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## Revision of the genus *Optioservus* SANDERSON, 1953, part 2: The *O. maculatus* species group (Coleoptera: Elmidae)

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### Abstract

The *Optioservus maculatus* species group (Coleoptera: Elmidae) is newly proposed. Ten species, including six new species, are recognized: *O. gapyeongensis* JUNG, KAMITE & BAE, *O. hagai* NOMURA, *O. inahatai* sp.n., *O. maculatus* NOMURA, *O. masakazui* sp.n., *O. occidens* sp.n., *O. ogatai* sp.n., *O. sakaii* sp.n., *O. variabilis* NOMURA and *O. yoshitomii* sp.n. Larvae of nine species are also described: *O. gapyeongensis* JUNG, KAMITE & BAE, *O. hagai* NOMURA, *O. maculatus* NOMURA, *O. masakazui* sp.n., *O. occidens* sp.n., *O. ogatai* sp.n., *O. sakaii* sp.n., *O. variabilis* NOMURA and *O. yoshitomii* sp.n.

**Key words:** Coleoptera, Elmidae, *Optioservus*, *Optioservus maculatus* species group, taxonomy, larvae.

### Introduction

The Nearctic *Optioservus fastidius* and *O. quadrimaculatus* species groups have already been revised by KAMITE (2013). The *O. fastidius* species group includes six East Nearctic species and the *O. quadrimaculatus* species group includes seven West Nearctic species.

At present, a total of six species of *Optioservus* SANDERSON, 1953 are known from the Palearctic Region: *O. hagai* NOMURA, 1958, *O. maculatus* NOMURA, 1958, *O. nitidus* NOMURA, 1958, *O. rugulosus* NOMURA, 1958 and *O. variabilis* NOMURA, 1958, from Japan; and *O. gapyeongensis* JUNG, KAMITE & BAE, 2011, from Russian Far East, China and Korea.

In this part, the *O. maculatus* species group is newly proposed for 10 Palearctic species including six new species. This species group is closely related to the Nearctic *O. quadrimaculatus* species group but is characterized by the unique male metaventrite. The distribution of this species group is restricted to the eastern Palearctic Region, and is most diverse in Japan.

Type specimens and the material examined are deposited in the following collections:

|      |  |
|------|--|
| CFK  | collection of Jun'ichi Fujiwara, Kunitachi, Japan            |
| CHM  | collection of Naoyuki Hikida, Mito, Japan                    |
| CKN  | collection of Yuuki Kamite, Nagoya, Japan                    |
| CMS  | collection of Hirofumi Moriya, Sagamihara, Japan             |
| EMEC | Essig Museum of Entomology, Berkeley, California, USA        |
| EUMJ | Ehime University Museum, Matsuyama, Japan                    |
| HOWP | Hoshizaki Institute for Wildlife Protection, Izumo, Japan    |
| KU   | Entomological Museum of Korea University, Seoul, South Korea |
| NMW  | Naturhistorisches Museum Wien, Vienna, Austria               |
| NSMT | National Museum of Nature and Science, Tsukuba, Japan        |

The material and methods, as well as abbreviations and the elytral color patterns follow KAMITE (2013).

### *Optioservus maculatus* species group

*Optioservus gapyeongensis* JUNG, KAMITE & BAE, *O. hagai* NOMURA, *O. inahatai* sp.n., *O. maculatus* NOMURA, *O. masakazui* sp.n., *O. occidens* sp.n., *O. ogatai* sp.n., *O. sakaii* sp.n., *O. variabilis* NOMURA and *O. yoshitomii* sp.n.

This species group is characterized by the following features: most of the species display elytral color patterns (Fig. 133, Table 1); head granulate; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> or subequal in width; metaventre furnished with small process in males; apex of intercoxal process of abdominal ventrite 1 relatively pointed; ventrite 5 granulate; phallobase squamous at lateral and ventral surfaces (Fig. 60, smooth in *O. gapyeongensis* only).

Table 1: Elytral color patterns of the Japanese species of the *Optioservus maculatus* species group. F<sub>1</sub>: elytra almost entirely yellowish, except blackish lateral margins; F<sub>2</sub>: elytra almost entirely yellowish, except blackish sutural and lateral margins; F<sub>3</sub>: elytra dark brown to black, with yellowish patches at humeral and apical areas; F<sub>4</sub>: elytra dark brown to black, with very small yellowish patches at humeral areas, and yellowish patches at apical areas, or yellowish patches at apical areas only; F<sub>5</sub>: elytra dark brown to black, with yellowish bands from humeral to apical areas; F<sub>6</sub>: elytra dark brown to black, with yellowish patches at humeral areas; F<sub>7</sub>: elytra entirely dark brown to black, or very small yellowish patches at humeral areas.

| Species              | F <sub>1</sub> | F <sub>2</sub> | F <sub>3</sub> | F <sub>4</sub> | F <sub>5</sub> | F <sub>6</sub> | F <sub>7</sub> | N   |
|----------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|
| <i>O. hagai</i>      | 0              | 0              | 40             | 0              | 0              | 6              | 1              | 47  |
| <i>O. inahatai</i>   | 2              | 0              | 0              | 0              | 0              | 0              | 7              | 9   |
| <i>O. maculatus</i>  | 13             | 1              | 397            | 0              | 0              | 0              | 1              | 412 |
| <i>O. masakazui</i>  | 0              | 4              | 0              | 6              | 0              | 0              | 89             | 99  |
| <i>O. occidens</i>   | 0              | 2              | 692            | 0              | 0              | 0              | 0              | 694 |
| <i>O. ogatai</i>     | 17             | 86             | 112            | 0              | 0              | 25             | 544            | 784 |
| <i>O. variabilis</i> | 1              | 79             | 207            | 0              | 0              | 59             | 196            | 542 |
| <i>O. yoshitomii</i> | 0              | 0              | 564            | 0              | 8              | 0              | 0              | 572 |

### Key to the species of the *Optioservus maculatus* species group

#### Adults:

- 1 Lateral part of pronotum widely flat. Pronotal sublateral carinae long, 0.44–0.54 times as long as PL (Fig. 47). Phallobase smooth at lateral and ventral surfaces. Parameres with short projecting hooks at dorso-medial part (Fig. 97). Russian Far East, China (Liaoning), Korea..... *gapeongensis*
- Lateral part of pronotum not so widely flat (except for *sakaii* and *yoshitomii*). Pronotal sublateral carinae short, 0.25–0.36 times as long as PL. Phallobase squamous at lateral and ventral surfaces (Fig. 60). Parameres without projecting hooks. Japan..... 2
- 2 Pronotum and elytra strongly convex. Pronotum wide, PW/PL 1.53–1.97 (1.68) in BF; PW/PL 1.49–1.65 (1.58) in MF. Apex of abdominal ventrite 5 with long setae. Lateral part of endophallus as in Fig. 67 ..... *hagai*
- Pronotum and elytra moderately convex. Pronotum not so wide, less than 1.47 times as wide as long. Apex of abdominal ventrite 5 with spinulate setae ..... 3
- 3 Pronotum and elytra slender. Elytral pubescence of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> intervals clearly long. Body larger, TL 3.12–3.39 mm ..... *inahatai*
- Pronotum and elytra more wide. Elytral pubescence of each interval short. Body smaller, TL 2.10–3.05 mm ..... 4
- 4 Lateral part of pronotum widely flat (Fig. 52). Elytra quadrimaculate or yellowish band from humeral to apical area (F<sub>3</sub> or F<sub>5</sub>); humeral yellowish patches of elytra small, not extend to 1<sup>st</sup> stria. Lateral part of endophallus as in Figs. 87, 95. Body smaller, TL 2.10–2.53 mm..... 5

- Lateral part of pronotum not so widely flat (Figs. 49–51). Elytra with many color patterns, but not appearing F<sub>5</sub>; yellowish humeral patches of elytra large, extending to 1<sup>st</sup> stria in F<sub>3</sub>. Lateral part of endophallus as in Figs. 71, 75, 79, 83, 91. Body larger, TL 2.51–3.05 mm ..... 6
- 5 Elytral striae deep; intervals strongly rugose (Fig. 62). Body smaller, TL 2.10–2.30 mm. Shikoku, Kyūshū ..... *sakaii*
- Elytral striae shallow; intervals less rugose (Fig. 64). Body larger, TL 2.30–2.53 mm. Honshū ..... *yoshitomii*
- 6 Pronotum with deep median longitudinal impression. Lateral part of endophallus as in Figs. 71, 75, 83 ..... 7
- Pronotum with shallow or without median longitudinal impression. Lateral aspect of endophallus as in Figs. 79, 91 ..... 9
- 7 Intervals of elytra relatively flattened. All tibiae black. Eastern part of Honshū ..... *maculatus*
- Intervals of elytra moderately convex. All tibiae reddish brown. Western part of Honshū ..... 8
- 8 Pronotum strongly convex, lateral part clearly granulate (Fig. 50). Intervals of elytra strongly rugose (Fig. 61) ..... *ogatai*
- Pronotum moderately convex, lateral part weakly granulate (Fig. 49). Intervals of elytra less rugose (Fig. 57) ..... *masakazui*
- 9 Lateral margin of elytra weakly serrate. All tibiae black. Body smaller, TL 2.68–2.84 mm. Western part of Honshū ..... *occidens*
- Lateral margin of elytra clearly serrate. All tibiae reddish brown. Body larger, TL 2.73–3.04 mm. Eastern part of Honshū ..... *variabilis*

**Larvae:**

- 1 Setiferous tubercles of thorax and abdomen not developed. Lateral part of thorax widely flat. Russian Far East, China (Liaoning), Korea ..... *gapyeongensis*
- Setiferous tubercles of thorax and abdomen developed. Lateral part of thorax not widely flat. Japan ..... 2
- 2 Abdomen clearly humped in dorsal and sublateral view on segments 1–8 (Fig. 32). Abdominal segment 9 strongly keeled in sublateral view (Fig. 113) ..... *hagai*
- Abdomen not or somewhat weakly humped in dorsal view on segments 1–8. Abdominal segment 9 not or weakly keeled in sublateral view ..... 3
- 3 Abdominal segment 9 not keeled in sublateral view (Figs. 118, 120) ..... 4
- Abdominal segment 9 weakly keeled in sublateral view (Figs. 114–117, 119) ..... 5
- 4 Mandible (Fig. 109) subtriangular. Head smaller, HW 0.38 mm. Shikoku, Kyūshū ..... *sakaii*
- Mandible (Fig. 111) falciform. Head larger, HW 0.39–0.40 mm. Honshū ..... *yoshitomii*
- 5 Abdominal segments 6–8 slightly humped in middorsal view. Eastern part of Honshū ..... 6
- Abdominal segments 6–8 not humped in middorsal view. Western part of Honshū ..... 7
- 6 Body smaller, TL less than 6.03 mm. Head smaller, HW 0.42 mm ..... *maculatus*
- Body larger, TL more than 6.58 mm. Head larger, HW 0.43–0.44 mm ..... *variabilis*
- 7 Mandible (Fig. 108) subtriangular ..... *ogatai*
- Mandible falciform ..... 8
- 8 Mandible (Fig. 106) more slender ..... *masakazui*
- Mandible (Fig. 107) more stout ..... *occidens*

***Optioservus gapyeongensis* JUNG, KAMITE & BAE, 2011**  
(Figs. 5–6, 29–30, 47, 53, 97–99, 103, 112, 121)

*Optioservus gapyeongensis* JUNG, KAMITE & BAE 2011: 179 (type locality: Korea, GG, Gapyeong-gun, Buk-myeon, Jeokmok-ri, Garim spring (37°58'24.8"N, 127°26'43.7"E, 320 m a.s.l.) beside Gapyeong stream; type material: Holotype ♂, KU, not examined).

TYPE MATERIAL EXAMINED: **Paratypes: SOUTH KOREA:** 1 ex. (CKN): "Gapyeongchun (Creek), Gyeonggi-do, 5.VI.2004, H. G. Lee & D. G. Kim leg."; 1 ex. (CKN): "Nonnam Creek, Gapyong Stream, Gapyong, Gyeonggi-do, 30.X. 2004, H. G. Lee & D. G. Kim leg."; 1 ex. (CKN): ditto but: "3.XII.2005, S.W. Jung & D. G. Kim leg."

**ADDITIONAL MATERIAL EXAMINED:**

**Adults: RUSSIA:** 23 exs. (EUMJ): "Mt. Tumannaya, Primorskij, 20–22–VIII–1991, M. Satô"; 2 exs. (EUMJ): "Shamora R, Vladivostok, 18–VIII–1991, M. Satô leg.>"; 1 ex. (EUMJ): "Staraya, Kamenka, 21–VIII–1992, M. Satô leg.>"; 1 ex. (EUMJ): "Primorskij Krai, Ussuriskij Reserve, 18–VII–1983, Vshivkova"; 2 exs. (EUMJ): ditto but: "21–IX–1984, Vshivkova"; 2 exs. (EUMJ): ditto but: 8–VII–1972, Toistikova"; 1 ex. (EUMJ): ditto but: "9–X–1972, Levaniciova"; 1 ex. (EUMJ): "Primorskij Krai, Novaya Moskva, 8–VIII–1978, G. Lafer"; 2 exs. (EUMJ): "Primorskij Krai, Kedrovaya Pady, 10–I–1975, Vshivkova"; 1 ex. (EUMJ): Vshivkova, Primorskij Krai, Kedrovaya Pady, 11–VIII–1973, G. S. Lafer"; 2 exs. (NMW): "Primorskii krai, Tigrovyi, 19.–21.8.1992, lgt. Boukal". **CHINA:** 70 exs. (NMW): "Liaoning, 50km SE Benxi, 26.9.1994, 300m, leg. Ji & Wang (61)"; 15 exs. (NMW): "Liaoning (164), 50km NE Kuandian, 300m, Qingshangou For. Park, 1.9.1996, lg. Ji & Wang"; 1 ex. (NMW): "Liaoning (167), 50km NE Kuandian, 300m, Qingshangou For. Park, 1.9.1996, lg. Ji & Wang"; 2 exs. (NMW): "Liaoning, 70km NE Fushun, 10.9.1994, 180–200m, leg. Ji & Wang (38)"; 2 exs. (NMW): "Liaoning, 80km NE Fushun, 11.9.1994, 130m, leg. Ji & Wang (43)"; 2 exs. (NMW): "Liaoning, 1994, 55km NW Dandong, 100m, Fenghuang shan, 24.9., leg. Ji & Wang (47)". **SOUTH KOREA:** 3 exs. (CKN): "Gyronggi-do, Gapyeong-gun, Buk-myeon, Jeokmok-ri, Garimgyo (Br), 10.V.2009, S.W. Jung leg."; 1 ex. (EUMJ): "Mt. Sudosan, 700 m, Kyongsangpuk-do, 9–12 VII 1971, K. Yamagishi leg.".

