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A REVISION OF JAPANESE *ELASMOSTETHUS* FIEBER (HETEROPTERA: ACANTHOSOMATIDAE)

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The Japanese species of the genus *Elasmostethus* Fieber are revised. Eight species are recognized, including four new species: *E. kerzhneri*, *E. hasegawai*, *E. amabilis* and *E. rotundus*. *E. brevis* Lindberg is recorded from Japan for the first time. The species previously recognized in Japan as *E. minor* Horváth is found to be the undescribed species *E. kerzhneri*. Host plant association is confirmed for the most species. A key to the Japanese species is provided.

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Key words. – Acanthosomatidae; *Elasmostethus*; revision; new species; new record; key; Japan.

The acanthosomatid genus *Elasmostethus* Fieber is represented by about 25 known species in the Palaearctic, Oriental and Australian regions. In Japan, Hasegawa (1958) recognized six species in this genus: *E. interstinctus* (Linnaeus, 1758), *E. minor* Horváth, 1899, *E. humeralis* Jakovlev, 1883, and three unnamed species. Since his work, only a few faunal reports were published in Japan but no comprehensive taxonomic study.

During my study, I revised the Japanese species of *Elasmostethus*, recognizing eight species including four new. *Elasmostethus brevis* Lindberg was recognized as new to Japanese fauna. In this paper, all Japanese species are (re)described, and the male and female genital structures are illustrated in detail. A key to Japanese species is provided.

MATERIAL AND METHODS

All measurements in the text are given in millimeters. Terminology for the structures of the male genital capsule follows Schaefer (1977). Some new terms are introduced here for fine structures of the male genitalia (see generic diagnosis).

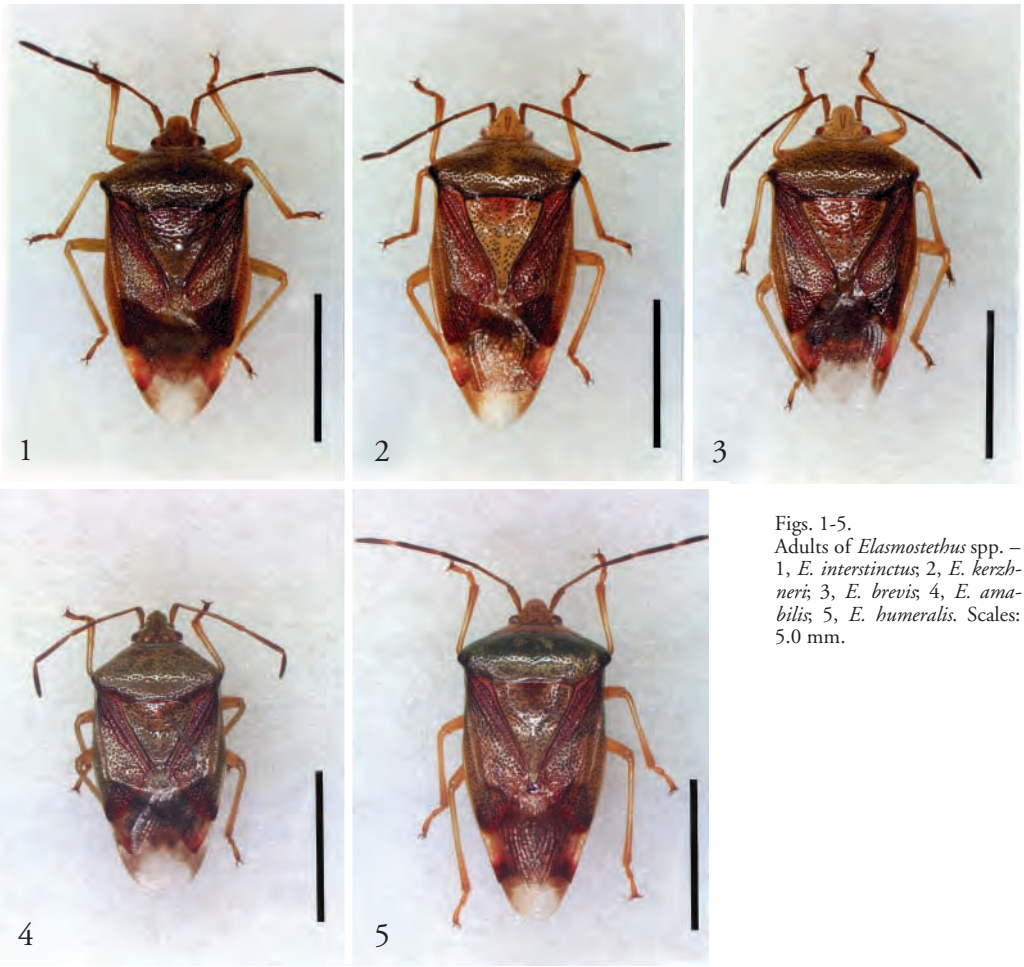
Depositories of the specimens examined are abbreviated as follows.

APMA Aomori Prefectural Museum, Aomori
EUM Entomological Laboratory, Ehime University, Matsuyama, Ehime
IC personal collection of Mr. T. Ichita, Kuroishi, Aomori
KRMK Kitami Region Museum of Science, History and Art, Kitami, Hokkaido
MTIM Maruseppu Town Insectarium, Maruseppu, Hokkaido
NIAS National Institute of Agro-Environmental Sciences, Tsukuba, Ibaraki
NSMT Department of Zoology, National Science Museum, Tokyo
OMO Otaru Museum, Otaru, Hokkaido
OUO Zoological Laboratory, Fuculty of Education, Okayama University, Okayama
OMNH Osaka Municipal Museum of Natural History, Osaka
SEHU Systematic Entomology, Faculty of Agriculture, Hokkaido University, Sapporo, Hokkaido
SUS Department of Biology, Faculty of Education, Saitama University, Saitama
TPMU Tochigi Prefectural Museum, Utsunomiya, Tochigi
NUT Department of Biology, Nankai University, Tianjin, China

TAXONOMY

Genus *Elasmostethus* Fieber

Elasmostethus Fieber, 1860: 78, type species: *Cimex dentatus* De Geer, 1773: 260 (= *Cimex interstinctus* Linnaeus, 1758: 445), monotypic.
Dichobothrium Breddin, 1903: 207, type species: *Dichobothrium sastragaloides* Breddin, 1903: 209 (synonymized by Kumar, 1974: 51).



Figs. 1-5.
Adults of *Elasmostethus* spp. – 1, *E. interstinctus*; 2, *E. kerzhneri*; 3, *E. brevis*; 4, *E. amabilis*; 5, *E. humeralis*. Scales: 5.0 mm.

Kumar (1974) proposed the following definition of *Elasmostethus*: jugum not extending beyond apex of tylus; antennal segment I extending beyond apex of tylus; rostrum reaching from hind coxae to posterior end of abdominal segment III; bucculae not united posteriorly; maxillary plate usually without a tubercle; humeral angle sometimes projected; prosternum with a median groove; mesosternal carina similar to that of *Elasmucha*, extending anteriorly to fore coxae, sometimes to prosternum or head, posteriorly to middle coxae, sometimes to hind coxae; scent gland spout elongate, ⅔ or more of metapleuron width, sometimes reaching lateral margin of metapleuron; abdominal spine usually reaching to middle coxae, rarely beyond them; Pendergrast's organs absent, but sometimes abdominal sternum VI with paired spots.

Japanese members of the genus are characterized by the following body features: body ovoid with rounded sides, broadened anteriorly; dorsum green with red markings, densely dark punctuated; head triangular with laterally concave jugum; antennal segments III-V densely pubescent; anterior part of pronotum strongly declinate, angulated at anterior corners and with thickened lateral margins; humeral angle weakly projecting with obtuse apex; scutellum triangular, clearly longer than broad, with short apical tip; corium with weakly rounded costal margin and with slightly sinuate membranal margin; mesosternal carina anteriorly reaching middle of prosternal groove and posteriorly reaching hind coxae; scent gland spout ⅔ times as wide as metapleuron; legs densely pubescent on apical ⅔ of tibia and ventral part of tarsus; male hind femur with a small basal tubercle; connexiva concolorous, not serrate; abdominal spine reaching to middle coxae; apical corner of abdominal segment VII acute in both sexes. Pendergrast's organs obviously present on abdominal sterna VI and VII in female.

