of extra short setae near posterior margins of 2nd to 5th tergites; 6th and 7th tergites with three pairs of extra short setae near posterior margins; 8th tergite trapezoidal, with short apodemes near antero-lateral corners, sparsely covered with minute setae, with short setae on lateral margins, with a pair of very long setae at the middle of lateral margins, with two pairs of extra setae on dorsal surface; 8th sternite semicircular, covered sparsely with short setae, and with long setae on lateral and posterior margins; 9th tergite arcuate in posterior margin, covered with minute setae in apical area, with long setae on posterior margin; 9th sternite arcuate in posterior margin, with short setae on caudal margin.

Measurements of larva (n=4). TL: 6.5–7.5 mm; HW: 1.7–2.1 mm; PL: 1.0–1.1 mm; PW: 2.4–2.9 mm; TW: 2.4–2.9 mm.

Pupa not examined.

Specimens examined. Adult. 6 ♂♂, 21 ♀♀.

[Honshu] (Gumma Pref.) 1 ♀, Konroku Pass, 5–VII–1986, S. TSUYUKI leg. (NWU, genit. s. nos. HY 171–172). (Tochigi Pref.) 1 ♂, Nantai, 22–VI–1960, T. NAKANE leg. (TN); 1 ♀, Tashiro-rindô, 18–VII–1993, H. OHKAWA leg. (TPM, genit. s. nos. HY 111–112). (Saitama Pref.) 1 ♀, Bukou-san, Chichibu, 29–VI–1995, S. KARIYAMA leg. (KMNH, No. 18589). (Nagano Pref.) 1 ♀, Shimashima, 15–VII–1950, T. NAKANE leg. (TN). (Aichi Pref.) 1 ♀, Mennoki-tôge, 30–V–1985, N. KANIE leg. (Gifu Pref.) 1 ♀, Hiwada, 23–VI–1995 (larva coll.), 26–VI–1995 (emerge), H. YOSHITOMI. (Mie Pref.) 2 ♀,

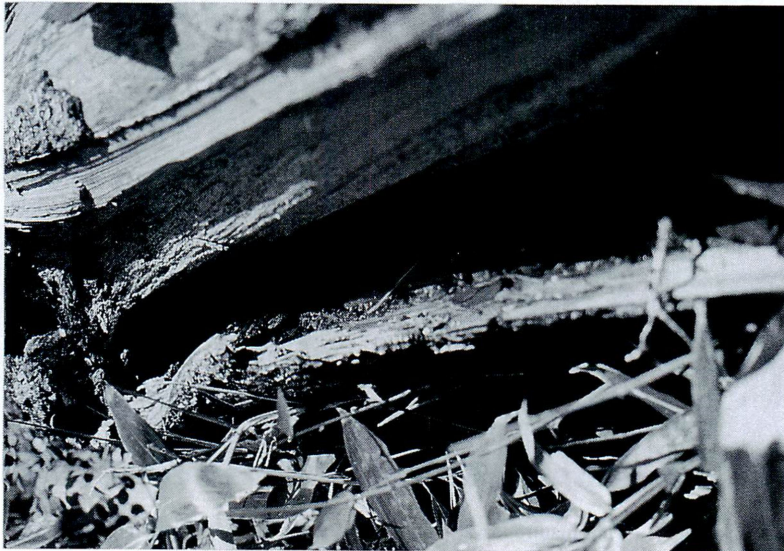


Fig. 39. Larval habitat of *Sacodes dux* (LEWIS), at Hiwada, Gifu Pref., 12–VII–1996, photo by H. YOSHITOMI.