**Larvae: RUSSIA:** 1 immature larva (EUMJ): "Primorskij Krai, Ussuriskij Reserve, 18–VII–1983, Vshivkova".

**SOUTH KOREA:** 3 mature larvae (CKN): "Gyronggi-do, Gapyeong-gun, Buk-myeon, Jeokmok-ri, Garimgyo (Br), 10.V.2009, S.W. Jung leg.".

REDESCRIPTION: **Adult:** TL/EW 1.97–2.13 (2.05). Dorsal surface black, but elytra with yellowish patches at humeral and apical areas ( $F_3$ ). Humeral yellowish patches extending from basal 1/3 to 1/6, extend to 1<sup>st</sup> stria or reach to the suture (Fig. 5). Ventral surface, antennae, mouth parts and legs reddish brown, but antennomeres 1–8, tarsi paler.

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes moderate in size; the distance between eyes about 1.28 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.4 : 2.2 : 1.6 : 1.0 : 1.0 : 1.0 : 1.1 : 1.0 : 1.8 : 1.8 : 2.9. Clypeus transverse, about 2.89 times as wide as long. Labrum transverse, about 1.88 times as wide as long.

Pronotum transverse (Fig. 47), convex; lateral part widely flat and weakly granulate; median longitudinal impression deep, without prescutellar pits; antero-lateral corners moderately produced anteriad; PW/PL 1.22–1.39 (1.29); sublateral carinae 0.44–0.54 (n = 10, 0.47) times as long as PL.

Elytra elongate oval, moderately convex; lateral margin weakly serrate; intervals less rugose, slightly convex; punctate striae shallow; striae punctures of each stria somewhat large and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> (Fig. 53); EL/EW 1.40–1.54 (1.47); EL/PL 2.40–2.65 (2.54); EW/PW 1.29–1.39 (1.34).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male; medial part somewhat weakly granulate in female; apex evenly rounded and with spinulate setae.

Aedeagus as in Figs. 97–98; phallobase smooth at lateral and ventral surfaces; penis about 1.50 times as long as phallobase, dilated at base, gradually narrowed and apical part rounded, curved

ventrad in lateral view (Fig. 98); parameres slender, with short projecting hooks at dorso-medial part, about 0.75 times as long as penis.

Ovipositor as in Fig. 99; coxite about 7.50 times as long as stylus; valvifer about 12.70 times as long as stylus.

MEASUREMENTS: MF (n = 10): TL 2.41–2.86 (2.64) mm; PL 0.66–0.81 (0.75) mm; PW 0.92–1.03 (0.96) mm; EL 1.75–2.05 (1.89) mm; EW 1.21–1.41 (1.29) mm.

DESCRIPTION: **Larva:** Body cylindrical; TL/BW 5.92–6.23 (6.11). Color dark brown or brown, antennae, mouth parts and legs somewhat paler. Head about 1.17 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 103) subtriangular, 1.25 times as long as wide. Labrum about 2.00 times as wide as long. Thorax and abdomen with setiferous tubercles; each tubercle not developed. Thorax not humped in dorsal view, lateral part widely flat. Pronotum slightly wider than long; PW/PL 1.37–1.43 (1.40). Abdomen not humped in dorsal view; abdominal segment 9 slightly keeled in sublateral view (Fig. 112).

MEASUREMENTS (n = 3): TL 5.37–5.42 (5.39) mm; HW 0.40–0.41 (0.41) mm; PL 0.56–0.60 (0.57) mm; PW 0.79–0.82 (0.80) mm; BW 0.87–0.91 (0.88) mm.

DISTRIBUTION: Russian Far East, China (Liaoning), Korea.

DIFFERENTIAL DIAGNOSIS: In adult features, this species is easily distinguishable from the other species by the following characteristics: lateral part of pronotum widely flat; sublateral carinae long, 0.44–0.54 (n = 10, 0.47) times as long as PL (Fig. 47); phallobase smooth at lateral and ventral surface; parameres with short projecting hooks at dorso-medial part (Fig. 97). In larval features, this species is also distinguishable from the other species by the following characteristics: setiferous tubercles of thorax and abdomen not developed; lateral part of thorax widely flat.

### *Optioservus hagai* NOMURA, 1958

(Figs. 1–4, 31–32, 54, 65–68, 104, 113, 122, 133; Table 1)

*Optioservus (Cyclolimnius) hagai* NOMURA 1958: 56 (type locality: Kokura, Fukuoka Pref., Japan; type material: NSMT, examined); SATÔ 1977: 4; SATÔ 1985: 438, pl. 80, fig. 13; SATÔ 1992: 184, figs. 38A, 38D, 38E; JÄCH et al. 2006: 436; OGATA & NAKAJIMA 2006: 232, fig. 2M; HAYASHI 2007: 93, fig. 1M; HAYASHI & KADOWAKI 2007: 164, fig. 2M; HAYASHI 2008: 75; HAYASHI & KADOWAKI 2008a: 283, fig. 2J; HAYASHI & KADOWAKI 2008b: 300; FUJIWARA 2008: 14; FUJIWARA & NUMATA 2009: 269, fig. 28; HAYASHI & KADOWAKI 2010: 178; HAYASHI & KADOWAKI 2011: 124; HAYASHI 2011: 104, fig. 47E.

TYPE MATERIAL: Holotype ♂ (F<sub>6</sub>, NSMT). Paratypes: 6 ♂♂, 13 ♀♀ (EUMJ, NSMT): “Kokura, Kyushu, 17.XI.1955 (17.Sept.1955 in Nomura (1958)), A. Haga”.

#### ADDITIONAL MATERIAL EXAMINED:

**Adults: JAPAN:** TOTTORI PREF.: 1 ex. (F<sub>3</sub>; CKN): “Miya-gawa, Syôda, Daisen-chô, 19.IX.2006 Y. Kamite leg.”; 20 exs. (6F<sub>3</sub>; CKN, EMEC, NMW): “Amida-gawa, Boryô, Daisen-chô, 22.XI.2006, H. Kadowaki leg.”; 8 exs. (F<sub>3</sub>; CKN): ditto but: “22.IV.2007, M. Hayashi leg.”; 5 exs. (F<sub>3</sub>; CKN): ditto but: “31.I.2008, H. Kadowaki leg.”; 10 exs. (F<sub>3</sub>; CKN): “Amida-gawa-chôdôkyô, Boryô, Daisen-chô, 22.XI.2006, H. Kadowaki leg.”. HIROSHIMA PREF.: 1 ex. (F<sub>3</sub>; CFK): “Kitsukabara-gawa, Kitahiroshima-chô, 6.VI.2007, J. Fujiwara leg.”. SHIMANE PREF.: 2 exs. (CKN): “Yamao-gawa, Daitôchôshinjyô, Unnan-shi, 8.I.2007, M. Hayashi leg.”. FUKUOKA PREF.: 1 ex. (F<sub>6</sub>; CKN): “Kushigi, Chikuzen-machi, 6.IV.2003, J. Nakajima leg.”; 7 exs. (2F<sub>3</sub>, 2F<sub>6</sub>; CKN): ditto but: “28.III.2005, Y. Kamite leg.”; 4 exs. (2F<sub>3</sub>, 2F<sub>6</sub>; EUMJ): ditto but: “10–V–2003, T. Ogata leg.”; 2 exs. (F<sub>3</sub>, F<sub>7</sub>; EUMJ): “Mt. Wakasugi, 6.XII.1970, Col. K. Baba”; 1 ex. (F<sub>3</sub>; CMS): “Kuwamagari, Chikuho-machi, 1999.11.4, H. Moriya leg.”; 2 exs. (F<sub>3</sub>; EUMJ), “Kokura, 3.Oct.1959, leg. A. Haga, *Optioservus (Cyclolimnius) hagai* Nomura DET. M. SATO 1980”.

**Larvae: JAPAN:** TOTTORI PREF.: 45 immature larvae (CKN): “Amida-gawa, Boryô, Daisen-chô, 22.IV.2007, M. Hayashi leg.”. SHIMANE PREF.: 4 mature larvae and 2 immature larvae (CKN): “Yamao-gawa, Daitôchôshinjyô, Unnan-shi, 8.I.2007, M. Hayashi leg.”. FUKUOKA PREF.: 3 mature larvae and 1 immature larva (CKN): “Kuwamagari, Chikuho-machi, 28.III.2005, Y. Kamite leg.”; 4 mature larvae (CKN): “Kushigi, Chikuzen-

machi, 6.IV.2003, T. Ogata leg.”; 8 mature larvae and 7 immature larvae (CKN); ditto but: “28.III.2005, Y. Kamite leg.”.

**REDESCRIPTION:** **Adult:** TL/EW 1.66–1.84 (1.79) in BF; TL/EW 1.70–1.85 (1.78) in MF. Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tibiae and tarsi paler. Color patterns of elytra: F<sub>3</sub>, F<sub>6</sub>, or F<sub>7</sub>; humeral yellowish patches at about basal 1/4 to 1/6, extend to around 1<sup>st</sup> stria or reach to the suture in F<sub>3</sub> (Figs. 1, 3).

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes moderate in size; the distance between eyes about 1.27 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.3 : 2.0 : 1.8 : 1.0 : 1.0 : 1.0 : 1.2 : 1.0 : 1.8 : 1.8 : 3.1. Clypeus transverse, about 2.60 times as wide as long. Labrum transverse, about 1.75 times as wide as long.

Pronotum wide, strongly convex; lateral part weakly granulate; without median longitudinal impression; without prescutellar pits; antero-lateral corners moderately produced anteriad. PW/PL 1.53–1.97 (1.68) in BF; sublateral carinae 0.31–0.35 (n = 5, 0.32) times as long as PL; PW/PL 1.49–1.65 (1.58) in MF; sublateral carinae 0.30–0.34 (n = 5, 0.32) times as long as PL.

Elytra oval (BF) or subparallel-sided (MF); strongly convex; lateral margin weakly serrate; intervals less rugose, moderately convex; punctate striae deep; strial punctures of each stria somewhat large and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> (Fig. 54); in BF EL/EW 1.21–1.32 (1.27); EL/PL 2.25–2.71 (2.45); EW/PW 1.14–1.20 (1.15); in MF EL/EW 1.17–1.29 (1.24); EL/PL 2.21–2.38 (2.30); EW/PW 1.16–1.19 (1.17).

Sides of prosternal process narrowing and apex somewhat truncate. Anterior part of mesoventral groove relatively wide. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex evenly rounded and with long setae.

Aedeagus as in Figs. 65–67; phallobase squamous at lateral and ventral surfaces; penis about 1.21 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 66); parameres slightly wide, about 0.71 times as long as penis; lateral part of endophallus as in Fig. 67.

Ovipositor as in Fig. 68; coxite about 5.82 times as long as stylus; valvifer about 10.18 times as long as stylus.

**MEASUREMENTS:** BF (n = 5): TL 2.19–2.39 (2.30) mm; PL 0.59–0.72 (0.67) mm; PW 1.06–1.16 (1.12) mm; EL 1.53–1.71 (1.63) mm; EW 1.22–1.32 (1.29) mm. MF (n = 5): TL 2.26–2.33 (2.30) mm; PL 0.68–0.72 (0.70) mm; PW 1.06–1.16 (1.10) mm; EL 1.58–1.62 (1.60) mm; EW 1.24–1.36 (1.29) mm.

**DESCRIPTION:** **Larva:** Body cylindrical; TL/BW 6.08–6.42 (6.25). Color dark brown, antennae, mouth parts and legs somewhat paler. Head about 1.17 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively small. Mandible (Fig. 104) subtriangular, 1.36 times as long as wide. Labrum about 1.85 times as wide as long. Pronotum slightly wider than long; PW/PL 1.46–1.61 (1.51), not humped in dorsal view. Abdominal segments 1–8 clearly humped in dorsal and sublateral view; abdominal segment 9 keeled in sublateral view (Fig. 113).

**MEASUREMENTS** (n = 3): TL 4.80–5.08 (4.94) mm; HW 0.38–0.39 (0.39) mm; PL 0.44–0.50 (0.47) mm; PW 0.70–0.73 (0.71) mm; BW 0.77–0.81 (0.79) mm.

**DISTRIBUTION:** Japan (Honshû, Kyûshû).

**BIOLOGICAL NOTES:** This is a rare species in the western part of Honshû and the northern part of Kyûshû. The main habitat of this species is the middle of the river, especially sandy substrates of branch streams.

**DIFFERENTIAL DIAGNOSIS:** In adult features, this species is easily distinguishable from the other species by the following characteristics: pronotum and elytra strongly convex; pronotum wide, PW/PL 1.53–1.97 (1.68) in BF; PW/PL 1.49–1.65 (1.58) in MF; apex of abdominal ventrite 5 with long setae; lateral part of endophallus as in Fig. 67. In larval features, this species is also distinguishable from the other species by the following characteristics: abdomen clearly humped in dorsal and sublateral 1–8 segments (Fig. 32); abdominal segment 9 strongly keeled in sublateral view (Fig. 113).