The male genitalia of Japanese *Elasmostethus* in gen-

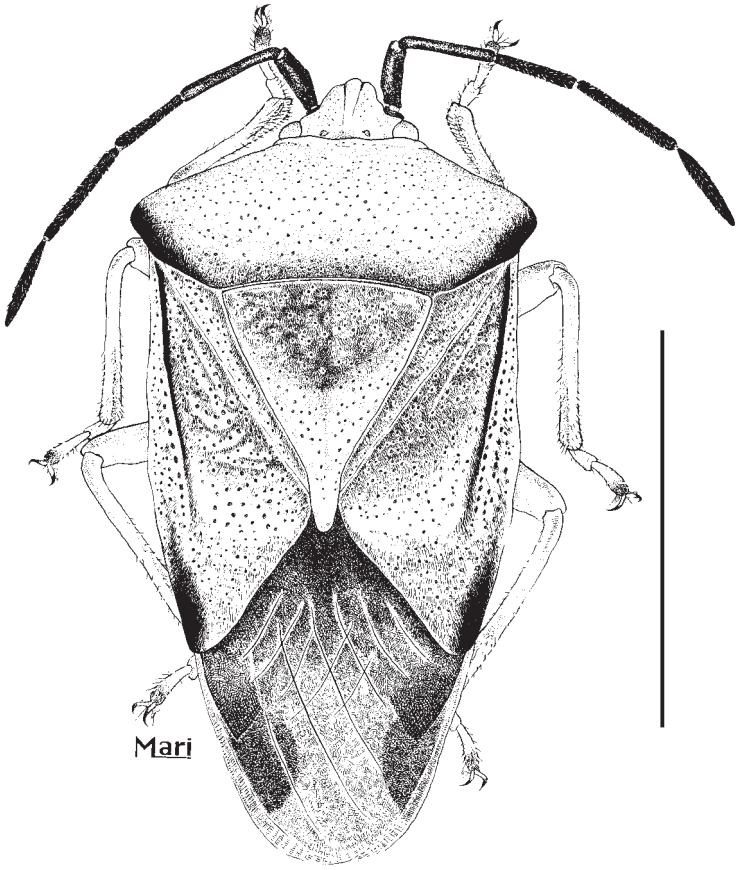
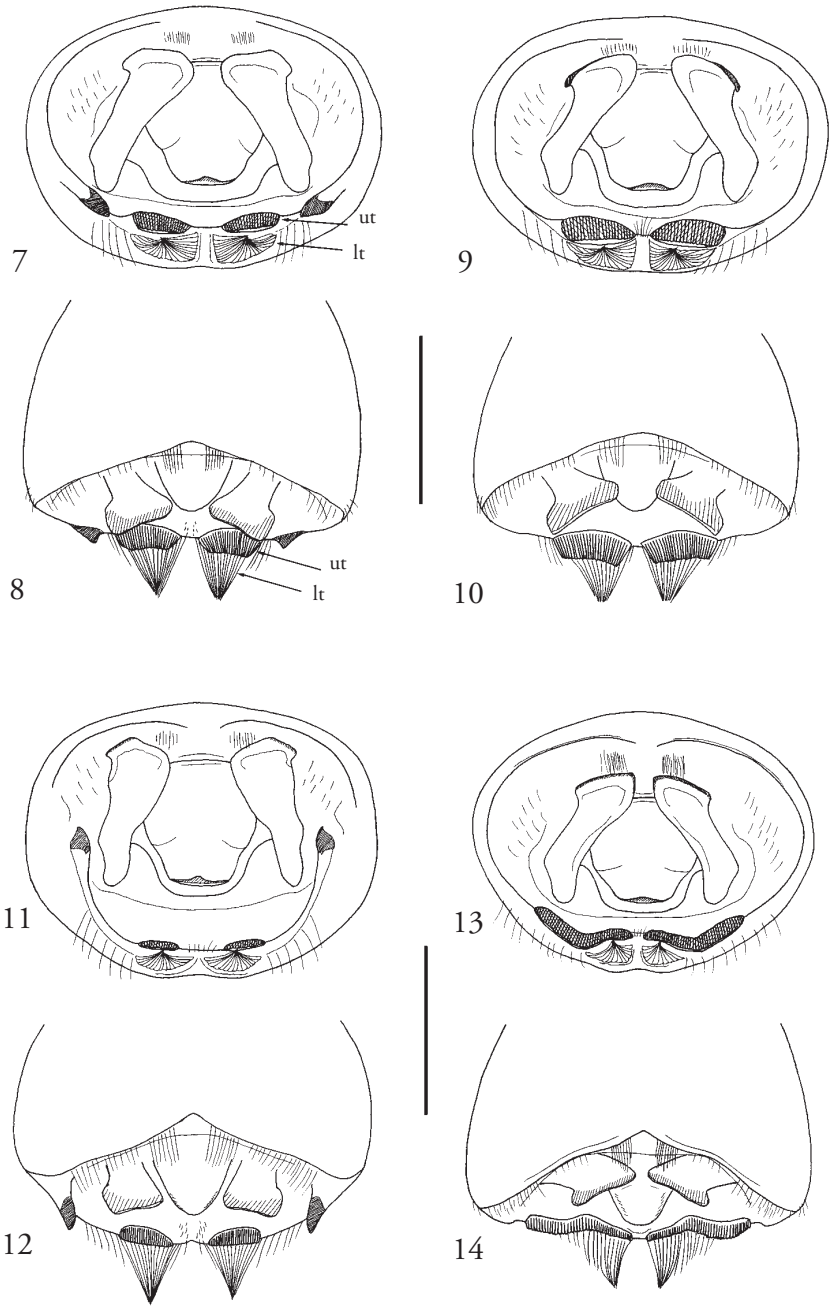


Fig. 6. *Elasmostethus hasegawai*. Scale: 5.0 mm.

eral show the following characteristics: The genital capsule is furnished with a pair of long setal tufts at the middle of ventral rim, here referred to as 'lower tufts' (figs. 7-8, *lt*), and with a pair of dense tufts consisting of black, short and stout bristles 'upper tufts' (figs. 7-8, *ut*) at the upper region of the lower tufts. The proctiger is strongly projecting apically, and its basal part is convex laterally. The phallotheca is well sclerotized, strongly swollen at dorsobasal part, forming a large 'dorsal diverticulum' (figs. 25-26, *dd*). The conjunctivum is weakly sclerotized, with a pair of strongly sclerotized lobes ventrally, which were termed ventrolateral conjunctival processes (figs. 25-26, *vcp*) by Kumar (1974). The conjunctivum is also attached to a sclerotized, subconical extension apically, which was termed as sheath of conjunctiva by Leston (1953) and conjunctival sheath by Kumar (1974) (figs. 25-26, *cs*). The conjunctival extension is usually accompanied by a large membranous sac dorsally, here referred to 'dorsal lobe' (figs. 25-26, *dl*). However, in some Japanese species, the tufts of genital capsule and/or the dorsal diverticulum are lacking.

Remarks. – Kumar (1974) comprehensively revised the world Acanthosomatidae, redefining the 47 acanthosomatid genera, including *Elasmostethus*, and provided a generic definition and keys. He used two character states, the backwards-extending mesosternal carina and the elongated scent gland spout, to distinguish *Elasmostethus* from related genera (e.g., *Acanthosoma* Curtis, 1824 and *Elasmucha* Stål, 1864) in the generic key.

The genus *Cyphostethus* Fieber was synonymized with *Elasmostethus* by Kumar (1974), but Ahmad and Önder (1993) restored *Cyphostethus* as a separate



Figs. 7-14. Male genital capsule of *Elasmostethus* species, caudal view (7, 9, 11, 13) and dorsal view (8, 10, 12, 14). – 7, 8, *E.interstinctus* (*lt*: lower tuft, *ut*: upper tuft); 9, 10, *E. kerzhneri*; 11, 12, *E. brevis*; 13, 14, *E. hasegawai*. Scales: 1.0 mm.

genus. I examined the Japanese species *Cyphostethus japonicus* Hasegawa, 1959; it is clearly distinct from the members of *Elasmostethus* in the general body features, including the male genitalia. Therefore I am following Ahmad's view in this work.

KEY TO THE JAPANESE SPECIES

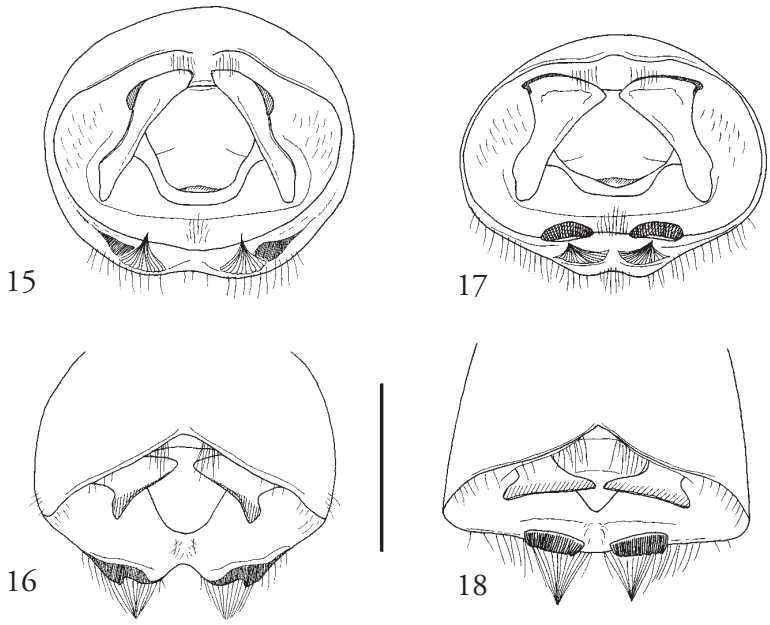
1. Corium with a small fuscous spot on central region; abdominal sterna without dark spots except for female VII; male genital capsule without lower tufts at middle of ventral rim (figs. 40-43) 2
– Corium usually lacking fuscous spot on central region; abdominal sternum with a pair of fuscous spots laterally (occasionally missing in some specimens); male genital capsule with a pair of lower tufts at middle of ventral rim (figs. 7-18) 3
2. Male genital capsule densely furnished with long setae on ventral rim (figs. 40-41); paramere with an obtuse outer angle on apical part (fig. 44); apical corner of abdominal segment VII extending beyond genital segments (fig. 46).....*E. nubilus*
– Male genital capsule with only a few long setae on ventral rim (figs. 42-43); paramere without outer angle on apical part (fig. 45); apical corner of abdominal segment VII not extending beyond genital segments (fig. 47) .....*E. rotundus*
3. Abdominal terga V-VII reddish yellow below wings.....*E. humeralis*
– Abdominal terga almost entirely black below wings 4
4. Males 5
– Females.....9
5. Ventral rim of genital capsule without upper tufts (figs. 15-16) .....*E. amabilis*
– Ventral rim of genital capsule with a pair of upper tufts (figs. 7-14, 17-18).....6
6. Ventral and lateral rims of genital capsule without black teeth 7
– Ventral or lateral rim of genital capsule with black teeth 8
7. Genital capsule with a pair of elongate and sinuate upper tufts on ventral rim (figs. 13-14) ....*E. hasegawai*
– Genital capsule with a pair of oval upper tufts on ventral rim (figs. 9-10).....*E. kerzhneri*
8. Lateral rim of genital capsule with black teeth-like projections (figs. 11-12).....*E. brevis*
– Ventral rim of genital capsule with a pair of small black lateral teeth (figs. 7-8).....*E. interstinctus*
9. Posterior corner of genital segment IX protruding beyond VIII (fig. 36); lateral margins of abdominal terga broadly yellow .....*E. amabilis*
– Posterior corner of genital segment IX not protruding beyond VIII; lateral margins of abdominal terga narrowly yellow.....10
10. Posterior margin of genital segments VIII arched, scarcely emarginate medially (fig. 34).....*E. brevis*
– Posterior margin of genital segments VIII distinctly emarginate medially (figs. 32-33, 35) 11
11. Antennae usually entirely infuscate; membrane infuscate; corium often with a fuscous long stripe along vein R+M (fig. 6); genital segment VIII strongly rounded laterally (fig. 35) ....*E. hasegawai*
– Antennae fuscous only on apical segments; membrane not infuscate; corium without long fuscous stripe; genital segment VIII gently rounded laterally (fig. 32-33).....12
12. Membrane brownish.....*E. kerzhneri*
– Membrane not brownish .....*E. interstinctus*

Elasmostethus interstinctus (Linnaeus)
(figs. 1, 7-8, 19, 25-26, 32)

Cimex interstinctus Linnaeus, 1758: 445.
Elasmostethus interstinctus – Hasegawa, 1958: 6; Miyamoto & Yasunaga, 1989: 188.

Redescription. – Body ovoid; dorsal surface green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head green, irregularly punctate except around eyes and with a pair of fuscous, narrow stripes on basal part of tylus. Antenna green, with brownish segment III, fuscous IV and V. Rostrum greenish yellow with fuscous apex, reaching to middle coxae. Pronotum green, reddish along posterolateral margin, densely punctate except for calli; humeral angle projecting weakly, infuscate posteriorly. Scutellum green, tinged with red basally, densely punctate; apex pale, impunctate. Corium translucent, green, with some red along claval and membranal margin, densely punctate; base of vein R+M narrowly blackish; apical corner slightly infuscate; clavus red, densely punctate; membrane hyaline and with a triangular, fuscous marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, darkened on apex of tarsomere II; apex of claw fuscous. Abdominal terga entirely black, except for narrowly greenish yellow lateral margins; posterior margin of segment VII reddish yellow. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate; each segment with a pair of fuscous spots laterally; segment VII reddish on apical corner. Pendergrast's organs semicircular (fig. 32).