Elodes and Sacodes of Japan

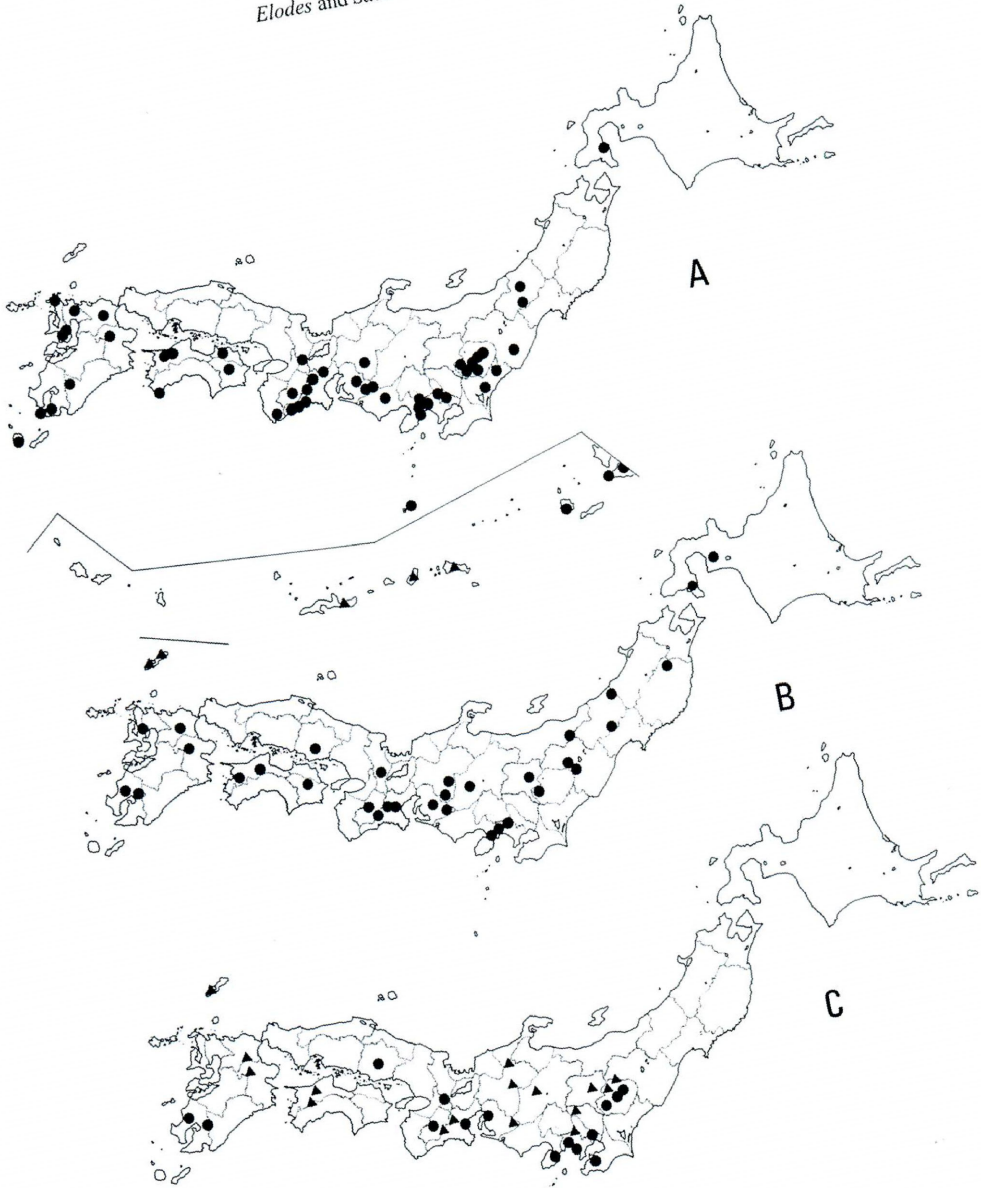


Fig. 40. Map showing the distribution of *Sacodes* spp. — A, *S. nakanei* (KLAUSNITZER) (circles) and *S. amamiensis* (M. SATŌ) (triangles); B, *S. minima* (KLAUSNITZER) (circles) and *S. tsushimaensis* sp. nov. (triangles); C, *S. protecta* HAROLD (circles) and *S. dux* (LEWIS) (triangles).

Hirakura, 17-VI-1995, K. AKITA leg. (Ishikawa Pref.) 1 ♂, 1 ♀, Hakusan, 10-VIII-1966 (larvae coll.), -V-1967 (emerge), N. HAYASHI (genit. & ant. s. nos. HY 341, 346-348). (Nara Pref.) 1 ♀, Kasuga-yama, 8-V-1949, N. YATÔ leg. (TN); 1 ♀, ditto, 6-VI-1995, H. YOSHITOMI leg. (genit. s. no. HY 33).

[Shikoku] (Ehime Pref.) 1 ♂, Odamiyama, 15-V-1968, K. HATTA leg. (NWU); 3 ♀♀, Mt. Ohnogahara, 28-V-1978, M. SAKAI leg. (NWU).

[Kyushu] (Fukuoka Pref.) 1 ♂, Hikosan, 5-VI-1952, T. NAKANE leg. (TN, figured in NAKANE, 1963, pl. 70, 17). (Ôita Pref.) 1 ♂, Mt. Kurodake, Kujû, 17-VI-1990, S. OGATA leg. (genit. s. nos. HY 93-95); 2 ♀♀, ditto, 23-V-1995, S. IMASAKA leg. (SI). (Nagasaki Pref.) 1 ♂, 3 ♀♀, Todoroki Fall, Mt. Taradake, 6-V-1989, S. IMASAKA leg. (genit. s. no. HY 299). (Tsushima) 1 ♀, Ariake-san, 9-V-1996, H. YOSHITOMI leg. (Kagoshima Pref.) 1 ♀, Kurio, 12-VI-1982, T. NAKANE leg. (TN).