### *Optioservus inahatai* sp.n.

(Figs. 11–13, 48, 55, 100–102, 124, 133; Table 1)

**TYPE MATERIAL: JAPAN:** Holotype ♂ (F<sub>7</sub>; EUMJ): “2013.VII.21, Iya-gawa-genryû, alt.1550m, Minokoshi, Tsurugi-san, Miyoshi-shi, Tokushima Pref., Noriaki Inahata leg.”. Paratypes: 4 exs. (1F<sub>1</sub>, 3F<sub>7</sub>; CKN, NMW): same data as for the holotype; 3 exs. (1F<sub>1</sub>, 2F<sub>7</sub>; CKN, EMEC): ditto but: “2013.IX.10, Noriaki Inahata leg.”; 1 ex. (F<sub>7</sub>; CKN): “2013.IX.10, alt.1500~1600m, Minokoshi, Tsurugi-san, Miyoshi-shi, Tokushima Pref., Noriaki Inahata leg.”.

**DESCRIPTION: Adult:** TL/EW 2.27–2.46 (2.38). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tibiae and tarsi paler. Color patterns of elytra: F<sub>1</sub> or F<sub>7</sub>.

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes somewhat small in size; the distance between eyes about 1.52 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.2 : 2.1 : 1.6 : 1.0 : 1.0 : 1.0 : 1.0 : 1.3 : 1.6 : 2.9. Clypeus transverse, about 2.67 times as wide as long. Labrum transverse, about 1.79 times as wide as long.

Pronotum slightly transverse (Fig. 48), convex; lateral part moderately granulate; with deep median longitudinal impression; without prescutellar pits; antero-lateral corners moderately or weakly produced anteriad. PW/PL 1.09–1.17 (1.14); sublateral carinae 0.30–0.34 (n = 9, 0.32) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin weakly serrate; intervals less rugose, moderately convex, 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> intervals with long pubescence; punctate striae deep; strial punctures of each stria relatively small and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> or of subequal width (Fig. 55); EL/EW 1.61–1.75 (1.70); EL/PL 2.44–2.65 (2.54); EW/PW 1.28–1.35 (1.31).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginate and with spinulate setae.

Aedeagus as in Figs. 100–101; phallobase squamous at lateral and ventral surfaces; penis about 1.42 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 101); parameres slender, about 0.66 times as long as penis.

Ovipositor as in Fig. 102; coxite about 7.18 times as long as stylus; valvifer about 12.43 times as long as stylus.

**MEASUREMENTS:** MF (n = 9): TL 3.12–3.39 (3.21) mm; PL 0.86–0.96 (0.91) mm; PW 1.01–1.07 (1.03) mm; EL 2.24–2.43 (2.31) mm; EW 1.31–1.42 (1.35) mm.

DISTRIBUTION: Japan (Shikoku).

BIOLOGICAL NOTES: The habitat of this species is restricted only to the source of the Iyagawa (river), Tsurugi-san (mountain) in the eastern part of Shikoku.

ETYMOLOGY: The specific name is dedicated to Mr. Noriaki Inahata who offered specimens of this remarkable species.

DIFFERENTIAL DIAGNOSIS: This new species resembles *O. variabilis* in general appearance, but is distinguishable from the latter by the following characteristics: body large; pronotum and elytra slender; elytral pubescence of 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> intervals clearly long; lateral margin of elytra weakly serrate.

### *Optioservus maculatus* NOMURA, 1958

(Figs. 14–16, 33–34, 56, 69–72, 105, 114, 122, 125, 133; Table 1)

*Optioservus* (s.str.) *maculatus* NOMURA 1958: 50 (type locality: Yudonosan, Yamagata Pref., Japan; type material: NSMT, examined); SATŌ 1977: 4; SATŌ 1985: 438, pl. 80, fig. 16; SATŌ 1992: 179; JÁCH et al. 2006: 436.

TYPE MATERIAL: Holotype ♂ (F<sub>1</sub>, NSMT). Allotype ♀ (F<sub>3</sub>, NSMT): “YUDONOSAN MT, YAMAGATA, 30.VII.1950, K. Shirahata”.

#### ADDITIONAL MATERIAL EXAMINED:

**Adults: JAPAN:** IWATE PREF.: 1 ex. (F<sub>3</sub>; CKN): “Takko-gawa, Kamitakko, Kotsunagi, Ichinohe-machi, 17.VIII.1998, N. Hikida leg.”. YAMAGATA PREF.: 7 exs. (F<sub>3</sub>; CKN): “Takatani, Tsuruoka-shi, 14.IX.2007, Y. Kamite leg.”; 5 exs. (F<sub>3</sub>; CKN): “Nabekura-zawa, Tsuruoka-shi, 14.IX.2007, Y. Kamite leg.”; 7 exs. (1F<sub>1</sub>, 5F<sub>3</sub>; CKN): “Shidu, Nishikawa-machi, 23.IX.2004, T. Ogata leg.”; 36 exs. (2F<sub>1</sub>, 34F<sub>3</sub>; CKN): ditto but: “14.IX.2007, Y. Kamite leg.”; 50 exs. (F<sub>3</sub>; CKN, EMEC, NMW): ditto but: “11.X.2009, Y. Kamite leg.”; 24 exs. (2F<sub>1</sub>, 22F<sub>3</sub>; CKN): “Ōsawa-gawa, Nishikawa-machi, 11.X.2009, Y. Kamite leg.”; 33 exs. (4F<sub>1</sub>, 29F<sub>3</sub>; CKN): ditto but: “12.X.2009, Y. Kamite leg.”; 10 exs. (F<sub>3</sub>; CKN): “Mazawa-gawa-shiriyū, Nishikawa-machi, 20.IX.2009, T. Ikeda leg.”; 2 exs. (F<sub>3</sub>; CKN): “Kurogamo-rindō, Shirataka-machi, 400m, 7-X-2007, H. YADA Leg.”; 21 exs. (3F<sub>1</sub>, 18F<sub>3</sub>; CMS): “Tamugimata, Asahi-mura, Nabekura-sawa, 24.Sep.2004, H. Moriya leg.”. FUKUSHIMA PREF.: 2 exs. (F<sub>3</sub>; CKN): “R-Onogawa, Ohuchi, Shimogomachi, Minamiaizu, 1999.6.13, N. Hikida Leg.”. IBARAKI PREF.: 5 exs. (F<sub>3</sub>; CKN, EUMJ): “Mt. HANAZONO, 5.V.1980, Leg. M. Kubota”; 2 exs. (F<sub>3</sub>; EUMJ): “nr. Hanazono, 10.Aug.1977, H. Kobayashi”; 1 ex. (F<sub>3</sub>; CKN): “Mt. OSYO, SEKIMOTOMACHI, KITAIBARAKI-SHI, 10.IV.1997, N. HIKIDA leg.”; 9 exs. (F<sub>3</sub>; CKN, CHM): “Manaita-zawa, Yamizo-san, Daigo-machi, 16.IX.2002, N. Hikida leg.”. GUNMA PREF.: 17 exs. (F<sub>3</sub>; CKN): “Kofuzan-sawa, Tokura, Katashina-mura, 10.VI.2006, Y. Kamite leg.”; 32 exs. (31F<sub>1</sub>, 1F<sub>3</sub>; CKN): ditto but: “26.IX.2009, Y. Kamite leg.”; 3 exs. (F<sub>3</sub>; CKN): ditto but: “N. Kamite leg.”; 5 exs. (F<sub>3</sub>; CKN): “Katashina-gawa, Ōshimizu, Katashina-mura, 27.IX.2009, Y. Kamite leg.”; 3 exs. (F<sub>3</sub>; CKN): “Tokura-sawa, Tokura, Katashina-mura, 26.IX.2009, Y. Kamite leg.”; 14 exs. (F<sub>3</sub>; CKN): ditto but: “27.IX.2009, Y. Kamite leg.”; 23 exs. (F<sub>3</sub>; CKN): “Kuruma-gawa-genryū, Haruna-san, Misato-machi, Takasaki-shi, 8.IX.2008, M. HAYASHI LEG.”; 2 exs. (F<sub>3</sub>; CKN): ditto but: “31.IV.2010, M. Hayashi leg.”; 1 ex. (F<sub>3</sub>; EUMJ): “Fujimi-shita, Oze, 22.VII.1987, Y. Notsu leg.”; 4 exs. (F<sub>3</sub>; CKN): “Tashiro, Tsumagoi-mura, 3.V.2011, Y. Kamite leg.”; 2 exs. (F<sub>3</sub>; CKN): “Uenohara, Fujiwara, Minakami, 11. VI. 2012, leg. Mamoru CHACHIN”; 1 ex. (F<sub>3</sub>; CKN): “Yamada-riv, Akasiba, Kawauchi, Kiryu C, 12. XI. 2012, leg. Mamoru CHACHIN”. YAMANASHI PREF.: 2 exs. (F<sub>3</sub>; CKN): “Sannose, Enzan-shi, 15.XII.2003, T. Ogata leg.”; 15 exs. (F<sub>3</sub>; CMS): “Ichinose, Enzan-shi, Nakajima-gawa, 1994.10.15, Col. Hirofumi Moriya”; 48 exs. (F<sub>3</sub>; CMS): “Ichinose, Enzan-shi, Small stream, 1994.10.15, Col. Hirofumi Moriya”; 1 ex., (F<sub>3</sub>; CKN): “Kamase-rindoh, Sutama-cho, Hokuto-shi, 18. Sep. 2005, M. Kishi leg.”. NAGANO PREF.: 23 exs. (1F<sub>2</sub>, 22F<sub>3</sub>; CKN): “Sugadaira-kōgen, Ueda-shi, 4.V.2011, Y. Kamite leg.”.

**Larvae: JAPAN:** YAMAGATA PREF.: 9 immature larvae (CKN): “Shidu, Nishikawa-machi, 11.X.2009, Y. Kamite leg.”; 1 mature larva (CKN): “Ōsawa-gawa, Nishikawa-machi, 11.X.2009, Y. Kamite leg.”; 3 mature larvae and 3 immature larvae (CKN): ditto but: “12.X.2009, Y. Kamite leg.”. GUNMA PREF.: 6 immature larvae (CKN): “Kuruma-gawa-genryū, Haruna-san, Misato-machi, Takasaki-shi, 31.IV.2010, M. Hayashi leg.”; 2 mature larvae and 2 immature larvae (CKN): “Tashiro, Tsumagoi-mura, 3.V.2011, Y. Kamite leg.”. NAGANO PREF.: 7 mature larvae and 7 immature larvae (CKN): “Sugadaira-kōgen, Ueda-shi, 4.V.2011, Y. Kamite leg.”.

REDESCRIPTION: **Adult:** TL/EW 2.05–2.28 (2.13). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8,

tarsi paler. Color patterns of elytra: F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub>, or F<sub>7</sub>; humeral yellowish patches at about basal 1/3 to 1/6, extend to 1<sup>st</sup> stria or reach to the suture in F<sub>3</sub> (Fig. 14).

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes moderate in size; the distance between eyes about 1.20 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.4 : 2.2 : 1.7 : 1.0 : 1.0 : 1.0 : 1.0 : 1.6 : 1.6 : 3.2. Clypeus transverse, about 2.50 times as wide as long. Labrum transverse, about 1.90 times as wide as long.

Pronotum transverse, slightly convex; lateral part moderately granulate; with deep median longitudinal impression; without prescutellar pits; antero-lateral corners moderately or weakly produced anteriad. PW/PL 1.25–1.42 (1.31); sublateral carinae 0.26–0.34 (n = 10, 0.30) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin clearly serrate; intervals less rugose, slightly convex; punctate striae shallow; striae punctures of each stria somewhat large and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> or of subequal width (Fig. 56); EL/EW 1.45–1.66 (1.53); EL/PL 2.36–2.94 (2.54); EW/PW 1.22–1.30 (1.27).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 69–71; phallobase squamous at lateral and ventral surfaces; penis about 1.45 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 70); parameres slender, about 0.60 times as long as penis; lateral part of endophallus as in Fig. 71.

Ovipositor as in Fig. 72; coxite about 6.84 times as long as stylus; valvifer about 12.63 times as long as stylus.

**MEASUREMENTS:** MF (n = 10): TL 2.51–2.72 (2.63) mm; PL 0.69–0.81 (0.75) mm; PW 0.93–1.02 (0.97) mm; EL 1.79–2.03 (1.89) mm; EW 1.17–1.29 (1.24) mm.

**DESCRIPTION:** **Larva:** Body cylindrical; TL/BW 7.11–7.27 (7.19). Color dark brown, antennae, mouth parts and legs somewhat paler. Head about 1.15 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 105) widely falciform, 2.06 times as long as wide. Labrum about 1.60 times as wide as long. Pronotum slightly wider than long; PW/PL 1.24–1.31 (1.27), not humped in dorsal view. Abdominal segments 1–5 not humped and 6–8 slightly humped in dorsal view; abdominal segment 9 slightly keeled in sublateral view (Fig. 114).

**MEASUREMENTS** (n = 3): TL 5.76–6.03 (5.90) mm; HW 0.42 mm; PL 0.59–0.61 (0.60) mm; PW 0.73–0.77 (0.76) mm; BW 0.81–0.83 (0.82) mm.

**DISTRIBUTION:** Japan (Honshû).

**BIOLOGICAL NOTES:** This is a relatively rare species in the eastern part of Honshû. The main habitat of this species is found in the upper reaches of rivers where they are abundant on small rocks and in the gravel of riffles.

**NOTES:** NOMURA (1958) described this species from specimens from Yudonosan, Yamagata Pref., Oze, Gunma Pref. and Uriki [correct: Urugi] pass, Nagano Pref. Among them, the specimens of Uriki [correct: Urugi] pass are clearly another species, described herein under the name *O. yoshitomii*.