Male genitalia: Sides of genital capsule rounded in dorsal view; ventral rim furnished with a pair of lower tufts and a pair of upper tufts, and with a pair of black teeth laterally; infolding of dorsal rim with a pair of long setal tufts at each side of middle (figs. 7-8); paramere with broad rectangular outer projection reflexed caudad (fig. 19); phallotheca with a large dorsal diver-



Figs. 15-18. Male genital capsule of *Elasmostethus* species, in caudal view (15, 17) and dorsal view (16, 18) – 15, 16, *E. amabilis*; 17, 18, *E. humeralis*. Scale: 1.0 mm.

ticulum; dorsal lobe of conjunctival sheath well developed and divided into 5 lobules (figs. 25-26).

Female genitalia: Posterior margin of genital segments VIII rounded laterally and with a shallow median emargination (fig. 32).

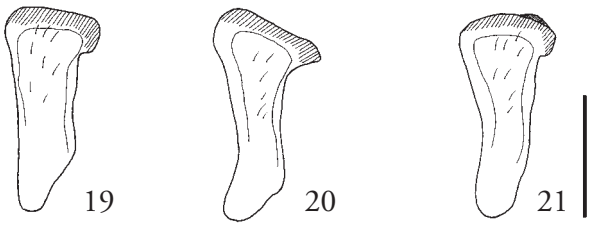
Dimensions. – ♂/♀: Body length 9.56-10.90 (mean 10.40)/10.00-11.90 (11.30); width of head including eyes 1.73-1.93 (1.84)/1.79-2.00 (1.91); length of antennal segment I 0.86-1.10 (1.00)/0.76-1.00 (0.91), II 1.38-1.69 (1.55)/1.28-1.52 (1.36), III 0.86-1.10 (0.96)/0.83-1.00 (0.91), IV 1.45-1.73 (1.57)/1.31-1.52 (1.43), V 1.35-1.55 (1.42)/1.14-1.45 (1.27); width of pronotum 4.62-5.45 (5.10)/4.83-6.00 (5.60); width of scutellum 2.42-2.90 (2.74)/2.62-3.38 (3.06); length of scutellum 2.90-3.66 (3.35)/3.24-3.93 (3.63); length of fore femur 2.00-2.55 (2.33)/2.07-2.48 (2.30), fore tibia 2.07-2.35 (2.23)/1.86-2.28 (2.09), middle femur 2.21-2.76 (2.58)/2.35-2.83 (2.67), middle tibia 2.28-2.62 (2.43)/1.73-2.62 (2.35), hind femur 2.76-3.52 (3.18)/2.69-3.45 (3.14), hind tibia 2.83-3.59 (3.26)/2.69-3.31 (3.05).

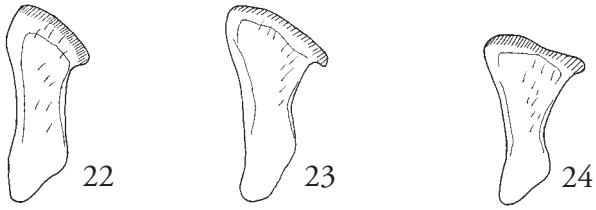
Distribution. – Japan (Hokkaido, Rishiri Is., Rebun Is.); Korea, China, Russian Far East (Magadan, Kamchatka, Khabarovsk, Amur, Primorskij, Sakhalin, Kurils), Europe, North America.

Biology. – *Betula ermanii* Cham. (Betulaceae) could be confirmed as a host plant. On this we collected many eggs and young instar nymphs in Hokkaido. This species occurs mainly in the montane to subalpine zone in Hokkaido, but the adults are occasionally found in the lowland zone as well. The adults are frequently attracted to light.

Remarks. – This species is characterized by the black abdominal terga under wings, the black tooth on male ventral rim in the male genitalia (figs. 7-8), shape of paramere (fig. 19), and the medially emarginate posterior margin of female genitalia (fig. 32).

Material examined. – JAPAN: Hokkaido: 2♀, Kutsugata-Mikaeridai, Rishiri Is., 20.ix.1991, M. Tomokuni (NSMT); 1♂, Mt. Kuro-dake, Taisetsu-zan Mts., 11.vii.1960, S. Takagi; 2♀, Mt. Tomuraushi-dake, Taisetsu-zan Mts., 17-23.vii.1968, H. Takizawa; 1♀, Mt. Tokachi-dake, Taisetsu-zan Mts., 18.vii.1951, T. Oku (SEHU); 1♂ 3♀, Mt. Midori-dake, Taisetsu-zan Mts., 7.viii.2001, A. Yamamoto; 2♂ 1♀, Kogen-onsen, Kamikawa, 14.iv.1998, A. Yamamoto; 1♂ 6♀, Kanoko-dam, Ashoro, 20.ix.1995, A. Yamamoto; 1♂, Tokachi-Mitsumata, Kamishihoro, 29.vii.1995, S. Ohno; 1♂ 1♀, Sin-Arashiyama, Memuro, 20.ix.1995, A. Yamamoto (OMO); 1♂, Oketo-ko, Oketo, 19.ix.1998, N. Muramatsu (KRMK); 1♀, Mt. Shokanbetsu-dake, Mashike, 10.ix.1995, G. Ito; 1♀, Shirai-sawa, Otaru, 1.ix.1998, A. Yamamoto; 1♂ 1♀, Hokkaido Univ., Sapporo, 5-6.ix.1998, G. Ito; 2♂ 1♀, Mt. Soranuma-dake, Sapporo, 6.vi.1999, A. Yamamoto (OMO); 2♂ 2♀, Nakayama-toge, Sapporo, 16.ix.1986, S. Kudo (SEHU); 6♂ 4♀, Mt. Yotei-zan, Makkari, 30.viii.2000, A. Yamamoto; 1♂ 1♀, Asahi-onsen,





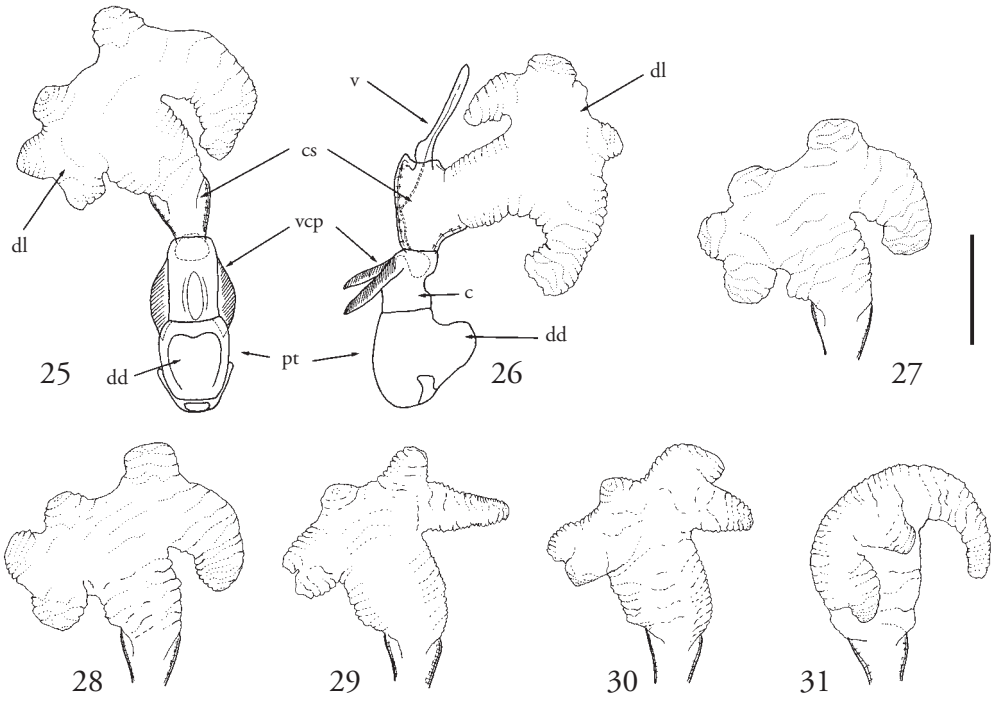
Figs. 19-24.
Right parameres of *Elasmostethus* spp. – 19, *E. interstinctus*; 20, *E. kerzhneri*; 21, *E. brevis*; 22, *E. hasegawai*; 23, *E. amabilis*; 24, *E. humeralis*. Scale: 0.5 mm.

Iwanai, 18.viii.1998, A. Yamamoto; 1♂ 2♀, Shinsen-numa, Kyowa, 17.viii.1994, M. Ohara; 1♂, Kokkuri-ko, Rankoshi, 19.viii.1997, A. Yamamoto; 1♀, Mt. Kariba-yama, Shimamaki, 6-8.viii.1988, M. Ohara et al. (OMO). – CHINA: 1♂ 2♀, Harbin, 16-17.vi.1963 (NUT). – RUSSIA: 2♂ 1♀, 8 km S of Nagornyj, S. Yakutia, 16-17.vii.1995, T. Yasunaga (OUO).

Elasmostethus kerzhneri sp. n.
(figs. 2, 9-10, 20, 27, 33)

Elasmostethus minor – Hasegawa, 1958: 6; Higuchi & Sato, 1988: 54; Ichita, 1988: 120; Miyamoto & Yasunaga, 1989: 188; Hayashi, 1998: 188 (nec Horváth, 1899).