Larva. 1 younger larva and 3 mature larvae, Mt. Takao, Tokyo Pref., 12-IV-1953, N. HAYASHI leg. (used in HAYASHI, 1957); 1 larva, Hiwada, Takane-mura, Gifu Pref., 29-IV-1995, H. YOSHITOMI leg.; 67 larvae, ditto, 4-VIII-1995, H. YOSHITOMI leg.; 11 larvae, Haku-san, Ishikawa Pref., 10-VIII-1966, N. HAYASHI leg.

Distribution. Japan: Honshu, Shikoku (new record), Kyushu, Tsushima (new record).

Biological notes. This species is mainly collected in an area from the low mountain to the subalpine zone, but sometimes collected from the basal zone in which remain natural forests. The adults occur from May to July. The larvae are collected from a treehole (on Mt. Haku-san) and rotten wood holes filled with stagnant water (on Mt. Takao and at Hiwada, Fig. 39). The pupal periods are several days under the room temperature.

Remarks. This species is easily and clearly distinguished from the other species of the genus by the specialized genitalia and concavity of the 7th abdominal sternite in the male, and by the well sclerotized 8th sternite.

The larva is also very specialized in general appearance and in the features of mouth parts, and is easily separated from other previously known species.

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要 約

吉富博之：日本産マルハナノミ属とキムネマルハナノミ属の再検討（コウチュウ目マルハナノミ科）。——日本に産するマルハナノミ属 *Elodes* とキムネマルハナノミ属 *Sacodes* の分類学的再検討を行った。

マルハナノミ属 *Elodes* は日本から以下の5種（うち1種が新種）が確認された。

1. *E. inornata* LEWIS, 1895, comb. rev. コクロマルハナノミ
2. *E. wilsoni* PIC, 1918 クロマルハナノミ
3. *E. scapularis* LEWIS, 1895 キュウシュウクロマルハナノミ（改称）
4. *E. elegans* YOSHITOMI, 1997, sp. nov. ホソキマルハナノミ（新種）
5. *E. kojimai* NAKANE, 1963 ムネモンマルハナノミ

コクロマルハナノミ、クロマルハナノミ、キュウシュウクロマルハナノミの3種は *marginata* 種群に、ホソキマルハナノミとムネモンマルハナノミの2種は *minuta* 種群にそれぞれ属する。コクロマルハナノミ、クロマルハナノミ、ムネモンマルハナノミの3種については、幼虫の記載も行った。そのうちの2種、コクロマルハナノミとクロマルハナノミの蛹の期間は6~7日間であった。

キムネマルハナノミ属 *Sacodes* には、日本から以下の6種（うち1種が新種）が認められた。

1. *S. nakanei* (KLAUSNITZER, 1973), comb. nov. コキムネマルハナノミ
2. *S. amamiensis* (M. SATÔ, 1966), comb. nov. カタモンマルハナノミ
3. *S. minima* (KLAUSNITZER, 1973), comb. nov. ヒメキムネマルハナノミ
4. *S. tsushimensis* YOSHITOMI, 1997, sp. nov. ツシマキムネマルハナノミ（新種）
5. *S. protecta* HAROLD, 1881, comb. rev. キムネマルハナノミ
6. *S. dux* (LEWIS, 1895), comb. nov. ルイスキムネマルハナノミ

本属の幼虫は現在までに世界から2種が記載され、*phytotelmata*（植物体、たとえば樹洞や竹の切り株にできた水溜まり）で生活することが知られてきた。この生態的特徴は、本属の生態学的固有派生形質の一つとされている。今回あらたに、コキムネマルハナノミ、キムネマルハナノミ、ルイスキムネマルハナノミの3種の幼虫が判明し、記載を行った。この3種の幼虫も、同様に *phytotelmata* で生活することがわかった。コキムネマルハナノミとルイスキムネマルハナノミの蛹期間は2~3日間であった。

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New Records of *Calosoma maximowiczi* and *Hemicarabus tuberculosus* (Coleoptera, Carabidae) from Shiga Prefecture, Central Japan

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In their list of insects, SHIMBO and HOZUMI (1979, p. 859) recorded *Calosoma maximowiczi* MORAWITZ, 1863 from Shiga Prefecture. However, our re-examination of their specimen preserved in the SHIMBO collection of the Woodland for Nature Observation in Ritto, Shiga Pre-