**DIFFERENTIAL DIAGNOSIS:** In adult features, this species resembles *O. occidens* in general appearance, but is distinguishable from the latter by the following characteristics: pronotum with

deep median longitudinal impression; lateral margin of elytra clearly serrate; lateral part of endophallus as in Fig. 71. In larval features, this species resembles *O. variabilis* in general appearance, but is distinguishable from the latter by the body and head being small.

### *Optioservus masakazui* sp.n.

(Figs. 7–8, 35–36, 49, 57, 73–76, 106, 115, 123, 133; Table 1)

*Optioservus* sp.: HAYASHI & KADOWAKI 2007: 164, fig. 2L; HAYASHI & KADOWAKI 2008a: 283; HAYASHI & KADOWAKI 2010: 177; HAYASHI et al. 2010: 203.

TYPE MATERIAL: JAPAN: Holotype ♂ (F<sub>7</sub>; EUMJ): “Kidani-sawa, Funatani-gawa, Daisen, Tottori Pref., 26.XII.2007, H. Kadowaki leg.”. Paratypes: 10 exs. (9F<sub>7</sub>; CKN, HOWP, NMW): same data as for the holotype. TOTTORI PREF.: 37 exs. (3F<sub>2</sub>, 4F<sub>4</sub>, 28F<sub>7</sub>; CKN, EMEC): “Ônarubara, Kôfu-chô, 19.IX.2006, Y. Kamite leg.”; 23 exs. (1F<sub>2</sub>, 1F<sub>4</sub>, 21F<sub>7</sub>; CKN): ditto but: “S. Ôta leg.”; 6 exs. (F<sub>7</sub>; CKN): “Funatani-gawa, Ônarubara, Kôfu-chô, 700m, 24–IX–2006, Masato MORI Leg.”; 1 ex. (F<sub>7</sub>; CKN): “Funatani-gawa, Ônarubara, Kôfu-chô, N 35°20'22" E 133°33'15", LEG. J. FUJIWARA, 19.I.2008, alt. 740m”; 1 ex. (F<sub>7</sub>; CKN): “Funatani-gawa, Mitsukue, Kôfu-chô, 16.IX.2003, T. Ogata leg.”; 2 exs. (1F<sub>4</sub>, 1F<sub>7</sub>; CKN): “Mitsukue-bashi, Funatani-gawa, Daisen, 26.XII.2007, H. Kadowaki leg.”. OKAYAMA PREF.: 28 exs. (18F<sub>7</sub>; CKN): “Hiruzen, Maniwa-shi, 18.IX.2006, Y. Kamite leg.”; 3 exs. (F<sub>7</sub>; CKN): “Myôren-gawa-jyôryû, Kawakami, leg. T. DEJIMA, 9.X.2005, Coll. n, T. DEJIMA”.

#### ADDITIONAL MATERIAL EXAMINED:

Larvae: JAPAN: TOTTORI PREF.: 2 mature larvae and 1 immature larva (CKN): “Ônarubara, Kôfu-chô, 19.IX.2006, Y. Kamite leg.”. OKAYAMA PREF.: 10 mature larvae and 57 immature larvae (CKN): “Hiruzen, Maniwa-shi, 18.IX.2006, Y. Kamite leg.”.

DESCRIPTION: Adult: TL/EW 2.07–2.18 (2.13). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tibiae and tarsi paler. Color patterns of elytra: F<sub>2</sub>, F<sub>4</sub>, or F<sub>7</sub>.

Head almost flat on dorsal surface, sparsely granulate and densely pubescent. Eyes moderate in size; the distance between eyes about 1.23 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.1 : 2.0 : 1.7 : 1.0 : 1.0 : 1.0 : 1.0 : 1.0 : 1.5 : 1.6 : 3.1. Clypeus transverse, about 2.63 times as wide as long. Labrum transverse, about 1.95 times as wide as long.

Pronotum transverse (Fig. 49), convex; lateral part weakly granulate; with deep median longitudinal impression; without prescutellar pits; antero-lateral corners moderately or weakly produced anteriad. PW/PL 1.34–1.38 (1.37); sublateral carinae 0.25–0.33 (n = 10, 0.30) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin clearly serrate; intervals less rugose, moderately convex; punctate striae deep; striae punctures of each stria relatively small and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> (Fig. 57); EL/EW 1.48–1.57 (1.53); EL/PL 2.41–2.68 (2.54); EW/PW 1.18–1.25 (1.22).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 73–75; phallobase squamous at lateral and ventral surfaces; penis about 1.43 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 74); parameres slender, about 0.59 times as long as penis; lateral part of endophallus as in Fig. 75.

Ovipositor as in Fig. 76; coxite about 7.05 times as long as stylus; valvifer about 11.36 times as long as stylus.

MEASUREMENTS: MF ( $n = 10$ ): TL 2.61–2.93 (2.74) mm; PL 0.71–0.83 (0.77) mm; PW 0.98–1.13 (1.06) mm; EL 1.89–2.10 (1.96) mm; EW 1.22–1.36 (1.28) mm.

DESCRIPTION: **Larva:** Body cylindrical; TL/BW 6.75–7.24 (7.02). Color dark brown or brown, antennae, mouth parts and legs somewhat paler. Head about 1.13 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 106) falciform, 1.94 times as long as wide. Labrum about 1.60 times as wide as long. Pronotum slightly wider than long; PW/PL 1.30–1.34 (1.33), not humped in dorsal view. Abdomen not humped in dorsal view; abdominal segment 9 slightly keeled in sublateral view (Fig. 115).

MEASUREMENTS ( $n = 3$ ): TL 5.87–6.30 (6.06) mm; HW 0.43–0.44 (0.44) mm; PL 0.60–0.61 (0.61) mm; PW 0.78–0.82 (0.81) mm; BW 0.83–0.89 (0.86) mm.

DISTRIBUTION: Japan (Honshû).

BIOLOGICAL NOTES: This species is restricted to the Daisen and Hiruzen mountain ranges in the western part of Honshû. The main habitat of this species is in the upper reaches of rivers and their tributaries.

ETYMOLOGY: The specific name is dedicated to Dr. Masakazu Hayashi who offered many interesting specimens and helped in many ways.

DIFFERENTIAL DIAGNOSIS: This new species resembles *O. maculatus* in general appearance, but is distinguishable from the latter by the following characteristics: [adult] body large; lateral part of pronotum weakly granulate (Fig. 49); intervals of elytra convex; all tibiae reddish brown; [larva] mandibles more slender (Fig. 106).

### *Optioservus occidens* sp.n.

(Figs. 17–19, 37–38, 58–59, 77–80, 107, 116, 123, 129, 133; Table 1)

*Optioservus* sp. 2: YAMAJI 2008: 8, fig. 16; HAYASHI & KADOWAKI 2011: 124.

*Optioservus* sp.: FUJIWARA 2009: 53, fig. 3.

TYPE MATERIAL: JAPAN: Holotype ♂ (F<sub>3</sub>; EUMJ): “Nishiure-tôge, Kiyomi-chô, Takayama-shi, Gifu Pref., 15.XI.2008, Y. Kamite leg.”. Paratypes: 36 exs. (F<sub>3</sub>; CKN, EMEC, NMW): same data as for the holotype. NAGANO PREF.: 2 exs. (F<sub>3</sub>; CKN): “Ichinosawa-gawa, Minowa-machi, 3.V.2010, Y. Kamite leg.”; 8 exs. (F<sub>3</sub>; EUMJ): “Kaida-kogen, 16.VIII.1966, M. Sato leg.”; 9 exs. (F<sub>3</sub>; EUMJ): “Chigonusawa, 25.VIII.1968, M. Sato leg.”; 9 exs. (F<sub>3</sub>; CKN): “Sachizawa-gawa-shiryû, Kiso-machi, 28.VII.2007, Y. Kamite leg.”; 10 exs. (F<sub>3</sub>; CKN): ditto but: “12.VII.2008, Y. Kamite & T. Ikeda leg.”; 9 exs. (F<sub>3</sub>; CKN): “Sachizawa-gawa, Kiso-machi, 29.VII.2007, Y. Kamite leg.”; 28 exs. (F<sub>3</sub>; CKN): ditto but: “12.VII.2008, Y. Kamite leg.”; 30 exs. (F<sub>3</sub>; CKN): “Karasawa-no-taki, Kiso-machi, 29.VII.2007, Y. Kamite leg.”; 6 exs. (F<sub>3</sub>; CKN): “Jizô-tôge, Kiso-machi, 12.VII.2008, Y. Kamite leg.”; 5 exs. (F<sub>3</sub>; CKN): “Ômata-gawa, Ontake-kôgen, Ôtaki-mura, 18.VIII.2007, T. Ikeda leg.”; 1 ex. (F<sub>3</sub>; CMS): “Kayano, Minowa-machi, 6.5.1997, H. Moriya leg.”. Gifu Pref.: 5 exs. (F<sub>3</sub>; EUMJ): “Akigami, Hida, Aug.4.1966, M. Sato leg.”; 3 exs. (F<sub>3</sub>; EUMJ): ditto but: “Apr.30.1967, M. Sato”; 3 exs. (F<sub>3</sub>; EUMJ): “Yamanashi-kogen, Nov.20.1966, M. Sato leg.”; 1 ex. (F<sub>3</sub>; EUMJ): “Oppara, 15.VI.1978, M. Sato leg.”; 1 ex. (F<sub>3</sub>; CKN): “Kute, Takayama-shi, 12.VIII.2009, Y. Kamite leg.”; 7 exs. (F<sub>3</sub>; CKN): “Amô-tôge, Shirakawa-mura, 1300m, 9–IX–2006, Masato MORI Leg.”; 8 exs. (F<sub>3</sub>; CKN): “Nomugi, Takane-chô, Takayama-shi, 25.VIII.2002, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): ditto but: “29.IV.2005, Y. Kamite leg.”; 16 exs. (F<sub>3</sub>; CKN): ditto but: “30.VIII.2005, Y. Kamite leg.”; 20 exs. (F<sub>3</sub>; CKN): ditto but: “6.VI.2010, Y. Kamite leg.”; 12 exs. (F<sub>3</sub>; CKN): “Nishiure-tôge, Kiyomi-chô, Takayama-shi, 2.V.2005, Y. Kamite leg.”; 9 exs. (F<sub>3</sub>; CKN): “Mugishima, Kiyomi-chô, Takayama-shi, 30.IV.2007, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Futamata, Kiyomi-chô, Takayama-shi, 30.IV.2007, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Sandani, Shôkawa-chô, Takayama-shi, 31.VII.2005, Y. Kamite leg.”; 32 exs. (F<sub>3</sub>; CKN): ditto but: “28.VIII.2005, Y. Kamite leg.”; 6 exs. (F<sub>3</sub>; CKN): “Isshiki, Syôkawa-chô, Takayama-shi, 28.VIII.2005, Y. Kamite leg.”; 6 exs. (F<sub>3</sub>; CKN): ditto but: “19.IX.2009, Y. Kamite leg.”; 3 exs. (F<sub>3</sub>; CKN): “Washimi, Gujyô-shi, 14.XI.2004, Y. Kamite leg.”; 7 exs. (F<sub>3</sub>; CKN): “Meihô-kôgen, Meihô, Gujyô-shi, 30.IV.2007, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Shiratoriaburasaka, Gujyô-shi, 700m, 9–IX–2006, Masato MORI Leg.”; 12 exs. (F<sub>3</sub>; CKN): “Tsukio-dani, Ibigawa-chô, 18.VIII.2007, Y. Kamite leg.”; 4 exs. (F<sub>3</sub>; CKN): ditto but: “19.IV.2009, Y. Kamite leg.”; 3 exs. (F<sub>3</sub>; CKN): “Ôtani-gawa-shiryû, Ibigawa-chô, 18.VIII.2007, Y. Kamite leg.”; 2 exs. (F<sub>3</sub>; CKN): “Nukumi-dani, Motosu-shi, 19.VI.2005, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Midoriyokokura-rindô, Motosu-shi, 3.VI.2006, Y. Kamite leg.”; 2 exs. (F<sub>3</sub>; CKN): “Taraga-dani, Seki-shi, 30.VIII.2009, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN):