Type material. – Holotype ♂, Yabitsu-yachi, Towadako, Aomori Pref., Honshu, Japan, 21.vi.1998, M. Ohara et al. (SEHU). – Paratypes: Honshu: 2♂ 2♀, same data as for holotype (SEHU); 5♂ 5♀, same data as for holotype (OMO); 1♂ 4♀, Sukayu, Aomori, Aomori Pref., 6.ix.1987, T. Ichita (IC); 2♂ 1♀, Mt. Ohdake, Aomori, Aomori Pref., 8.vi.1998, S. Yamauchi; 3♂ 1♀, Mt. Hina-dake, Aomori, Aomori Pref., 21.vi.1997, S. Yamauchi; 1♂ 1♀, Mt. Ishikura-dake, Aomori, Aomori Pref., 8.viii.1999, S. Yamauchi; 1♂, Sen'nin-tai, Aomori, Aomori Pref., 5.vi.1999, S. Yamauchi; 5♂ 2♀, Mt. Komaga-mine, Towadako, Aomori Pref., 21.vi.1998, S. Yamauchi; 3♂ 1♀, Mt. Sarukura-dake, Towadako, Aomori Pref., 22.vi.1998, S. Yamauchi; 1♀, Ajigasawa, Aomori Pref., 28.vii.1987, A. Fukuda; 1♀, same locality, 24.vii.1989, K. Shimoyama (APMA); 1♂ 1♀, Mt. Iwaki-san (alt. 1200-1625 m), Aomori Pref., 27.ix.1986, T. Ozaki (IC); 2♂ 2♀, Mt. Chokai-zan, Iwaki-san Mts., Aomori Pref., 7.vii.1993, S. Yamauchi; 2♂, Mt. Saihoji-mori, Iwaki-san Mts., Aomori Pref., 12.vii.1995, S. Yamauchi; 1♂ 1♀, Shirasawa, Iwaki-san Mts., Aomori Pref., 17.viii.1993, S. Yamauchi (APMA); 2♂ 5♀, Mt. Shirakami-dake, Iwasaki, Aomori Pref., 31.vii.1988, T. Ichita (IC); 1♀, Juni-ko, Iwasaki, Aomori Pref., 5.viii.1994, S. Yamauchi; 2♀, Takinomata-zawa, Hiraka, Aomori Pref., 28.vi.1988, S. Yamauchi (APMA); 1♂ 1♀, Gama-numa (alt. 1600 m), Hachiman-tai, Iwate Pref., 13.ix.2000, M. Hayashi et al.; 2♂ 1♀, Horai-numa (alt. 1310 m), Hachiman-tai, Iwate Pref., 9.ix.2001, M. Hayashi et al.; 2♂, Matsukawa-onsen (alt. 890 m), Hachiman-tai, Iwate Pref., 9.ix.2001, M. Hayashi et al.; 5♂ 5♀, Fukenoyu (alt. 1120 m), Hachiman-tai, Kazuno, Akita Pref., 17.vii.2001, M. Hayashi et al.; 3♂ 3♀, Oyachi (alt. 1080 m), Hachiman-tai, Kazuno, Akita Pref., 13.ix.2000, M. Hayashi et al. (SUS); 1♂, Mt. Zawo-san, Miyagi Pref., 22-23.vi.1974, Y. Kurosawa (NSMT, no. 4675); 1♂, Hinoemata, Fukushima Pref., 9-10.vi.1990, K. Konishi; 1♂, Sandogoya-onsen, Kuroiso, Tochigi Pref., 21. ix.1974, K. Sadanaga (NIAS); 1♂, Happo-gahara, Yaita, Tochigi Pref., 11.viii.1983, K. Kawakami; 1♂, Kinugawa-onsen, Fujiwara, Tochigi Pref., 12.viii.1987, K. Watanabe (TPMU); 1♂, Konsei-rindo, Nikko, Tochigi Pref., 23.vii.1983, K. Kawakami (NIAS); 1♀, Karikomi-ko, Nikko, Tochigi Pref., 12.vi.1996, A. Yamamoto (OMO); 2♂, Yumoto, Nikko, Tochigi Pref., 26.viii.1985, T. Imura (TPMU); 1♂ 5♀, Yamanohana, Ozegahara, Gunma Pref., 24.viii.1961, I. Hiura (OMNH); 1♂ 3♀, Ozegahara, Gunma Pref., 28-31.viii.1978, M. Sato (NSMT, no. 4676-4679); 1♂, same locality, 28-31.viii.1978, M. Tomokuni (NSMT, no. 4680); 2♂, same locality, 20-24.viii.1979, M. Sato (NSMT, no. 4681-4682); 1♂, Kosuge-gawa, Kosuge, Yamanashi Pref., 14.vii.1960, S. Katsuya; 1♂, Mt. Iizuna-yama, Nagano Pref., 29.vi.1943, K. Sakaguchi; 1♂, from Sarukura to Mt. Shirouma-dake, Hakuba,



Figs. 25-26. Male genitalia of *Elasmostethus interstinctus*. – 25, aedeagus in dorsal view; 26, aedeagus in lateral view. Scale: 1.0 mm.
Figs. 27-31. Dorsal lobe of conjunctival sheath in male genitalia of *Elasmostethus* spp. – 27, *E. kerzhneri*; 28, *E. brevis*; 29, *E. hasegawai*; 30, *E. amabilis*; 31, *E. humeralis*(*c*: conjunctivum, *cs*: conjunctival sheath, *dd*: dorsal diverticulum, *dl*: dorsal lobe, *v*: vesica, *vcp*: ventral conjunctival process). Scale: 1.0 mm.

Nagano Pref., 15-16.ix.1966, H. Hasegawa; 1♂, Kamikochi, Azumi, Nagano Pref., 3.viii.1952, E. Nakanishi; 1♂, same locality, 12.ix.1952, H. Hasegawa; 1♂, Takamiishi, Mt. Yatsuga-take, Nagano Pref., 31.vii.1964, H. Hasegawa; 1♂, Inagoyu, Koumi, Nagano Pref., 24.vii.1959, T. Shibata (NIAS).

Description. – Body ovoid; dorsal surface green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head green, irregularly punctate except around eyes and with a pair of fuscous, narrow stripes on basal part of tylus. Antenna green, with brownish segment III, fuscous IV and V. Rostrum greenish yellow with fuscous apex, reaching to middle coxae. Pronotum green, reddish along posterolateral margin, densely punctate except for calli; humeral angle projecting weakly, infuscate posteriorly. Scutellum green, tinged with red basally, densely punctate; apex pale, impunctate. Corium translucent, green, with some red along claval and membranal margin, densely punctate; base of vein R+M narrowly blackish; apical corner slightly infuscate; clavus red, densely punctate; membrane brownish, with a triangular, fuscous marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, darkened on apex of tarsomere II; apex of claw fuscous. Abdominal terga entirely black, except for narrowly greenish yellow lateral margins; posterior margin of segment VII reddish yellow. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate; each segment with a pair of fuscous spots laterally; segment VII reddish on apical corners. Pendergrast's organs semicircular (fig. 33).

Male genitalia: Sides of genital capsule rounded, strongly convergent basally in dorsal view; ventral rim furnished with a pair of lower tufts and a pair of upper tufts, lateral teeth lacking; upper tuft large, oval-shaped; infolding of dorsal rim furnished with a pair of long setal tufts at each side of middle (figs. 9-10); paramere with triangular outer projection strongly re-

flexed caudad (fig. 20); phallotheca with a large dorsal diverticulum; dorsal lobe of conjunctival sheath developed and divided into 5 lobules (fig. 27).

Female genitalia (fig. 33): Posterior margin of genital segments VIII rounded laterally and with a shallow median emargination.

Dimensions. – ♂/♀: Body length 9.78-11.50 (10.60)/9.92-11.90 (10.90); width of pronotum 4.49-5.31 (4.98)/4.69-6.04 (5.28); width of head including eyes 1.73-1.90 (1.80)/1.73-1.97 (1.86); length of antennal segment I 0.97-1.10 (1.01)/0.83-0.97 (0.89), II 1.45-1.66 (1.54)/1.21-1.52 (1.34), III 0.90-1.14 (1.00)/0.76-1.04 (0.91), IV 1.45-1.69 (1.57)/1.31-1.55 (1.42), V 1.31-1.48 (1.41)/1.21-1.41 (1.31); width of scutellum 2.42-2.86 (2.64)/2.52-3.24 (2.87); length of scutellum 3.04-3.45 (3.25)/2.97-3.73 (3.41); length of fore femur 2.21-2.42 (2.28)/2.24-2.83 (2.55), fore tibia 2.07-2.28 (2.16)/2.07-2.55 (2.32), middle femur 2.48-2.76 (2.62)/2.38-2.83 (2.57), middle tibia 2.21-2.48 (2.36)/2.07-2.55 (2.33), hind femur 3.04-3.38 (3.20)/2.66-3.31 (3.02), hind tibia 3.11-3.31 (3.16)/2.69-3.24 (2.98).

Etymology. – Named in honor of Dr. I. M. Kerzhner, who kindly gave me valuable information on *E. minor* Horváth for comparison. The name is a noun in the genitive case.

Distribution. – Japan (Honshu).

Biology. – *Betula ermanii* Cham. (Betulaceae) was confirmed as a host plant; many nymphs were collected on this in Aomori Pref., northern Honshu (T. Ichita, pers. comm.). Further, *E. kerzhneri* also seems to be associated with *Salix reinii* Franch. et Savat. (Salicaceae), on which many mating adults were collected in Mt. Hakkoda-san, Aomori Pref. (M. Ohara, pers. comm.). This species occurs mainly in the montane to subalpine zone in Honshu.

Remarks. – This species was previously reported as *E. minor* Horváth in some faunistic reports in Japan. However this new species can be readily distinguished from *E. minor* by the oval-shaped upper tuft in the male genitalia (figs. 9-10), and the shape of the paramere (fig. 20). Otherwise, this species is very similar to *E. interstinctus* in general appearance, but it can be distinguished by the brownish membrane, the lack of lateral teeth on the genital, and the triangular outer projection of the paramere.

Elasmostethus brevis Lindberg
(figs. 3, 11-12, 21, 28, 34)

Elasmostethus brevis Lindberg, 1934: 5.

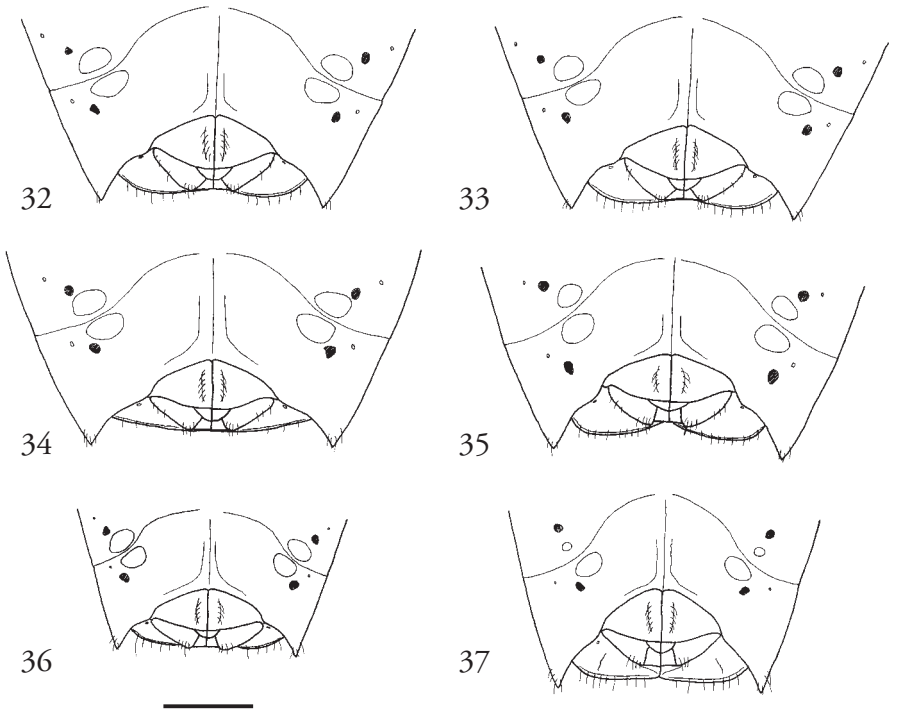
Redescription. – Body ovoid, with comparatively rounded sides; dorsal surface green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head green, irregularly punctate except around eyes and with a pair of fuscous, narrow stripes on basal part of tylus. Antenna green, with brownish segment III, fuscous IV and V. Rostrum greenish yellow with fuscous apex, reaching to middle coxae. Pronotum green, reddish along posterolateral margin, densely punctate except for calli; humeral angle projecting weakly, infuscate posteriorly. Scutellum green, tinged with red basally, densely punctate; apex pale, impunctate. Corium translucent, green, with some red along claval and membranal margin, densely punctate; base of vein R+M narrowly blackish; apical corner slightly infuscate; clavus red, densely punctate; membrane hyaline and with a triangular, fuscous marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, darkened on apex of tarsomere II; apex of claw fuscous. Abdominal terga entirely black, except for narrowly greenish yellow lateral margins; posterior margin of segment VII reddish yellow. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate; each segment with a pair of fuscous spots laterally; segment VII reddish on apical corners. Pendergrast's organs semicircular (fig. 34).