EUMJ): "Hinoki-toge, 4.V.1967, Y. Arita leg.". **ISHIKAWA PREF.:** 1 ex. (F<sub>3</sub>; EUMJ): "Hebi-dani, 20.VIII.1978, R. Ohgushi"; 1 ex. (F<sub>3</sub>; NMW): "Futatsuya-dani, Nara-toge, Kawaichōfutatsuya, Hida-shi, ca. 14 km W Hida, 36°19'48.1"N, 137°4'35.32"E, 810 m a.s.l., 19.IX.2013, leg. M.A. Jäch (9)"; 1 ex. (F<sub>3</sub>; NMW): "Sandani, Shōkawachō, Takayama-shi, ca. 25 km SW Takayama, Sandani-gawa (river), 36°3'1.16"N, 136°59'20.09"E, 980 m a.s.l., 18.IX.2013, leg. M.A. Jäch (5)". **FUKUI PREF.:** 1 ex. (F<sub>3</sub>; CKN): "Nagano, Ōno-shi, 2.XI.2008, Y. Kamite leg.". **KYOTO PREF.:** 1 ex. (F<sub>3</sub>; EUMJ): "Kibune, 6.VIII.1980, M. & A. Sakai leg."; 1 ex. (F<sub>3</sub>; CKN): "2010. VIII. 29 St. 1, Kibune-gawa, Kibune-yama-kokuyūrin, Sakyō-ku, Kyōto-shi, Noriaki Inahata leg., alt. 380m"; 1 ex. (F<sub>3</sub>; CKN): "2011. IV. 6 St. 6, Kurama-gawa, Kurama, Sakyō-ku, Kyōto-shi, Noriaki Inahata leg., alt. 350m". **NARA PREF.:** 40 exs. (36F<sub>3</sub>; CKN): "Wasabi-dani, Kawakami-mura, 23.IX.2005, Y. Kamite leg."; 16 exs. (14F<sub>3</sub>; CKN): "Wasamata, Kamikitayama-mura, 23.IX.2005, Y. Kamite leg."; 15 exs. (F<sub>3</sub>; CMS): "Shimotako-gawa, Simotako, Kawakami-mura, 1994.5.17, H. Moriya leg."; 7 exs. (F<sub>3</sub>; CMS): "Simotako, Kawakami-mura, 1997.9.3, H. Moriya leg."; 143 exs. (F<sub>3</sub>; CMS): "Nakanotani, Dorogawa, Tenkawa-mura, 1994.5.16, Col. Hirofumi Moriya"; 75 exs. (F<sub>3</sub>; CMS): ditto but: "1995.9.24, Col. Hirofumi Moriya". **HYŌGO PREF.:** 5 exs. (F<sub>3</sub>; CKN): "Akasai-keikoku, Haga-chō, Shisō-shi, 2-IX-2006, Masato MORI Leg."; 4 exs. (F<sub>3</sub>; CKN): ditto but: "2-V-2010, Masato MORI Leg."; 2 exs. (F<sub>3</sub>; CKN): ditto but: "6.VIII.2007, LEG. J. FUJIWARA"; 26 exs. (F<sub>3</sub>; CKN): ditto but: "2.X.2009, Y. Kamite leg."; 2 exs. (1F<sub>3</sub>; CKN): "Onzui-keikoku, Haga-chō, 2-V-1994, M. Mori Leg."; 9 exs. (F<sub>3</sub>; CKN): "Hikihara-gawa-genryū, Sakanotani-rindō, Hyōnosen, Haga-chō, Shisō-shi, 4.VII.2010, M. Mori leg.". **TOTTORI PREF.:** 1 ex. (F<sub>3</sub>; CKN): "Kisaichi-gawa-jyōryū, Ôgino-sen, Yazu-chō, 920m 6-IX-2007, Masato MORI Leg."; 8 exs. (F<sub>3</sub>; CKN): "Hosomigawa-jyōryū, Furusatono-mori, Yazu-chō, 750m, 6-IX-2007, Masato MORI Leg."; 16 exs. (15F<sub>3</sub>; EUMJ): "Tokura-tōge, 8.X.1987, M. Satō leg."; 10 exs. (F<sub>3</sub>; CKN, HOWP): "Mikuni-yama-hokuroku, Wakasugi, Nichinan-chō, 18.ix.2009, M. HAYASHI LEG.". **OKAYAMA PREF.:** 6 exs. (1F<sub>2</sub>, 5F<sub>3</sub>; CKN): "Akawase, Kamisabara, Kagamino-chō, 5.VIII.2007, Osamu Yamaji leg."; 4 exs. (F<sub>3</sub>; CKN): "Akawase, Kagamino-chō, 21.IX.2009, H. Kadowaki leg."; 4 exs. (1F<sub>2</sub>, 3F<sub>3</sub>; CKN, EUMJ): "Okutsu-gawa-keikoku, Tsuyama-shi, 1.VI.2003, Osamu Yamaji leg.". **SHIMANE PREF.:** 4 exs. (F<sub>3</sub>; CKN, HOWP): "Takajiri-gawa-genryū, Oriomo, Kamitakajiri, Yoshika-chō, 17.viii.2008, M. HAYASHI LEG."; 1 ex. (F<sub>3</sub>; CKN): "Karetani, Hikimi-chō, 27.III.2005, T. Ogata leg.".

#### ADDITIONAL MATERIAL EXAMINED:

**Larvae: JAPAN: NAGANO PREF.:** 6 immature larvae (CKN): "Ichinosawa-gawa, Minowa-machi, 3.V.2010, Y. Kamite leg.". **GIFU PREF.:** 2 mature larvae and 16 immature larvae (CKN): "Nomugi, Takane-chō, Takayama-shi, 29.IV.2005, Y. Kamite leg."; 1 immature larva (CKN): "Nōgō-dani, Neonōgō, Motosu-shi, 3.VI.2005, Y. Kamite leg."; 1 immature larva (CKN): "Yatani, Motosu-shi, 17.VI.2007, Y. Kamite leg."; 1 mature larva (CKN): "Nishiure-tōge, Kiyomi-chō, Takayama-shi, 2.V.2005, Y. Kamite leg."; 15 mature larvae (CKN): ditto but: "30.XII.2006, Y. Kamite leg.".

**DESCRIPTION: Adult:** TL/EW 2.15–2.25 (2.20). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tarsi paler. Color patterns of elytra: F<sub>2</sub> or F<sub>3</sub>; humeral yellowish patches at about basal 1/3 to 1/6, extend to 1<sup>st</sup> stria or reach to the suture in F<sub>3</sub> (Fig. 17).

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes relatively large in size; the distance between eyes about 1.09 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.4 : 2.2 : 1.8 : 1.0 : 1.0 : 1.0 : 1.0 : 1.5 : 1.5 : 2.9. Clypeus transverse, about 2.41 times as wide as long. Labrum transverse, about 1.83 times as wide as long.

Pronotum transverse, slightly convex; lateral part moderately granulate; with shallow or without median longitudinal impression; without prescutellar pits; antero-lateral corners moderately produced anteriad. PW/PL 1.28–1.43 (1.33); sublateral carinae 0.27–0.36 (n = 10, 0.31) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin weakly serrate; intervals less rugose, slightly convex; punctate striae shallow or vague; strial punctures of each stria somewhat large and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> or of subequal width (Fig. 58); EL/EW 1.54–1.64 (1.60); EL/PL 2.55–2.94 (2.67); EW/PW 1.23–1.29 (1.26).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 77–79; phallobase squamous at lateral and ventral surface; penis about 1.63 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 78); parameres slender, about 0.66 times as long as penis; lateral part of endophallus as in Fig. 79.

Ovipositor as in Fig. 80; coxite about 6.31 times as long as stylus; valvifer about 11.23 times as long as stylus.

MEASUREMENTS: MF (n = 10): TL 2.68–2.84 (2.76) mm; PL 0.68–0.79 (0.75) mm; PW 0.97–1.03 (1.00) mm; EL 1.95–2.05 (2.01) mm; EW 1.22–1.31 (1.26) mm.

DESCRIPTION: **Larva:** Body cylindrical; TL/BW 7.20–7.85 (7.46). Color dark brown or brown, antennae, mouth parts and legs somewhat paler. Head about 1.07 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 107) widely falciform, 1.69 times as long as wide. Labrum about 1.94 times as wide as long. Pronotum slightly wider than long; PW/PL 1.24–1.34 (1.29), not humped in dorsal view. Abdomen not humped in dorsal view; abdominal segment 9 slightly keeled in sublateral view (Fig. 116).

MEASUREMENTS (n = 3): TL 6.34–6.44 (6.38) mm; HW 0.42–0.43 (0.43) mm; PL 0.59–0.63 (0.61) mm; PW 0.77–0.82 (0.79) mm; BW 0.82–0.88 (0.86) mm.

DISTRIBUTION: Japan (Honshū).

BIOLOGICAL NOTES: This is a relatively rare species in the western part of Honshū. The main habitat of this species is upper reaches of rivers where they are abundant on small rocks and in the gravel of riffles. They prefer the main stream to branch streams.

ETYMOLOGY: The specific name refers to the western Honshū distribution of this species.

DIFFERENTIAL DIAGNOSIS: In adult features, this new species resembles *O. maculatus* in general appearance, but is distinguishable from the latter by the following characteristics: pronotum with shallow or without median longitudinal impression; lateral margin of elytra weakly serrate; lateral part of endophallus as in Fig. 79. In larval features, this new species resembles *O. masakazui* in general appearance, but is distinguishable from the latter by the stout mandibles (Fig. 107).

### *Optioservus ogatai* sp.n.

(Figs. 20–22, 39–40, 50, 61, 81–84, 108, 117, 122, 126, 130, 133; Table 1)

*Optioservus variabilis*: AKIYAMA 2005: 210, pl. 2, fig. 7.

*Optioservus* sp.: OGATA & NAKAJIMA 2006: 233, fig. 20; HAYASHI 2007: 94, fig. 1L; YOSHIOKA 2007: 243, fig. 18N; AKIYAMA 2008: 115; HAYASHI 2009: 241; HAYASHI 2011: 104, fig. 47F.

*Optioservus* sp. 1: YAMAJI 2008: 8, fig. 15.

TYPE MATERIAL: JAPAN: Holotype ♂ (F<sub>7</sub>; EUMJ): “Bansyō-dani, Kumakōgen-chō, Ehime Pref., 21.IX.2008, Y. Kamite leg.”. Paratypes: 26 exs. (1F<sub>2</sub>, 25F<sub>7</sub>; CKN, EMEC, NMW): same data as for the holotype. SAITAMA PREF.: 16 exs. (F<sub>7</sub>; CKN): “Onouchizawa, Ogano-machi, 30.Aug.2007, Yasuyuki IWATA leg.”. TOKYO: 2 exs. (F<sub>7</sub>; CKN): “Hirai-gawa, Hinode-machi, 1.IX.2007, Y. Kamite leg”; 2 exs. (F<sub>7</sub>; CMS): “Mitake-zawa, Youzawa, Itsukaichi-machi, 1994.12.21, H. Moriya leg.”; 1 ex. (F<sub>7</sub>; CMS): “Matsuo, Hinode-machi, 1994.10.1, Col. Hirofumi Moriya”. KANAGAWA PREF.: 2 exs. (F<sub>7</sub>; CMS): “Wada, Sanogawa, Fujino-machi, Tsukui-gun, 2003.5.7, Hirofumi Moriya leg.”. SHIZUOKA PREF.: 7 exs. (1F<sub>2</sub>, 4F<sub>7</sub>; CKN): “Umegashima, Shizuoka-shi, 18.X.2008, I. Ôshio leg.”; 10 exs. (1F<sub>3</sub>, 1F<sub>6</sub>, 8F<sub>7</sub>; CKN): “Kusaki-gawa, Misakubo-chō, 10.IV.2005, Y. Tahira leg.”; 44 exs. (1F<sub>2</sub>, 1F<sub>3</sub>, 2F<sub>6</sub>, 34F<sub>7</sub>; CKN): ditto but: “25.VI.2005, Y. Tahira leg.”; 25 exs. (1F<sub>6</sub>, 18F<sub>7</sub>; CKN): ditto but: “Y. Kamite leg.”; 12 exs. (F<sub>7</sub>; CKN): “Hayakawa, 28.VII.1953, H. OYAMA”; 1 ex. (F<sub>7</sub>; EUMJ): “Misakubo, 26.V.1986, M. Satô leg.”. NAGANO PREF.: 5 exs. (2F<sub>3</sub>, 3F<sub>7</sub>; CKN): “Ogiso, Kiso-mura, 6.VI.2010, Y. Kamite leg.”; 8 exs. (3F<sub>2</sub>, 2F<sub>3</sub>, 1F<sub>6</sub>, 2F<sub>7</sub>; CKN): “Nagawa, Matsumoto-shi, 6.VI.2010, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Sachizawa-gawa, Kiso-machi, 12.VII.2008, Y. Kamite leg.”; 4 exs. (1F<sub>2</sub>, 2F<sub>3</sub>, 1F<sub>6</sub>; CKN): “Sachizawa-gawa-shiryû, Kiso-machi, 28.VII.2007, Y. Kamite leg.”; 8 exs. (1F<sub>2</sub>, 3F<sub>3</sub>, 2F<sub>6</sub>, 2F<sub>7</sub>; CKN): ditto but: “29.VII.2007, Y. Kamite leg.”; 5 exs. (1F<sub>2</sub>, 2F<sub>3</sub>, 1F<sub>6</sub>, 1F<sub>7</sub>; CKN): ditto but: “12.VII.2008, Y. Kamite & T. Ikeda leg.”; 5 exs. (4F<sub>3</sub>, 1F<sub>7</sub>; CKN): “Karasawa-no-taki, Kiso-

machi, 29.VII.2007, Y. Kamite leg.”; 7 exs. (4F<sub>3</sub>, 1F<sub>6</sub>, 2F<sub>7</sub>; CKN): “Jizô-tôge, Kiso-machi, 12.VII.2008, Y. Kamite leg.”; 21 exs. (3F<sub>1</sub>, 5F<sub>2</sub>, 11F<sub>3</sub>, 2F<sub>6</sub>; CKN): “Ôdaira, Iida-shi, 15.V.2010, Y. Kamite leg.”; 15 exs. (2F<sub>2</sub>, 1F<sub>3</sub>, 12F<sub>7</sub>; CMS): “Kayano, Minowa-machi, 1997.5.6, H. Moriya leg.”; 20 exs. (1F<sub>2</sub>, 3F<sub>3</sub>, 1F<sub>6</sub>, 15F<sub>7</sub>; CMS): “Yokoyama, Ina-shi, 1995.10.6, Col. Hirofumi Moriya”; 23 exs. (7F<sub>3</sub>, 1F<sub>6</sub>, 15F<sub>7</sub>; CMS): “Teranakatsubo, Ina-shi, 6.May.1997, H. Moriya leg.”. **GIFU PREF.:** 5 exs. (F<sub>2</sub>; CKN): “Amô-tôge, Shirakawa-mura, 1300m, 9–IX–2006, Masato MORI Leg.”; 2 exs. (1F<sub>3</sub>, 1F<sub>7</sub>; CKN): “Amô-tôge, Shirakawa-mura, 19.IX.2009, Y. Kamite leg.”; 8 exs. (F<sub>7</sub>; EUMJ): “Hirayu-tôge, 12.VIII.1978, M. Sato leg.”; 24 exs. (3F<sub>2</sub>, 5F<sub>6</sub>, 15F<sub>7</sub>; CKN): “Kute, Takayama-shi, 12.VIII.2009, Y. Kamite leg.”; 10 exs. (1F<sub>1</sub>, 2F<sub>3</sub>, 7F<sub>7</sub>; EUMJ): “Akigami, Hida, Aug.4.1966, M. Sato leg.”; 4 exs. (1F<sub>2</sub>, 1F<sub>6</sub>, 2F<sub>7</sub>; EUMJ): ditto but: “Apr.30.1967, M. Satô”; 2 exs. (1F<sub>2</sub>, 1F<sub>7</sub>; EUMJ): “Hiwada, Hida, Aug.16.1966, M. Satô”; 11 exs. (3F<sub>2</sub>, 1F<sub>3</sub>, 7F<sub>7</sub>; EUMJ): “Yakeishidani, Hida, 4.VIII.1966, M. Sato leg.”; 5 exs. (1F<sub>2</sub>, 1F<sub>3</sub>, 3F<sub>7</sub>; EUMJ): “Nigorigo, Hida, Aug.4.1966, M. Satô”; 1 ex. (F<sub>3</sub>; EUMJ): “Kami-kuwajima, Hida, Aug.4.1966, M. Satô”; 2 exs. (1F<sub>2</sub>; CKN): “Yamanomura, Kamioka-chô, Hida-shi, 30.IV.2005, Y. Kamite leg.”; 8 exs. (3F<sub>2</sub>, 4F<sub>3</sub>; CKN): “Sugô-tôge, Kamioka-chô, Hida-shi, 29.IV.2007, Y. Kamite leg.”; 10 exs. (2F<sub>2</sub>, 7F<sub>3</sub>, 1F<sub>7</sub>; CKN): ditto but: “2.V.2009, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; EUMJ): “Sugô-kogen, 22–V–1994, K. Ishida”; 4 exs. (2F<sub>3</sub>, 2F<sub>7</sub>; CKN): “Nomugi, Takane-chô, Takayama-shi, 29.IV.2005, Y. Kamite leg.”; 9 exs. (2F<sub>6</sub>, 7F<sub>7</sub>; CKN): ditto but: “30.VIII.2005, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; CKN): ditto but: “6.VI.2010, Y. Kamite leg.”; 7 exs. (2F<sub>2</sub>, 5F<sub>7</sub>; CKN): “Ichinomiya-machi, Takayama-shi, 29.IV.2010, Y. Kamite leg.”; 1 ex. (F<sub>2</sub>; CKN): “Nishiure-tôge, Kiyomi-chô, Takayama-shi, 2.V.2005, Y. Kamite leg.”; 1 ex. (F<sub>2</sub>; CKN): ditto but: “15.XI.2008, Y. Kamite leg.”; 2 exs. (F<sub>7</sub>; CKN): “Mugishima, Kiyomi-chô, Takayama-shi, 30.IV.2007, Y. Kamite leg.”; 3 exs. (1F<sub>2</sub>, 1F<sub>6</sub>, 1F<sub>7</sub>; CKN): “Sandani, Shôkawa-chô, Takayama-shi, 28.VIII.2005, Y. Kamite leg.”; 2 exs. (1F<sub>2</sub>, 1F<sub>7</sub>; CKN): ditto but: “19.IX.2009, Y. Kamite leg.”; 4 exs. (F<sub>3</sub>; CKN): “Mumaya, Syôkawa-chô, Takayama-shi, 3.V.2009, Y. Kamite leg.”; 19 exs. (5F<sub>2</sub>, 14F<sub>3</sub>; CKN): “Itoshiro, Gujyô-shi, 3.IX.2009, Y. Kamite leg.”; 2 exs. (1F<sub>2</sub>, 1F<sub>7</sub>; CKN): “Washimi, Gujyô-shi, 14.XI.2004, Y. Kamite leg.”; 3 exs. (F<sub>7</sub>; CKN): “Tsukio-dani, Ibigawa-chô, 18.VIII.2007, Y. Kamite leg.”; 29 exs. (7F<sub>2</sub>, 1F<sub>3</sub>, 15F<sub>7</sub>; CKN): “Midoriyokokurandô, Motosu-shi, 3.VI.2006, Y. Kamite leg.”; 1 ex. (F<sub>2</sub>; CKN): ditto but: “19.IV.2009, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; CKN): “Nukumi-dani, Motosu-shi, 19.VI.2005, Y. Kamite leg.”; 2 exs. (1F<sub>6</sub>, 1F<sub>7</sub>; CKN): “Otome-keikoku, Nakatsugawa-shi, 22.IX.2009, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; NMW): “N of Nara-toge, Hida-shi, ca. 16 km W Hida, 36°20'50.11"N, 137°03'53.48"E, 1240 m a.s.l., 19.IX.2013, leg. M.A. Jäch (11)”. **FUKUI PREF.:** 10 exs. (2F<sub>1</sub>, 1F<sub>3</sub>, 7F<sub>7</sub>; EUMJ): “Kammuri-dake, Eiheiji-cho, 17.viii.1981, H. Sasaji leg.”; 1 ex. (F<sub>1</sub>; EUMJ): “Kyôgatake, Ohno, 23.vii.1976, H. Sasaji”; 1 ex. (F<sub>2</sub>; EUMJ): “Satsura-dani, Izumi-mura, 2.viii.1981, H. Sasaji leg.”; 2 exs. (1F<sub>3</sub>, 1F<sub>7</sub>; CKN): “Tani, Katsuyama-shi, 17.VI.2003, Y. Kamite leg.”. **SHIGA PREF.:** 8 exs. (1F<sub>2</sub>, 2F<sub>3</sub>, 5F<sub>7</sub>; CKN): “Okubuki, Kôduhara, Maibara-shi, 20.VII.2008, T. Ikeda leg.”; 1 ex. (F<sub>7</sub>; EUMJ): “Kôtsubata, Mar.13.1966, M. Satô leg.”; 7 exs. (F<sub>7</sub>; CKN): “Yataka, Maibara-shi, 19.IV.2008, Y. Kamite leg.”; 6 exs. (4F<sub>7</sub>; CKN): ditto but: “21.III.2009, Y. Kamite leg.”. **MIE PREF.:** 5 exs. (3F<sub>2</sub>, 2F<sub>7</sub>; CKN): “Nishinotani, Ôdai-chô, alt. 1100m, 25. X. 2012, N. Inahata leg.”. **KYOTO PREF.:** 5 exs. (3F<sub>2</sub>, 2F<sub>7</sub>; CKN): “Iga-gawa-genryû, Hacchôdaira, Sakyô-ku, Kyôto-shi, alt. 800m, 23.VIII.2012, N. Inahata leg.”. **NARA PREF.:** 12 exs. (8F<sub>7</sub>; CKN): “Wasamata, Kamikitayama-mura, 23.IX.2005, Y. Kamite leg.”; 23 exs. (7F<sub>2</sub>, 16F<sub>7</sub>; CMS): “Nakanotani, Dorogawa, Tenkawa-mura, 1994.5.16, Col. Hirofumi Moriya”; 20 exs. (4F<sub>2</sub>, 16F<sub>7</sub>; CMS): ditto but: “1995.9.24, Col. Hirofumi Moriya”. **TOTTORI PREF.:** 2 exs. (F<sub>2</sub>; CKN): “Tsukuyone-kawa-jyôryû, Hyôno-sen-skijiyô, Wakasa-chô, 930m, 7–IX–2007, Masato MORI Leg.”; 1 ex. (F<sub>7</sub>; CKN): “Hyôno-sen, Tsukuyone, Wakasa-chô, 24.X.2010, H. Kadokawa Leg.”; 1 ex. (F<sub>7</sub>; CKN): “Kisaichigawa-jyôryû, Ôginose, Yazu-chô, 920m, 6–IX–2007, Masato MORI Leg.”. **OKAYAMA PREF.:** 1 ex. (F<sub>2</sub>; CKN): “Wakasugi-keikoku, Nishiawakura-son, 5.X.2003, Osamu Yamaji leg.”; 6 exs. (4F<sub>2</sub>, 2F<sub>7</sub>; CKN): “Komanoo-yamananroku, Higashiawakura-son, 14.X.2002, Osamu Yamaji leg.”; 3 exs. (1F<sub>2</sub>, 2F<sub>7</sub>; CKN): ditto but: “5.X.2003, Osamu Yamaji leg.”. **HIROSHIMA PREF.:** 1 ex. (F<sub>7</sub>; CKN): “Kamiyu-kawa, Takano-chô, Syôbara-shi, 25.VIII.2007, Yoshifumi Akiyama leg.”. **SHIMANE PREF.:** 2 exs. (F<sub>7</sub>; CKN, HOWP): “Azuma-yama, Okuzumo-chô, 26.IX.2006, M. Hayashi leg.”; 2 exs. (1F<sub>3</sub>, 1F<sub>7</sub>; CKN): “Kare-tani, Hikimi-chô, 27.III.2005, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; HOWP): “Shiso-gawa-genryû, Hikimi, Masuda-shi, 18.viii.2008, M. HAYASHI LEG.”. **TOKUSHIMA PREF.:** 2 exs. (F<sub>7</sub>; CKN): “Shioduka, Yamashiro-chô, 9.X.2003, Y. Kamite leg.”; 5 exs. (1F<sub>3</sub>, 3F<sub>7</sub>; CKN): “Fagasu-no-mori, Takashiro-yama, Naka-chô, 15.X.2006, H. Fujimoto leg.”; 4 exs. (3F<sub>7</sub>; CKN): “Minokoshi, Tsurugi-san, Miyoshi-shi, 1300m, 15–VII–06, Masato MORI Leg.”; 4 exs. (F<sub>7</sub>; EUMJ): “Mt. Tsurugi, 11–12.VII.1976, A. Oda”; 1 ex (F<sub>2</sub>; CKN): “2013. VII. 20, Sadamitsu-gawa-genryû, Marusasa-yama, Tsurugi-chô, alt. 1260m, Noriaki Inahata leg.”. **EHIME PREF.:** 13 exs. (1F<sub>1</sub>, 2F<sub>2</sub>, 6F<sub>7</sub>; CKN): “Bansyô-dani, Kumakôgen-chô, 30.IX.2006, Y. Kamite leg.”; 2 exs. (1F<sub>7</sub>; CKN): “Bansyodani, Omogo-mura, 25.V.2004, T. Kurihara leg.”; 7 exs. (F<sub>7</sub>; CKN): “Jiyoshidani-gawa, Kumakôgen-chô, 18.VIII.2010, Y. Kamite leg.”; 5 exs. (F<sub>7</sub>; EUMJ): “Odamiyama, 2.IV.1986, E. Yamamoto”; 9 exs. (7F<sub>3</sub>, 2F<sub>7</sub>; EUMJ): ditto but: “29.IV.1986, E. Yamamoto”; 17 exs. (7F<sub>1</sub>, 8F<sub>7</sub>; EUMJ): ditto but: “21.V.1986, E. Yamamoto”; 56 exs. (3F<sub>1</sub>, 4F<sub>3</sub>, 1F<sub>6</sub>, 48F<sub>7</sub>; EUMJ): ditto but: “25.V.1986, E. Yamamoto”; 23 exs. (1F<sub>3</sub>, 21F<sub>7</sub>; EUMJ): ditto but: “1.VI.1986, E. Yamamoto”; 2 exs. (F<sub>7</sub>; EUMJ): ditto but: “8.VI.1986, E. Yamamoto”; 2 exs. (1F<sub>1</sub>, 1F<sub>7</sub>; EUMJ): ditto but: “15.VIII.1986, E. Yamamoto”; 1 ex. (F<sub>7</sub>; EUMJ): ditto but: “8.IX.2000, S. Hayakawa leg.”; 13 exs. (3F<sub>3</sub>, 10F<sub>7</sub>; EUMJ): “Namakusa-dani, ODAMUYAMA, 20.VII.1994, E. Yamamoto leg.”; 3 exs. (F<sub>7</sub>; EUMJ): “Rokurodani, ODAMUYAMA, 22.VII.1994, E. Yamamoto leg.”; 4 exs. (F<sub>7</sub>; EUMJ): ditto but: “29.VII.1994, E.

Yamamoto leg.”; 3 exs. (1F<sub>3</sub>, 2F<sub>7</sub>; EUMJ): “Hontani, 900–950m, ODAMIYAMA, 20.VIII.1994, E. Yamamoto leg.”; 2 exs. (F<sub>7</sub>; EUMJ): “Kurokawa, 25.VII.1958, K. Kuwada”; 2 exs. (F<sub>7</sub>; NMW): “Kanayama-dani, Kumakogen-chō, ca. 38 km ESE Matsuyama, 33°44'05.27"N, 133°08'07.79"E, 1000 m a.s.l., 22.IX.2013, leg. M.A. Jäch (18)”. **KÔCHI PREF.:** 7 exs. (1F<sub>2</sub>, 6F<sub>7</sub>; CKN): “near Yosakoi Pass, alt. ca. 1,350m, Ino Town, 24.VIII.2007, Takashi Kurihara leg., N: 33°45'12", E: 133°09'51"; 39 exs. (2F<sub>2</sub>, 37F<sub>7</sub>; CKN): ditto but: “21.IX.2008, Y. Kamite leg.”; 2 exs. (F<sub>7</sub>; CKN): “Name-kawa, Shiraga-yama, 850, Motoyama-chō, 28–VII–07, Masato MORI Leg.”; 1 ex. (F<sub>7</sub>; EUMJ): “Kôen-sen–Yosatōi-tôge, Shiraino-keikoku, Teragawa, Hongawa, Ino-chō, 8.viii.2009, car net, Ryûsuke & Toshie Miyata”; 1 ex. (F<sub>7</sub>; NMW, one additional specimen in alcohol): “ca. 9 km E of Otoyo-chō, above and below Ryuô-no-taki, 33°46'10.83"N, 133°45'43.18"E, 915 m a.s.l., 24.IX.2013, leg. M.A. Jäch (26)”. **FUKUOKA PREF.:** 3 exs. (1F<sub>3</sub>, 2F<sub>7</sub>; CMS): “Roppongi, Yabe-mura, 1999.11.6, H. Moriya leg.”. **ÔITA PREF.:** 3 exs. (F<sub>7</sub>; CKN): “Gozen-dake, Maetsue-mura, 19.VII.2003, Y. Kamite leg.”; 17 exs. (2F<sub>1</sub>, 1F<sub>3</sub>, 11F<sub>7</sub>; CKN): ditto but: “26.III.2005, Y. Kamite leg.”; 4 exs. (F<sub>7</sub>; CKN): ditto but: “22.IV.2003, J. Nakajima leg.”.