Male genitalia: Sides of genital capsule strongly rounded in dorsal view; ventral rim rounded, furnished with a pair of lower tufts and a pair of upper tufts; lateral rim with a large, blackish-tipped acute projection; infolding of dorsal rim with a pair of long setal tufts at each side of middle (figs. 11-12); paramere with semicircular outer projection weakly reflexed caudad, (fig. 21); phallotheca with a large dorsal diverticulum; dorsal lobe of conjunctival sheath developed and divided into 5 lobules (fig. 28).

Female genitalia: Posterior margin of genital segments VIII rounded and lacking median emargination (fig. 34).

Dimensions. – ♂/♀: Body length 9.83-10.92 (10.47)/9.65-11.65 (10.97); width of head including eyes 1.73-1.93 (1.84)/1.79-2.00 (1.90); length of antennal segment I 0.93-1.07 (1.01)/0.79-0.93 (0.85), II 1.38-1.79 (1.64)/1.24-1.48 (1.37), III 0.90-1.10 (1.00)/0.79-0.97 (0.88), IV 1.38-1.66 (1.51)/1.24-1.55 (1.40), V 1.21-1.38 (1.30)/1.17-1.31 (1.25); width of pronotum 4.07-5.31 (4.90)/4.69-5.52 (5.16); width of scutellum 2.35-2.97 (2.77)/2.76-3.17 (2.95); length of scutellum 2.83-3.59 (3.34)/3.24-3.59 (3.46); length of fore femur 2.07-2.42 (2.29)/1.93-2.28 (2.17), fore tibia 2.00-2.42 (2.22)/1.93-2.14 (2.06), middle femur 2.35-2.83 (2.62)/2.35-2.76 (2.56), middle tibia 2.14-2.55 (2.42)/2.14-2.48 (2.30), hind femur 2.76-3.38 (3.18)/2.62-3.17 (2.94), hind tibia 2.83-3.45 (3.24)/2.69-3.17 (2.95).

Distribution. – Japan (Hokkaido, Honshu); Korea, China, Russian Far East (Magadan, Kamchatka,



Figs. 32-37. Female genital segments of *Elasmostethus* spp. – 32, *E. interstinctus*; 33, *E. kerzhneri*; 34, *E. brevis*; 35, *E. hasegawai*; 36, *E. amabilis*; 37, *E. humeralis*. Scale: 1.0 mm.

Khabarovsk, Amur, Primorski, Sakhalin), European Russia, Scandinavian.

Biology. – I confirmed *Populus maximowiczii* A. Henry (Salicaceae) as a host plant, on which many eggs and young instar nymphs were collected in Hokkaido. Further, *Populus sieboldii* Miquel seems to be another host plant on which many adults and nymphs were collected in Sapporo, Hokkaido (M. Hayashi, pers. comm.). This species occurs mainly in the montane zone in Hokkaido and Honshu, and can be found in streamside forest.

Remarks. – This species resembles *E. interstinctus* very much in general appearance, but can be distinguished by the large lateral projections on the male genital capsule (figs. 11-12), the shape of the paramere (fig. 21), and the lack of a median emargination on the posterior margin of the female genitalia (fig. 34).

Material examined. – JAPAN: Hokkaido: 4♂ 3♀, Taisetsuko, Kamikawa, 24.viii.2001, A. Yamamoto; 1♂, Mt. Upepesanke-yama, Kamishihoro, 22.vii.1989, K. Haga; 1♂, Kuroishi-daira, Kamishihoro, 22.vii.1944, A. Yamamoto; 1♀, Mt. Kitoushi-yama, Ashoro, 3.vi.1989, K. Haga; 6♂ 1♀, Kannon-zawa, Sapporo, 2.viii.1998, A. Yamamoto; 1♂, Misumai, Sapporo, 10.v.1994, K. Sayama (OMO). – Honshu: 6♀, Nakafusa-onsen, Hodaka, Nagano Pref., 14.vi.1996, A. Yamamoto (OMO); 3♂, Kamikochi, Azumi, Nagano Pref., 16.viii.1951, T. Nakane; 2♂, Tokusawa, Azumi, Nagano Pref., 4.viii.1952, E. Nakanishi; 1♂, Shimashima-dani, Azumi, Nagano Pref., 27.vii.1955, T. Nakane (NIAS).

Elasmostethus hasegawai sp. n.
(figs. 6, 13-14, 22, 29, 35)

Type material. – Holotype ♂, Kamikochi, Azumi, Nagano Pref., Honshu, Japan, 12.ix.1952, H. Hasegawa (NIAS). – Paratypes: Honshu: 1♂, Yoshibezawa, Mt. Hayachine-san, Kawai, Iwate Pref., 14.vi.1987, K. Haga (SEHU); 1♂ 2♀, same locality, 11.x.1995, A. Yamamoto (OMO); 1♂, Mt. Tashiroyama, Tateiwa, Fukushima Pref., 20.viii.1951, K. Nagayama (NIAS); 1♀, Mitsumata, Horigane, Nagano Pref., 4.vi.1987, M. Hayashi; 2♂, same locality, 18.ix.1988, M. Hayashi; 1♂ 1♀, same locality, 4.ix.1991, M. Hayashi (SUS); 1♂ 1♀, same locality, 12.vi.1996, A. Yamamoto; 2♂ 2♀, same locality, 14.ix.1996, A. Yamamoto (OMO); 1♀, same data

Figs. 38-39.
Adults of *Elasmostethus* spp. – 38, *E. nubilus*, 39, *E. rotundus*. Scales: 5.0 mm.

(SEHU); 1♂, Nakafusa-onsen, Hodaka, Nagano Pref., 11.vi.1967, N. Fukuhara (NIAS); 1♂, same locality, 14.vi.1996, A. Yamamoto (OMO); 2♀, Kamikochi, Azumi, Nagano Pref., 10.viii.1951, H. Hasegawa; 22♂ 7♀, same locality, 12.ix.1952, H. Hasegawa; 6♂ 5♀, Shirahone-onsen, Azumi, Nagano Pref., 8.ix. 1951, H. Hasegawa (NIAS); 1♂, Shimashima-dani, Azumi, Nagano Pref., 12.vii.1960, I. Hiura (OMNH).

Description. – Body ovoid, somewhat slender; dorsal surface green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head green, irregularly punctate except around eyes and with a pair of fuscous, narrow stripes on basal part of tylus. Antenna usually entirely fuscous, sometimes with segments I and II dark green. Rostrum greenish yellow with fuscous apex, reaching to middle coxae. Pronotum green, reddish along posterolateral margin, densely punctate except for calli; humeral angle projecting weakly, infuscate posteriorly. Scutellum green, tinged with red basally, densely punctate; apex pale, impunctate. Corium translucent, green, with some red along claval and membranal margin, often with a fuscous long stripe along vein R+M, densely punctate; apical corner slightly infuscate; clavus red, densely punctate; membrane infuscate and with a triangular, dark marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, darkened on apex of tarsomere II; apex of claw fuscous. Abdominal terga entirely black, except for narrowly greenish yellow lateral margins; posterior margin of segment VII reddish yellow. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate; each segment with a pair of fuscous spots laterally; segment VII reddish on apical corners. Pendergrast's organs semicircular (fig. 35).

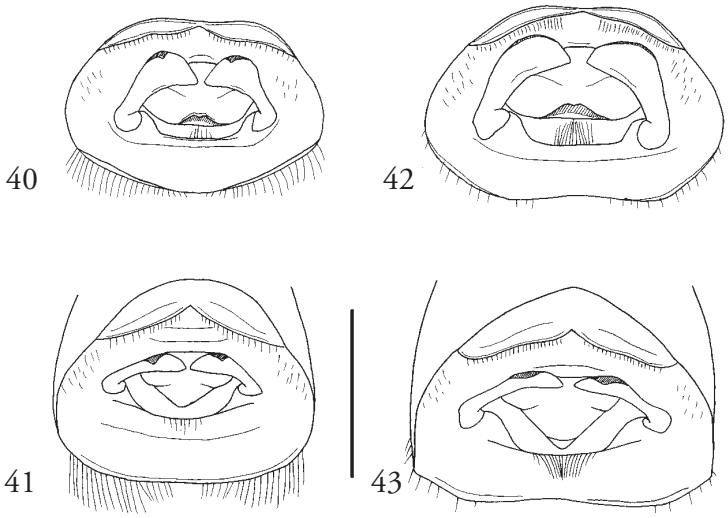
Male genitalia: Sides of genital capsule weakly rounded, strongly convergent basally in dorsal view; ventral rim furnished with a pair of lower tufts and a pair of upper tufts but lateral teeth lacking; upper tuft strongly elongate and weakly sinuate; infolding of dorsal rim with a pair of long setal tufts at each side of middle (figs. 13-14); paramere rather short and with a weak, triangular outer projection (fig. 22); phallotheca with a large dorsal diverticulum; dorsal lobe of conjunctival sheath developed and divided into 5 lobules; extreme right lobule (in the figure) somewhat reduced (fig. 29).

Female genitalia: Posterior margin of genital segments VIII strongly rounded laterally and with a shallow median emargination (fig. 35).

Dimensions. – ♂/♀: Body length 9.19-10.83 (9.90)/9.65-10.92 (10.36); width of head including eyes 1.73-1.86 (1.78)/1.73-1.93 (1.84); length of antennal segment I 0.83-1.04 (0.93)/0.79-0.90 (0.83), II 1.28-1.62 (1.41)/1.04-1.24 (1.12), III 0.86-1.07 (0.99)/0.90-1.00 (0.96), IV 1.41-1.66 (1.56)/1.31-1.45 (1.38), V 1.28-1.52 (1.40)/1.21-1.31 (1.27); width of pronotum 4.42-5.38 (4.87)/4.76-5.45 (5.22); width of scutellum 2.42-2.97 (2.64)/2.62-3.04 (2.85); length of scutellum 2.90-3.45 (3.17)/3.04-3.45 (3.30); length of fore femur 2.00-2.42 (2.13)/1.86-2.14 (2.06), fore tibia 2.00-2.21 (2.08)/1.93-2.07 (1.98), middle femur 2.28-2.69 (2.47)/2.14-2.62 (2.41), middle tibia 2.07-2.42 (2.22)/2.14-2.35 (2.22), hind femur 2.69-3.17 (2.88)/2.62-3.11 (2.83), hind tibia 2.69-3.11 (2.92)/2.62-2.90 (2.74).