#### ADDITIONAL MATERIAL EXAMINED:

**Larvae: JAPAN:** **SHIZUOKA PREF.:** 38 immature larvae (CKN): “Kusaki-gawa, Misakubo-chō, 25.VI.2005, Y. Kamite leg.”; 9 immature larvae (CKN): ditto but: “Y. Tahira leg.”; 2 mature larvae and 4 immature larvae (CKN): ditto but: “10.IV.2005, Y. Tahira leg.”. **NAGANO PREF.:** 3 mature larvae (CKN): “Nagawa, Matsumoto-shi, 6.VI.2010, Y. Kamite leg.”; 7 mature larvae and 4 immature larvae (CKN): “Ôdaira, Iida-shi, 15.V.2010, Y. Kamite leg.”. **GIFU PREF.:** 1 immature larva (CKN): “Sugô-tôge, Kamioka-chō, Hida-shi, 2.V.2009, Y. Kamite leg.”; 6 immature larvae (CKN): “Yamanomura, Kamioka-chō, Hida-shi, 30.IV.2005, Y. Kamite leg.”; 26 mature larvae and 4 immature larvae (CKN): “Ichinomiya-machi, Takayama-shi, 29.IV.2010, Y. Kamite leg.”; 6 immature larvae (CKN): “Mumaya, Syôkawa-chō, Takayama-shi, 3.V.2009, Y. Kamite leg.”; 3 immature larvae (CKN): “Itoshiro, Gujyô-shi, 3.IX.2009, Y. Kamite leg.”; 4 immature larvae (CKN): “Midoriyokokura-rindô, Motosu-shi, 3.VI.2006, Y. Kamite leg.”; 14 mature larvae and 6 immature larvae (CKN): ditto but: “3.III.2007, Y. Kamite leg.”. **SHIGA PREF.:** 6 mature larvae and 3 immature larvae (CKN): “Yataka, Maibara-shi, 19.IV.2008, Y. Kamite leg.”. **ÔITA PREF.:** 10 mature larvae and 23 immature larvae (CKN): “Gozen-dake, Maetsue-mura, 26.III.2005, Y. Kamite leg.”.

**DESCRIPTION: Adult:** TL/EW 2.13–2.32 (2.19). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tibiae and tarsi paler. Color patterns of elytra: F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub>, F<sub>6</sub> or F<sub>7</sub>; humeral yellowish patches relatively large, at about basal 1/2 to 1/4, extend to 1<sup>st</sup> stria or reach to the suture in F<sub>3</sub> (Fig. 21) and F<sub>6</sub>.

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes relatively large in size; the distance between eyes about 1.10 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.5 : 2.0 : 1.7 : 1.0 : 1.0 : 1.0 : 1.1 : 1.0 : 1.5 : 1.6 : 3.2. Clypeus transverse, about 2.43 times as wide as long. Labrum transverse, about 1.91 times as wide as long.

Pronotum, transverse (Fig. 50), strongly convex; lateral part moderately granulate; with deep median longitudinal impression; without prescutellar pits; antero-lateral corners moderately or weakly produced anteriad. PW/PL 1.29–1.47 (1.36); sublateral carinae 0.27–0.33 (n = 10, 0.31) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin clearly serrate; intervals rugose, moderately convex; punctate striae deep; striae punctures of each stria relatively small and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> (Fig. 61); EL/EW 1.53–1.69 (1.59); EL/PL 2.45–2.90 (2.64); EW/PW 1.19–1.27 (1.23).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 81–83; phallobase squamous at lateral and ventral surfaces; penis about 1.63 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 82); parameres slender, about 0.60 times as long as penis; lateral part of endophallus as in Fig. 83.

Ovipositor as in Fig. 84; coxite about 7.58 times as long as stylus; valvifer about 12.33 times as long as stylus.

MEASUREMENTS: MF (n = 10): TL 2.73–3.05 (2.89) mm; PL 0.73–0.84 (0.80) mm; PW 1.02–1.17 (1.08) mm; EL 2.00–2.21 (2.10) mm; EW 1.24–1.41 (1.32) mm.

DESCRIPTION: **Larva:** Body cylindrical; TL/BW 7.40–7.58 (7.50). Color dark brown or brown, antennae, mouth parts and legs somewhat paler. Head about 1.11 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 108) subtriangular, 1.27 times as long as wide. Labrum about 1.72 times as wide as long. Pronotum slightly wider than long; PW/PL 1.24–1.25 (1.25), not humped in dorsal view. Abdomen not humped in dorsal view; abdominal segment 9 slightly keeled in sublateral view (Fig. 117).

MEASUREMENTS (n = 3): TL 6.25–6.44 (6.33) mm; HW 0.42–0.44 (0.43) mm; PL 0.60–0.65 (0.62) mm; PW 0.75–0.81 (0.78) mm; BW 0.83–0.87 (0.84) mm.

DISTRIBUTION: Japan (Honshû, Shikoku, Kyûshû).

BIOLOGICAL NOTES: This is a widely distributed species in the western part of Honshû, all of Shikoku and the northern part of Kyûshû. It prefers sandy substrates. The main habitat of this species is upper reaches of the rivers and branch streams.

ETYMOLOGY: The specific name is dedicated to the late Mr. Takeshi Ogata who offered many interesting specimens and helped in many ways.

DIFFERENTIAL DIAGNOSIS: In adult features, this new species resembles *O. masakazui* in general appearance, but is distinguishable from the latter by the following characteristics: pronotum strongly convex, lateral part clearly granulate (Fig. 50); intervals of elytra strongly rugose (Fig. 61). The population of the Chûbu mountainous district is somewhat slender in body shape, and also resembles *O. variabilis*, but is distinguishable from the latter by the lateral part of endophallus as in Fig. 83. In larval features, this new species resembles *O. masakazui* and *O. occidens* in general appearance, but is distinguishable from the other two by the subtriangular mandibles (Fig. 108).

### *Optioservus sakaii* sp.n.

(Figs. 9–10, 41–42, 62, 85–88, 109, 118, 124)

*Optioservus maculatus*: OGATA & NAKAJIMA 2006: 232, fig. 2N.

TYPE MATERIAL: JAPAN: Holotype ♂ (EUMJ): "Komenono, Matsuyama-shi, Ehime Pref., 20.IX.2008, Y. Kamite leg.". Paratypes 37 exs. (CKN, EMEC, NMW): same data as for the holotype. EHIME PREF.: 1 ex. (CKN): "Komenono, Matsuyama-shi, 10.V.2001, Y. Kamite leg."; 42 exs. (CKN): ditto but: "10.X.2005, Y. Kamite leg."; 3 exs. (EUMJ): ditto but: "7–VIII.1979, K. Sasagawa"; 13 exs. (EUMJ): ditto but: "11–VIII.1979, K. Sasagawa"; 7 exs. (EUMJ): ditto but: "18–VIII.1979, K. Sasagawa"; 2 exs. (EUMJ): ditto but: "23–VIII.1979, K. Sasagawa"; 7 exs. (EUMJ): ditto but: "25–VIII.1979, K. Sasagawa"; 3 exs. (EUMJ): ditto but: "30–VIII.1979, K. Sasagawa"; 1 ex. (EUMJ): ditto but: "11–IX.1979, K. Sasagawa"; 1 ex. (EUMJ): ditto but: "9.V.1976, Y. Notsu leg."; 5 exs. (EUMJ): ditto but: "20.VI.1976, Y. Notsu leg."; 1 ex. (EUMJ): ditto but: "29.IV.1974, A. Oda leg."; 2 exs. (EUMJ): ditto but: "10.V.1997, S. Hayakawa leg."; 6 exs. (EUMJ): ditto but: "29.IV.1974, M. Sakai"; 7 exs. (EUMJ): ditto but: "11.VI.1974, M. Sakai"; 2 exs. (CKN, EUMJ): "Komeno-machi, Matsuyama-shi, 23.V.2004, Takashi Kurihara leg."; 19 exs. (CKN): ditto but: "11.IX.2004, Takashi Kurihara leg?"; 3 exs. (EUMJ): "Komeno-chô, Matsuyama, 31.X.1986, S. Nakamura"; 15 exs. (EUMJ): "Takanawa-san, 28.IV.1996, M. Satô leg."; 5 exs. (CKN): "Kiji, Imabari-shi, 20.IX.2008, Y. Kamite leg.". FUKUOKA PREF.: 1 ex. (CKN): "Shirakawa, Amagi-shi, 28.III.2005, Y. Kamite leg?"; 1 ex. (CKN): "Kuwamagari, Chikuho-machi, 28.III.2005, Y. Kamite leg?"; 1 ex. (CKN): ditto but: "6.IV.2003, T. Ogata leg?"; 1 ex. (CMS): ditto but: "1999.11.4, H. Moriya leg?"; 2 exs. (CMS): "Shiiba, Sawara-ku, Fukuoka-shi, 1999.11.5, H. Moriya leg?"; 28 exs. (CKN, EUMJ): "Kushigi, Chikuzen-machi, 20.VII.2003, Y. Kamite leg?"; 4 exs. (EUMJ): ditto but: "M. Sato leg?". MIYAZAKI PREF.: 1 ex. (EUMJ): "Mt. Aoidake, 25.VII.1974, M. Sakai leg.".

## ADDITIONAL MATERIAL EXAMINED:

**Larvae:** JAPAN: EHIME PREF.: 1 immature larva (CKN): "Komenono, Matsuyama-shi, 10.X.2005, Y. Kamite leg.". FUKUOKA PREF.: 3 mature larvae and 10 immature larvae (CKN): "Kuwamagari, Chikuho-machi, 28.III.2005, Y. Kamite leg."; 4 mature larvae and 5 immature larvae (CKN): "Kushigi, Chikuzen-machi, 6.IV.2003, T. Ogata leg."; 11 mature larvae and 42 immature larvae (CKN): ditto but: "28.III.2005, Y. Kamite leg.".

**DESCRIPTION: Adult:** TL/EW 1.90–2.08 (1.97). Dorsal surface black, but elytra with yellowish patches at humeral and apical areas ( $F_3$ ). Humeral yellowish patches relatively small, at about basal 1/3 to 1/6, not extend to 1<sup>st</sup> stria (Fig. 9). Ventral surface, antennae, mouth parts and legs reddish brown to blackish brown, but antennomeres 1–8, tarsi paler.

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes moderate in size; the distance between eyes about 1.21 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.5 : 2.3 : 2.0 : 1.0 : 1.0 : 1.0 : 1.3 : 1.0 : 1.8 : 1.8 : 3.0. Clypeus transverse, about 2.69 times as wide as long. Labrum transverse, about 1.83 times as wide as long.

Pronotum transverse, convex; lateral part moderately granulate; with shallow median longitudinal impression, without prescutellar pits; antero-lateral corners moderately produced anteriad. PW/PL 1.31–1.46 (1.37); sublateral carinae 0.27–0.33 ( $n = 10$ , 0.29) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin weakly serrate; intervals strongly rugose, moderately convex; punctate striae deep; striae punctures of each stria relatively small and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> or of subequal width (Fig. 62); EL/EW 1.30–1.50 (1.37); EL/PL 2.10–2.56 (2.27); EW/PW 1.18–1.25 (1.21).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 85–87; phallobase squamous at lateral and ventral surfaces; penis about 1.44 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 86); parameres slender, about 0.65 times as long as penis; lateral part of endophallus as in Fig. 87.

Ovipositor as in Fig. 88; coxite about 8.33 times as long as stylus; valvifer about 14.52 times as long as stylus.

**MEASUREMENTS:** MF ( $n = 10$ ): TL 2.10–2.30 (2.21) mm; PL 0.59–0.72 (0.68) mm; PW 0.83–0.98 (0.93) mm; EL 1.46–1.62 (1.53) mm; EW 1.01–1.21 (1.12) mm.

**DESCRIPTION: Larva:** Body cylindrical; TL/BW 6.93–7.34 (7.07). Color dark brown, antennae, mouth parts and legs somewhat paler. Head about 1.16 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 109) subtriangular, 1.36 times as long as wide. Labrum about 1.70 times as wide as long. Pronotum slightly wider than long; PW/PL 1.31–1.33 (1.32), not humped in dorsal view. Abdomen not humped in dorsal view; abdominal segment 9 not keeled in sublateral view (Fig. 118).

**MEASUREMENTS** ( $n = 3$ ): TL 5.27–5.36 (5.32) mm; HW 0.38 mm; PL 0.52 mm; PW 0.68–0.69 (0.69) mm; BW 0.73–0.77 (0.75) mm.

**DISTRIBUTION:** Japan (Shikoku, Kyūshū).

**BIOLOGICAL NOTES:** This species is restricted in the north-western part of Shikoku and Kyūshū. The main habitat of this species is upper or middle parts of rivers. They especially prefer sandy substrates in branch streams.

**ETYMOLOGY:** The specific name is dedicated to Dr. Masahiro Sakai who offered the collection of EUMJ and helped in many ways.

**DIFFERENTIAL DIAGNOSIS:** In adult features, this new species resembles *O. maculatus* in general appearance, but is distinguishable from the latter by the following characteristics: body small; intervals of elytra strongly rugose (Fig. 62); lateral part of endophallus as in Fig. 87. In larval features, this new species resembles *O. occidens* in general appearance, but is distinguishable from the latter by the abdominal segment 9 not being keeled in sublateral view (Fig. 118).