Etymology. – Named in honor of Mr. Hitoshi Hasegawa, who collected the holotype. The name is a noun in the genitive case.

Distribution. – Japan (Honshu).



Figs. 40-43.
Male genital capsule of *Elasmostethus* species, caudal view (40, 42) and dorsal view (41, 43). – 40, 41, *E. nubilus*; 42, 43, *E. rotundus*. Scale: 1.0 mm.

Biology. – This species is considered to be closely associated with *Cercidiphyllum japonicum* Sieb. et Zucc. (Cercidiphyllaceae). Prof. M. Hayashi collected many adults on this plant in Mitsumata, Horigane, Nagano Pref., Honshu (pers. comm.), and I also found some adults in Mt. Hayachine-san, Iwate Pref., Honshu. Young instar nymphs have not yet been found. This species inhabits the montane or subalpine zone in Honshu.

Remarks. – This new species is similar to *E. interstinctus* in general appearance. It is characterized by the infuscate forewing membrane and antennae, the fuscous long stripe that is often present on the corium (fig. 6), the characteristic sinuate upper tuft of male genital capsule (figs. 13-14), the shape of the paramere (fig. 22), and the strongly laterally rounded posterior margin of the female genitalia (fig. 35).

Elasmostethus amabilis sp. n.
(figs. 4, 15-16, 23, 30, 36)

Elasmostethus sp.1: Sato, 1998: 373.

Type material. – Holotype ♂, Kogen-onsen, Kamikawa, Hokkaido, Japan, 24.viii.2001, A. Yamamoto (SEHU). – Paratypes: Hokkaido: 2♂, same locality as holotype, 14.vi.1998, A. Yamamoto; 3♂, same locality as holotype, 6.viii.2001, A. Yamamoto (OMO); 2♂ 2♀, same data as holotype (SEHU); 3♂ 2♀, Motomachi, Maruseppu, 30.vii.2000, Y. Kida (OMO); 1♂, Nukabira, Kamishihoro, 2.vi.1951, S. Kato (NIAS); 4♂, Toyokura, Otaru, 9.vi.2002, I. Tadaki (OMO). Honshu: 19♂ 21♀, Hikinuma, Ibigawa, Shiobara, Tochigi Pref., 18.vi.1988, K. Sato (TPMU); 1♂, Mt. Hakusan, Ishikawa Pref., 29-31.viii.1960, T. Hidaka (NIAS); 1♂, Mt. Daisen, Tottori Pref., 13.x.1987, T. Komatsu (SEHU).

Description. – Body ovoid, noticeably small; dorsal surface pale green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head pale green, irregularly punctate except around eyes and with a pair of fuscous, narrow stripes on basal part of tylus. Antenna green, with brownish segment III, fuscous IV and V. Rostrum greenish yellow with fuscous apex, reaching to middle or hind coxae. Pronotum pale green, reddish along posterolateral margin, densely punctate except for calli; humeral angle slightly projected, infuscate posteriorly. Scutellum pale green, tinged with red basally, densely punctate; apex pale, impunctate. Corium translucent, pale green, with some red along claval and membranal margin, densely punctate; base of vein R+M narrowly blackish; apical corner slightly infuscate; clavus red, densely punctate; membrane hyaline, with a triangular, fuscous marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, infuscate on apex of tarsomere II; apex of claw fuscous. Abdominal terga entirely black, except for broadly greenish yellow lateral margins; lateral yellow area usually as broad as connexivum; posterior margin of segment VII reddish yellow. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate; each segment with a pair of fuscous spots laterally; segment VII reddish on apical corners. Pendergrast's organs semicircular (fig. 36).

Male genitalia: Sides of genital capsule strongly rounded; ventral rim projecting strongly, deeply emar-

ginate at middle, furnished with a pair of lower tufts and with a pair of black teeth at each side of the lower tufts; upper tufts absent; infolding of dorsal rim with a pair of long setal tufts at each side of middle (figs. 15-16); paramere with narrow triangular outer projection strongly reflexed caudad (fig. 23); phallotheca with a large dorsal diverticulum; dorsal lobe of conjunctival sheath developed and divided into 5 lobules; extreme right lobule (in the figure) somewhat reduced (fig. 30).

Female genitalia: Posterior margin of genital segments VIII rounded and lacking median emargination; posterior corner of segment IX protruding slightly beyond posterior margin of segment VIII (fig. 36).

Dimensions. – ♂/♀: Body length 8.19-10.01 (8.80)/8.37-10.01 (9.06); width of head including eyes 1.73-1.86 (1.78)/1.69-1.86 (1.77); length of antennal segment I 0.79-1.00 (0.87)/0.69-0.83 (0.76), II 1.38-1.73 (1.57)/1.07-1.31 (1.20), III 0.83-1.04 (0.94)/ 0.72-0.90 (0.82), IV 1.35-1.59 (1.48)/1.17-1.45 (1.29), V 1.17-1.41 (1.31)/1.10-1.24 (1.16); width of pronotum 3.80-4.62 (4.20)/3.86-4.59 (4.29), width of scutellum 2.07-2.55 (2.30)/2.14-2.66 (2.41), length of scutellum 2.38-3.04 (2.67)/ 2.48-3.04 (2.79); length of fore femur 1.69-2.04 (1.86)/1.55-1.83 (1.69), fore tibia 1.73-2.00 (1.87)/ 1.59-1.79 (1.70), middle femur 1.79-2.14 (1.97)/ 1.76-2.04 (1.87), middle tibia 1.73-2.07 (1.93)/1.73-2.07 (1.87), hind femur 2.48-3.00 (2.76)/2.21-2.69 (2.43), hind tibia 2.48-3.04 (2.77)/ 2.21-2.69 (2.45).

Etymology. – The name is an adjective; from Latin 'amabilis' (= cute), referring to the small habitus.

Distribution. – Japan (Hokkaido, Honshu).

Biology. – Sato (1998) found many adults on *Toisusu urbaniana* (Seemen) (Salicaceae) in Kuroiso, Tochigi Pref., Honshu. Recently I found many eggs and young instar nymphs on this plant in Kamikawa, Hokkaido, and confirmed this host association. This species mainly occurs in the montane zone in Hokkaido and Honshu and can be found in the streamside forest. The adults are often attracted to light.

Remarks. – This new species is similar to *E. interstinctus* in appearance. It can be recognized by the remarkably smaller body, the broad yellow lateral margins of the abdominal terga, the strongly projecting ventral rim of the male genital capsule and the lack of the upper tufts (figs. 15-16), the shape of the paramere (fig. 23), and the female genital segment IX that protrudes beyond the posterior margin of VIII (fig. 36).

Elasmostethus humeralis Jakovlev
(figs. 5, 17-18, 24, 31, 37)

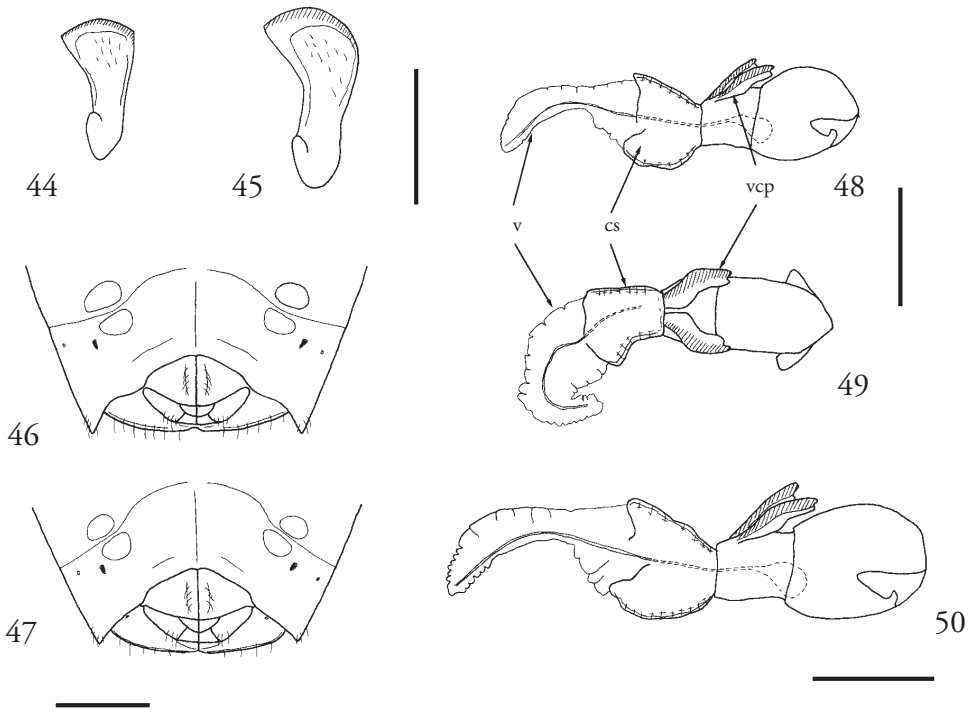
Elasmostethus humeralis Jakovlev, 1883: 15; Hasegawa, 1958: 6; Miyamoto & Yasunaga, 1989: 188.
Elasmostethus matsumurae Horváth, 1899: 366, synonymized by Horváth, 1907: 299.

Redescription. – Body ovoid, rather slender; dorsal surface green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head green, irregularly punctate except around eyes and with a pair of fuscous, narrow stripes on basal part of tylus. Antenna green, with brownish segment III, fuscous IV and apical ⅔ of V. Rostrum greenish yellow with fuscous apex, reaching to middle coxae. Pronotum green, densely punctate except for calli; humeral angle triangularly projected, infuscate posteriorly. Scutellum green, tinged with red basally, densely punctate; apex pale, impunctate. Corium translucent, green, with some red along claval and membranal margin, densely punctate; base of vein R+M narrowly blackish; apical corner slightly infuscate; clavus red, densely punctate; membrane hyaline, with a triangular, fuscous marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, darkened on apex of tarsomere II; apex of claw fuscous. Abdominal terga I-IV black with greenish yellow lateral margin; V-VII entirely yellow with red tinge. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate; each segment with a pair of fuscous spots laterally; apical corner of segment VII strongly acute, reddish. Pendergrast's organs on abdominal sternum VI remarkably reduced (fig. 37).

Male genitalia: Sides of genital capsule nearly straight in dorsal view; ventral rim projecting medially, furnished with a pair of lower tufts and a pair of upper tufts, lateral teeth lacking; infolding of dorsal rim with a pair of long setal tufts at each side of middle (figs. 17-18); paramere strongly broadened apically and with broad triangular outer projection weakly reflexed caudad (fig. 24); phallotheca with a large dorsal diverticulum; dorsal lobe of conjunctival sheath developed, inflated basally, with two small lobes at subbasal part and middle part (fig. 31).

Female genitalia: Genital segments somewhat flattened; posterior margin of genital segments VIII nearly straight, rounded laterally and with a weak median emargination (fig. 37).

Dimensions. – ♂/♀: Body length 10.01-11.47 (10.79)/9.96-11.74 (11.00); width of head including eyes 1.73-1.86 (1.81)/1.76-1.93 (1.86); length of antennal segment I : 0.90-1.04 (0.95)/0.83-0.93 (0.88), II 1.24-1.69 (1.44)/1.21-1.52 (1.36), III 1.10-1.31 (1.25)/1.10-1.24 (1.16), IV 1.52-1.86 (1.70)/1.45-1.73 (1.59), V 1.31-1.59 (1.44)/1.21-1.45 (1.33); width of pronotum 4.73-5.66 (5.11)/4.90-5.93 (5.51); width of scutellum 2.62-3.04 (2.74)/2.69-3.24 (2.99); length of scutellum 3.04-3.66 (3.37) /3.14-3.93 (3.59); length of fore femur 2.07-2.48 (2.31)/1.83-2.52 (2.27), fore tibia 2.21-2.48 (2.35)/ 1.73-2.45 (2.24), middle femur 2.42-2.90 (2.65)/ 2.45-2.90



Figs. 44-50. Male and female genitalia of *Elasmostethus* spp. – 44, 46, 48 and 49, *E. nubilus*; 45, 47 and 50, *E. rotundus*. 44 & 45, right paramere; 46 & 47, female genital segments; 48-50, male aedeagus (*cs*: conjunctival sheath, *v*: vesica, *vcp*: ventral conjunctival process). Scales: 0.5 mm for 44 & 45, 1.0 mm for 46-50.

(2.69), middle tibia 2.42-2.76 (2.57)/2.35-2.79 (2.58), hind femur 3.11-3.73 (3.39)/2.97-3.55 (3.27), hind tibia 2.76-3.93 (3.55)/3.04-3.66 (3.32).

Distribution. – Japan (Hokkaido, Honshu, Shikoku, Kyushu, Rishiri Is., Rebun Is., Oki Is.); China, Korea, Russian Far East (southern Khabarovsk, Primorski, Sakhalin, Kurils).

Biology. – This species is known to feed on many species of Umbelliferae and Araliaceae. I have confirmed the following host plants in Japan: *Angelica ursina* (Rupr.), *Angelica edulis* Miyabe, *Heracleum dulce* Fisch. (Umbelliferae); *Kalopanax pictus* (Thunb.), *Hedera rhombea* (Miq.) and *Aralia cordata* Thunb. (Araliaceae). This species occurs in Japan from lowland to the montane zone.

Remarks. – This species can easily be recognized by the reddish yellow abdominal terga under the wings, small Pendergrast's organs on abdominal segment VI (fig. 37), the shape of the paramere (fig. 24), and the nearly straight posterior margin of the female genitalia (fig. 37).

Material examined. – JAPAN: Hokkaido: 1♂, Rebun Is., 26.vii.1951, M. Konishi (SEHU); 1♀, Tokachi-Mitsumata, Kamishihoro, 24.vii.1994, A. Yamamoto; 2♂, Meto, Ashoro, 25.iv.1990, K. Haga (OMO); 1♂, Kami-muri, Maruseppu, 24.vii.2000, Y. Kida; 1♂ 2♀, from Simo-futamata to Kami-futamata, Mt. Shari-dake, Kiyosato, 17.vii.2001, Y. Kida (MTIM); 2♀, Bettoga, Nemuro, 26.vii.1992, N. Muramatsu (KRMK); 1♂ 1♀, Butokamabetsu-gawa, Horokanai, 18.vi.1995, A. Yamamoto; 6♂ 6♀, Hokkaido Univ., Sapporo, 15.ix.1993, A. Yamamoto; 2♀, Anataki, Otaru, 12.v.1998, A. Yamamoto; 1♀, Uendomari, Iwanai, 18-20.viii.1997, A. Yamamoto (OMO); 1♂, Mt. Yotei-zan, 27.v.1992, S. Kudo; 1♂, Shikotsu-ko, Chitose, 24.vi.1986, M. Ohara (SEHU); 16♂ 3♀, Apoi-dake, Samani, 25.v.1996, K. Sugishima; 2♂, Ainuma, Kumaishi, 8.vi.1996, K. Mizota; 3♂, Haraguchi, Matsumae, 7.vi.1996, K. Mizota (OMO); 6♂ 1♀, Shiriuchi, 20.vi.1976, T. Kumata et al. (SEHU). – Honshu: 2♂ 2♀, Ajigasawa, Aomori Pref., 26.vii.1988, K. Shimoyama (APMA); 2♀, Yoshibe-zawa, Kawai, Iwate Pref., 11.x.1995, A. Yamamoto; 1♂, Ouchi, Shimogo, Fukushima Pref., 13.vi.1999, K. Haga (OMO); 1♂, Mt. Jinba-yama, Hachioji, Tokyo Metrop., 8.x.1967, H. Takizawa (SEHU); 1♂, Mitsumata, Horigane, Nagano Pref., 14.ix.1995, A. Yamamoto; 2♂, Hirugano, Takasu, Gifu Pref., 12.ix.1995, A. Yamamoto; 1♀, Okoyama, Susono, Shizuoka Pref., 30.x.1998, G. Ito; 7♂ 4♀, Mt. Hirasan, Otsu, Shiga Pref.,

10.ix.1995, A. Yamamoto; 2♀, Ashiu, Miyama, Kyoto Pref., 9.ix.1995, A. Yamamoto (OMO). – Kyushu: 1♀, Mt. Hakucho-zan, Izumi, Kumamoto Pref., 7.viii.1988, T. Yasunaga (OMO). – CHINA: 1♂, Chilin, 2.viii.1928 (NUT).

Elasmostethus nubilus (Dallas)
(figs. 38, 40-41, 44, 46, 48-49)

Acanthosoma nubilus Dallas, 1851: 305.
Dichobothrium nubilum – Horváth, 1912: 608; Ishihara, 1935: 264; Miyamoto & Yasunaga, 1989: 188.
Elasmostethus nubilum – Higuchi & Sato, 1988: 51.

Redescription. – Body ovoid, comparatively small; dorsal surface green with dark red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head green, with a few small punctures on vertex; basal part of tylus with a pair of fuscous narrow stripes. Antenna green, with dark segments IV, V and apical ⅔ of III. Rostrum greenish yellow with fuscous apex, usually reaching to hind coxae. Pronotum green, densely punctate except for calli; humeral angle triangularly projected, broadly infuscate. Scutellum pale green, partly fuscous or tinged dark red basally and with pale basal corners and apex, densely punctate. Corium translucent, green, partly fuscous or tinged dark red along claval and membranal margin, with a small and obscure, fuscous spot near apex of vein R+M, densely punctate except along R+M vein sparser; apical corner broadly infuscate; clavus red, densely punctate; membrane hyaline, with a distinct fuscous marking at middle of costal margin. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, darkened on apex of tarsomere II; apex of claw fuscous. Abdominal terga I-II black; III-VII greenish yellow, fuscous or tinged dark red on broad median region. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate, lacking dark spots but in females often with a pair of fuscous spots on segment VII; apical corner of segment VII strongly acute, usually extending beyond posterior margin of genital segments; Pendergrast's organs semicircular (fig. 46).

Male genitalia: Genital capsule opening dorsoposteriorly; sides nearly straight in dorsal view; ventral rim slightly rounded, furnished with dense long setae except at middle, lower and upper tufts lacking; dorsal rim with narrowly V-shaped thin protrusion; infolding of dorsal rim broadly covered with short setae; proctiger strongly reflexed apically (figs. 40-41); paramere broadened apically and with a triangular inner projection and an obtuse outer angle on apical part (fig. 44); phallotheca lacking dorsal diverticulum; conjunctival sheath with reduced dorsal lobe; vesica remarkably inflated, fusiform (figs. 48-49).

Female genitalia: Posterior margin of genital segments VIII rounded and with a slight median emargination (fig. 46).

Dimensions. – ♂/♀: Body length 6.92-9.10 (8.26)/7.55-10.10 (9.13); width of head including eyes 1.45-1.66 (1.56)/1.45-1.73 (1.64); length of antennal segments I 0.55-0.69 (0.61)/0.48-0.66 (0.60), II 1.00-1.38 (1.20)/0.90-1.24 (1.10), III 0.86-1.10 (0.98)/0.76-0.97 (0.89), IV 1.21-1.48 (1.33)/1.10-1.38 (1.26), V 1.07-1.21 (1.15)/1.00-1.21 (1.12); width of pronotum 3.45-4.55 (4.13)/3.80-5.18 (4.63); width of scutellum 1.86-2.48 (2.24)/2.00-2.83 (2.54); length of scutellum 2.21-2.97 (2.67)/2.42-3.24 (2.98); length of fore femur 1.52-1.86 (1.74)/1.52-2.07 (1.77), fore tibia 1.59-1.86 (1.73)/1.45-1.93 (1.71), middle femur 1.73-2.21 (1.96)/1.38-2.28 (2.04), middle tibia 1.73-2.14 (1.91)/1.52-2.28 (1.95), hind femur 1.93-2.48 (2.33)/2.00-2.76 (2.48), hind tibia 2.07-2.69 (2.45)/1.93-2.69 (2.40).

Distribution. – Japan (Honshu, Shikoku, Kyushu, Sado Is., Tsushima Is., Yakushima Is., Amami-Oshima Is., Okinawa Is., Ishigaki Is., Iriomote Is.); China, Korea.

Biology. – This species is known to feed on many araliaceous plants. I have confirmed the following plants as hosts in Japan: *Aralia cordata* Thunb., *Acanthopanaxs ciadophylloides* (Fr. & Sav.) and *Hedera rhombea* (Miq.). This species is widespread in the lowland to montane zone in Japan except for Hokkaido.

Remarks. – This species is characterized by the small spot central on the corium, immaculate abdominal sterna except on segment VII, long setae on the ventral rim and the absence of upper and lower tufts in the male genitalia (figs. 40-41), and the slight median emargination in the rounded posterior margin of the female genitalia (fig. 46).

Material examined. – JAPAN: Honshu: 5♀, Mt. Kinpoku-san, Sado Is., Niigata Pref., 11.ix.1969, S. Hisamatsu (EUM); 2♀, Okutama, Tokyo Metrop., 2.v.1976, K. Haga (SEHU); 1♀, Hakone Mts., Kanagawa Pref., 17.vi.1939, H. Hasegawa (NIAS); 7♂ 5♀, Mt. Hira-san, Otsu, Shiga Pref., 10.ix.1995, A. Yamamoto (OMO); 1♀, Asiu, Miyama, Kyoto Pref., 12.xii.1978, Kitamura (SEHU); 1♀, Mt. Takahatayama, Tanabe, Wakayama Pref., 16.ix.1996, S. Goto (OMO); 21♂ 18♀, Toyo-oka, Hyogo Pref., 14.x.1987, S. Kudo (SEHU). – Shikoku: 1♂ 1♀, Sugitate, Matsuyama, Ehime Pref., 9.ii.1953, K. Sasaki; 1♂, Mt. Saraga-mine, Ehime Pref., 27.vi.1959, M. Sato (EUM). – Kyushu: 1♂ 4♀, Mt. Gokahara, Nagasaki Pref., 18.viii.1986, T. Yasunaga (OMO); 4♂ 3♀, Izuhara, Tsushima Is., Nagasaki Pref., 25.viii.1966, S. Nomoto (EUM); 2♂ 1♀, Mt. Kirishima, Kagoshima Pref., 31.viii.1929, M. Yano (NIAS); 1♂, Mugio, Yakushima Is., Kagoshima Pref., 18.iii.1974, T. Ishihara; 3♀, Mt. Miyanoura-dake, Yakushima Is., Kagoshima Pref., 28.xii.1972, K. Ito (EUM). – Ryukyu Is.: 1♂ 3♀, Mt. Yuwan-dake, Amami-Oshima Is., 29.vii.1963, J. L. Gressitt (NIAS); 19♂ 20♀, Terukubi-rindo, Kunigami, Okinawa Is., 19.iv.1986, T. Yasunaga; 2♂ 2♀, Mt. Fukai-Omoto-dake, Ishigaki Is., 23.iv.2002, A. Yamamoto; 5♂ 14♀, Funaura, Iriomote Is.,

2-3.x.2001, K. Sugishima (OMO). – CHINA: 1♂, Fo-chow, Fu-kien, 30.iv.1965, L. Wang; 1♀, same locality, 4.v.1965, L. Wang (NUT). – KOREA: 1♂ 1♀, Mt. Paikwoon, Okryongmyon, Kwangyang, Chollanam-do, 4. 5.viii.1994, S. Yoshimatsu (NIAS).

Elasmostethus rotundus sp. n.
(figs. 39, 42-43, 45, 47, 50)

Dichobothrium sp. – Hiura et al., 1959: 23, Hasegawa, 1960: 32; Sato, 1998: 386.
Elasmostethus sp. – Ichita, 1991: 120; Higuchi & Sato, 1988: 52.

Type material. – Holotype ♂, Nagabashi-naebo, Otaru, Hokkaido, Japan, 12.viii.2001, A. Yamamoto (SEHU). – Paratypes: Hokkaido: 1♂ 3♀, same data as for holotype (OMO); 1♂, Hokkaido Univ., Sapporo, 22.iv.1964, H. Takizawa (SEHU); 1♂ 2♀, same locality, 24.ix.1993, A. Yamamoto (OMO); 1♂ 3♀, Maruyama, Sapporo, 24.iv.1965, H. Takizawa (SEHU); 1♂, same locality, vi.1995, A. Yamamoto (OMO); 1♀, Misumai, Sapporo, 24.viii.1990, K. Sayama; 1♀, same locality, 17.viii.1993, K. Sayama; 1♂ 2♀, Shiriuchi, 10.viii.1976, T. Kumata et al.; 1♂, Fukushima, 12.viii.1976, T. Kumata et al.; 1♂ 2♀, Kikonai, 10.viii.1976, T. Kumata et al. (SEHU). – Honshu: 1♀, Hiyamizu-toge, Higashidori, Aomori Pref., 26.vii.1999, S. Yamauchi (APMA); 1♀, Masakari-domari, Minmaya, Aomori Pref., 23.viii.1987, T. Ichita (IC); 1♀, Ainai, Shiura, Aomori Pref., 24.v.1993, S. Yamauchi (APMA); 1♂ 1♀, Mt. Mano-dake, Aomori, Aomori Pref., 14.viii.1988, T. Ichita (IC); 3♂ 2♀, Mt. Ishikura-dake, Aomori, Aomori Pref., 8.viii.1999, S. Yamauchi; 1♀, Tamoyachi-zawa, Aomori, Aomori Pref., 8.vi.1997, S. Yamauchi; 1♂, Mt. Komaga-mine, Towadako, Aomori Pref., 21.vi.1988, S. Yamauchi (APMA); 1♀, Nagaya-sawa, Kuroishi, Aomori Pref., 25.viii.1987, T. Ichita (IC); 1♀, Ajigasawa, Aomori Pref., 28.vii.1987, A. Abe; 1♂, same locality, 23.vii.1989, A. Fukuda; 1♀, same locality, 24.vii.1989, A. Fukuda; 1♀, Juni-ko, Iwaseki, Aomori Pref., 5.viii.1994, S. Yamauchi (APMA); 1♀, Iwate-koen, Morioka, Iwate Pref., 29.iii.1936, H. Ito; 1♀, Mt. Himegami-yama, Iwate Pref., 5.iv.1936, H. Ito (NIAS); 1♂, Futakuchi-keikoku, Akiu, Miyagi Pref., 12.vii.1985, K. Konishi et al. (SEHU); 1♀, Sendai, Miyagi Pref., 18.iii.1944, H. Hasegawa; 1♂, same locality, 22.viii.1955, S. Katsuya; 3♂ 3♀, Oga, Akita Pref., 10.ix.1969, T. Kobayashi; 1♂ 1♀, Tazawa, Akita Pref., 11.viii.1969, T. Kobayashi; 1♂, Mt. Akagi, Gunma Pref., 11.viii.1937, S. Nomura; 1♀, Oneyama, nr. Usui Pass, Gunma Pref., 14.vi.1973, H. Hasegawa (NIAS); 1♀, Mitsumata, Horigane, Nagano Pref., 12.vi.1996, A. Yamamoto (OMO); 1♀, Matsumoto, Nagano Pref., 20.iii.1949, E. Imai; 1♀, same locality, 26.xii.1949, E. Imai; 2♀, Nagano Pref., 16.ix.1952, H. Hasegawa; 2♂ 6♀, Mt. Kiso-ontake, Gifu Pref., 15-16.ix.1953, H. Hasegawa; 2♂ 2♀, Kibune, Kyoto, Kyoto Pref., 7.ix.1952, E. Nakanishi (NIAS). – Kyushu: 1♀, Mt. Sobo, Oita Pref., 30.vii.1951, Takahashi; 1♂, Mt. Kirishima, Kagoshima Pref., 31.viii.1929, M. Yano (NIAS).

Description. – Body ovoid, rather plump; dorsal surface pale green with red markings, densely dark punctate; ventral surface greenish yellow, reddish on posterior end. Head pale green, with a few small punctures on vertex; basal part of tylus with a pair of fuscous narrow stripes. Antenna pale green, with dark segments IV, V and apical ⅔ of III. Rostrum greenish yellow with fuscous apex, usually reaching hind coxae. Pronotum pale green, densely punctate except for calli; humeral angle slightly projected, broadly infuscate. Scutellum pale green, usually not reddish or fuscous but sometimes with obscure red tinge, densely punctate. Corium translucent, pale green, with some red along claval and membranal margin and with an obscure, fuscous small spot near apex of vein R+M, densely punctate except along vein R+M sparser; apical corner broadly darkened; clavus red, densely punctate; membrane hyaline, with obscure costal and central dark markings. Femur greenish yellow, slightly darkened apically and with a small basal tubercle in male; tibia green, brownish apically; tarsus brown, infuscate on apex of tarsomere II; apex of claw fuscous. Abdominal terga I-II black, III-VII greenish yellow, fuscous or tinged dark red on broad median region. Connexiva greenish yellow, reddish on apex of segment VII. Sterna greenish yellow, impunctate, lacking dark spots but in females often with a pair of fuscous spots on segment VII; apical corner of segment VII usually not extending beyond posterior margin of genital segments; Pendergrast's organs semicircular (fig. 47).

Male genitalia: Genital capsule opening dorsoposteriorly; sides nearly straight in dorsal view; ventral rim furnished with a few long setae, lower and upper tufts lacking; dorsal rim with narrowly V-shaped thin protrusion; infolding of dorsal rim broadly covered with short setae; proctiger strongly reflexed apically (figs. 42-43); paramere broadened apically and projecting triangularly inwards on apical part; outer margin rounded, without distinct apical angle (fig. 45); phallotheca lacking dorsal diverticulum; conjunctival sheath with reduced dorsal lobe; vesica remarkably inflated, fusiform (fig. 50).

Female genitalia: Posterior margin of genital segments VIII strongly rounded and scarcely emarginate at middle in ventral view (fig. 47).

Dimensions. – ♂/♀: Body length 8.28-9.65 (8.85)/8.01-9.65 (8.91); width of head including eyes 1.52-1.73 (1.61)/1.52-1.73 (1.64); length of antennal segments I 0.62-0.69 (0.66)/0.55-0.69 (0.62), II 1.10-

1.31 (1.21)/0.97-1.24 (1.04), III 0.76-0.90 (0.86)/0.76-0.90 (0.81), IV 1.17-1.45 (1.30)/1.17-1.31 (1.22), V 1.04-1.10 (1.08)/0.97-1.17 (1.05); width of pronotum 4.07-4.55 (4.28)/4.14-4.76 (4.50); width of scutellum 2.21-2.55 (2.41)/2.35-2.76 (2.58); length of scutellum 2.69-3.11 (2.88)/2.76-3.24 (3.00); length of fore femur 1.59-2.00 (1.81)/1.59-1.93 (1.79), fore tibia 1.66-2.00 (1.82)/1.59-1.86 (1.70), middle femur 1.73-2.42 (2.09)/1.93-2.28 (2.12), middle tibia 1.86-2.21 (1.97)/1.73-2.07 (1.92), hind femur 2.35-2.83 (2.56)/2.28-2.69 (2.52), hind tibia 2.42-2.76 (2.58)/2.00-2.48 (2.35).

Etymology. – The name is an adjective; from Latin 'rotundus' (= rounded), referring to the rather rounded habitus.

Distribution. – Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Biology. – I confirmed *Kalopanax pictus* (Thunb.) (Araliaceae) as host plant; many nymphs were collected on this plant in Hokkaido. The species occurs in the montane zone of Japan.

Remarks. – This species is allied to *E. nubilus*, but it can be distinguished by the larger and broader body, the pale scutellum, the obscure markings on the forewing membrane, the apical corners of abdominal segment VII that do not extend beyond the genital segments (fig. 47), the absence of dense setae on the ventral rim of the male genitalia (figs. 42-43), the absence of distinct apical angle on the outer margin of the paramere (fig. 45) and the scarcely emarginate posterior margin of the female genitalia (fig. 50). *E. nubilus* and *E. rotundus* have a very unique genital structures: the dorsal protrusion of the genital capsule (figs. 40-43) and a remarkably inflated vesica (figs. 48-50).

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