### *Optioservus variabilis* NOMURA, 1958

(Figs. 23–25, 43–44, 51, 63, 89–92, 110, 119, 123, 127, 131, 133; Table 1)

*Optioservus* (s.str.) *variabilis* NOMURA 1958: 51 (type locality: Tokura, Gunma Pref., Japan; type material: NSMT, examined); SATŌ 1977: 4; SATŌ 1982: 391; SATŌ 1985: 438, pl. 80, figs. 15<sub>1–2</sub>; SATŌ 1992: 182; MORIYA 1997: 3, photo 5; ARAI 2007: 11.

**TYPE MATERIAL:** Holotype ♂ (F<sub>7</sub>, NSMT): “Tokura, Gunma Pref., 17.VIII.1957, Coll. Zen. Naruse”.

#### ADDITIONAL MATERIAL EXAMINED:

**Adults: JAPAN:** IWATE PREF.: 11 exs. (F<sub>3</sub>; CKN, CHM): “Nishi-dake, Jyōbōji-machi, 24.IX.2004, N. Hikida leg.”; 17 exs. (1F<sub>2</sub>, 9F<sub>3</sub>, 2F<sub>6</sub>, 1F<sub>7</sub>; CKN): “Komaga-mine, Jyōbōji-machi, 24.IX.2004, T. Ogata leg.”. AKITA PREF.: 44 exs. (4F<sub>2</sub>, 19F<sub>3</sub>, 12F<sub>6</sub>, 7F<sub>7</sub>; CKN): “Nakajimadai, Nikaho-shi, 16.IX.2007, Y. Kamite leg.”; 32 exs. (4F<sub>2</sub>, 24F<sub>3</sub>, 2F<sub>6</sub>, 2F<sub>7</sub>; CKN): “Mt. Chōkai, Baba, Nikaho-shi, 17.VIII.2008, T. Ikeda leg.”; 9 exs. (4F<sub>3</sub>, 2F<sub>6</sub>, 3F<sub>7</sub>; CKN): “Nishikichōsaimyōji, Senboku-shi, 3.V.2010, T. Ikeda leg.”. YAMAGATA PREF.: 1 ex. (F<sub>7</sub>; CKN): “Doro-sawa, Higashine-shi, 15.IX.2007, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; CKN): “Shidu, Nishikawa-machi, 12.X.2009, Y. Kamite leg.”; 5 exs. (2F<sub>2</sub>, 1F<sub>6</sub>, 2F<sub>7</sub>; CMS): ditto but: “24.Sep.2004, H. Moriya leg.”; 3 exs. (1F<sub>2</sub>, 2F<sub>7</sub>; EUMJ): “R. Ishitobi Gawa, alt. 700m, Nishikawa, 1999.9.12, N. Hikida leg.”; 4 exs. (1F<sub>2</sub>, 1F<sub>3</sub>, 2F<sub>7</sub>; CKN): “Ishipane-gawa, Nishikawa-machi, 23.IX.2004, J. Nakajima leg.”; 11 exs. (3F<sub>2</sub>, 3F<sub>3</sub>, 5F<sub>7</sub>; CKN): ditto but: “12.X.2009, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; CKN): “Ōkoshi-gawa, Nishikawa-machi, 14.IX.2007, Y. Kamite leg.”; 10 exs. (1F<sub>2</sub>, 4F<sub>3</sub>, 2F<sub>6</sub>, 3F<sub>7</sub>; CMS): “Nagano, Kaminoyama-shi, Zao-Line, small streams, 25.Sep.2004, H. Moriya leg.”; 1 ex. (F<sub>3</sub>; EUMJ): “Takizawa, Tsuruoka-shi, 19.VI.1994, S. Sakuragi leg.”. MIYAGI PREF.: 2 exs. (1F<sub>3</sub>, 1F<sub>6</sub>; CMS): “Mogazawa, Shichikasyuku-machi, 1998.6.29, H. Moriya leg.”; 18 exs. (16F<sub>3</sub>, 2F<sub>7</sub>; CMS): “Misumi, Shiroishi-shi, 1998.6.30, H. Moriya leg.”. FUKUSHIMA PREF.: 15 exs. (F<sub>3</sub>; CKN, EUMJ): “OZAWADAIRA, HINOEMATA, MINAMIAIDU-GUN, 1998.7.11, N. HIKIDA leg.”; 9 exs. (4F<sub>3</sub>, 5F<sub>7</sub>; CKN, EUMJ): “R-MIKAWA, NANAIRI, HINOEMATA-MURA, 1998.7.11, N. HIKIDA leg.”; 6 exs. (2F<sub>3</sub>, 1F<sub>6</sub>, 3F<sub>7</sub>; CKN, EUMJ): “Mt. TAKATSUKAYAMA, KAWAUTI-MURA, FUTABA-GUN, 1998.6.20, N. HIKIDA leg.”; 9 exs. (F<sub>3</sub>; CKN, EUMJ): “R-HANAKAWA, alt. 600m, BANDAI-MACHI, YAMA-GUN, 11.X.1997, N. HIKIDA leg.”; 1 ex. (F<sub>3</sub>; CKN): “R-Onogawa, Ohuti, Simogomachi, Minamiaizu, 1999.6.13, N. Hikida Leg.”; 2 exs. (1F<sub>3</sub>, 1F<sub>7</sub>; CKN): “Mt. Azuma, Tsuchiyu, Fukushima-shi, 1997.5.24, S. Ohmomo lg.”. GUNMA PREF.: 4 exs. (1F<sub>2</sub>, 1F<sub>3</sub>, 2F<sub>7</sub>; CKN): “Kofuzan-sawa, Tokura, Katashina-mura, 10.VI.2006, Y. Kamite leg.”; 3 exs. (F<sub>2</sub>; CKN): ditto but: “26.IX.2009, Y. Kamite leg.”; 6 exs. (2F<sub>2</sub>, 2F<sub>6</sub>, 2F<sub>7</sub>; CKN): “Tokura-sawa, Tokura, Katashina-mura, 26.IX.2009, Y. Kamite leg.”; 20 exs. (1F<sub>2</sub>, 3F<sub>6</sub>, 6F<sub>7</sub>; CKN, EMEC, NMW): ditto but: “27.IX.2009, Y. Kamite leg.”; 1 ex. (F<sub>7</sub>; EUMJ): “Tokura, Aug.7.1957, M. Satō”; 7 exs. (1F<sub>2</sub>, 1F<sub>3</sub>, 1F<sub>6</sub>, 4F<sub>7</sub>; CKN, EUMJ): ditto but: “17.VIII.1957, M. Satō”; 62 exs. (3F<sub>2</sub>, 50F<sub>3</sub>, 2F<sub>6</sub>, 7F<sub>7</sub>; CMS): “Fujiwara, Minakami-machi, 1997.7, H. Moriya leg.”; 2 exs. (1F<sub>6</sub>, 1F<sub>7</sub>; EUMJ): “Kuwamoto, Aokura, Shimomita-machi, Ryūsui Trap, 1991.8.31~9.1, leg. Yasuyuki Kōrai”; 1 ex. (F<sub>3</sub>; EUMJ): “Ozegahara, 28–31.VIII.1978, M. Sato leg.”; 1 ex. (F<sub>6</sub>; EUMJ): “Fujimishita, Oze, 22.VII.1987, Y. Notsu leg.”. NIIGATA PREF.: 7 exs. (1F<sub>2</sub>, 5F<sub>3</sub>, 1F<sub>7</sub>; CMS): “Ohtashinden, Tsunan, small stream, 16.V.1993, H. Moriya leg.”. TOKYO: 8 exs. (F<sub>2</sub>; CKN): “Nippara-keikoku, Okutama-machi, 2.IX.2007, Y. Kamite leg.”. KANAGAWA PREF.: 2 exs. (F<sub>7</sub>; CKN): “Sukumo-gawa, Hakone-machi, 27.V.2006, M. Kishi leg.”. YAMANASHI PREF.: 7 exs. (4F<sub>2</sub>, 2F<sub>3</sub>, 1F<sub>7</sub>; CKN): “Kanayama-sawa Cr., Sutama-cho, Hokuto-shi, N 35°52.15', E 138°34.77', 1.VIII.2006, alt. 1390m, Yusuke MINOSHIMA leg.”; 4 exs. (1F<sub>2</sub>, 1F<sub>6</sub>, 2F<sub>7</sub>; CKN): “Kanayama-sawa, Sutama-chō, Hokuto-shi, 2. Aug. 2006, Y. Iwata leg.”; 1 ex. (F<sub>7</sub>; CKN): ditto but: “3. Aug. 2006, Y. Iwata leg.”; 4 exs. (1F<sub>6</sub>, 3F<sub>7</sub>; CKN): “Dōshi-gawa-shiryū, Dōshi-mura, Minamitsuru-gun, 28.I.2008, I. Ōshio leg.”; 1 ex. (F<sub>2</sub>; CKN): “Sannose, Enzan-shi, 15.XII.2003, T. Ogata leg.”; 10 exs. (1F<sub>1</sub>, 1F<sub>2</sub>, 2F<sub>3</sub>, 1F<sub>6</sub>, 5F<sub>7</sub>;

CMS): “Enzan, Kosyu-shi, 17.Mar.2007, H. Moriya leg.”; 10 exs. (7F<sub>2</sub>, 2F<sub>3</sub>, 1F<sub>7</sub>; CMS): “Ichinose, Enzan-shi, Nakajima-gawa, 1994.10.15, Col. Hirofumi Moriya”; 12 exs. (8F<sub>2</sub>, 1F<sub>3</sub>, 3F<sub>7</sub>; CMS): “Ichinose, Enzan-shi, Small stream, 1994.10.15, Col. Hirofumi Moriya”; 11 exs. (4F<sub>2</sub>, 6F<sub>3</sub>, 1F<sub>7</sub>; CMS): ditto but: “1996.6.24, Col. Hirofumi Moriya”; 7 exs. (2F<sub>6</sub>, 5F<sub>7</sub>; EUMJ): “Komotsurushi-yama, Doushi-cho, 6.XII.1998, H. Yoshitomi leg.”. SAITAMA PREF.: 3 exs. (1F<sub>6</sub>, 2F<sub>7</sub>; CKN): “Onouchizawa, Ogano-machi, 30.Aug.2007, Yasuyuki IWATA leg.”; 6 exs. (1F<sub>3</sub>, 1F<sub>6</sub>, 4F<sub>7</sub>; CKN): “Nakatsugawa-keikoku, Ōtaki, Chichibu-shi, 24.VIII.2006, K. Arai leg.”; 2 exs. (F<sub>7</sub>; CKN): “Tenmokusan-rindo, Urayama, Chichibu-shi, 25. Sep. 2007, Y. Iwata leg.”; 1 ex. (F<sub>7</sub>; CKN): “Mameyakisawa, Chichibu-shi, 17–18.IX.2005, H. Yokoi leg.”. SHIZUOKA PREF.: 10 exs. (1F<sub>2</sub>, 9F<sub>7</sub>; CKN): “Abe-tōge, Umegashima, Shizuoka-shi, 30.VII.1999, Y. Tahira leg.”; 20 exs. (2F<sub>2</sub>, 18F<sub>7</sub>; CKN): ditto but: “26.VI.2005, Y. Tahira leg.”; 12 exs. (1F<sub>2</sub>, 4F<sub>7</sub>; CKN): ditto but: “Y. Kamite leg.”; 13 exs. (4F<sub>2</sub>, 9F<sub>7</sub>; CKN): “Umegashima, Shizuoka-shi, 18.X.2008, I. Ōshio leg.”; 7 exs. (F<sub>6</sub>; CKN): “Inokashira-yūsuī, Inokashira, Fujinomiya-shi, 11.XI.2001, Y. Tahira leg.”; 32 exs. (1F<sub>2</sub>, 8F<sub>3</sub>, 9F<sub>6</sub>, 3F<sub>7</sub>; CKN): ditto but: “26.VI.2005, Y. Kamite leg.”; 2 exs. (1F<sub>3</sub>, 1F<sub>7</sub>; CKN): “28.IX.2000, KANTEN R. Mt. AMAGI, Leg. K. Hirai”; 3 exs. (2F<sub>7</sub>; CKN): “Sasayama, Shizuoka-shi, 1300m, 26–VIII–2006, Masato MORI Leg.”. NAGANO PREF.: 2 exs. (F<sub>7</sub>; CKN): “Tobira, Matsumoto-shi, 4.V.2010, Y. Kamite leg.”; 11 exs. (F<sub>7</sub>; CKN): “Shirabiso, Kamimura, Iida-shi, 3.X.2010, Y. Kamite leg.”; 4 exs. (3F<sub>2</sub>, 1F<sub>3</sub>; EUMJ): “Mt. Nyugasayama, 16.Aug.1978, H. Yamada”; 4 exs. (3F<sub>7</sub>; EUMJ): “Higashi-dani, Hase-mura, Ina, 22.IX.1978, H. Yamada”; 17 exs. (1F<sub>2</sub>, 16F<sub>7</sub>; EUMJ): “Shiokawa, Ohshika-mura, 26.IX.1995, H. Yoshitomi leg.”. Gifu PREF.: 1 ex. (F<sub>7</sub>; EUMJ): “Mt. Enasan, 29.IV.1979, M. Satō”; 14 exs. (1F<sub>2</sub>, 3F<sub>6</sub>, 10F<sub>7</sub>; CKN): “Keyakidaira, Nakatsugawa-shi, 6.IX.2009, Y. Kamite leg.”.

**Larvae:** JAPAN: YAMAGATA PREF.: 2 immature larvae (CKN): “Ōkoshi-gawa, Nishikawa-machi, 14.IX.2007, Y. Kamite leg.”; 25 mature larvae (CKN): “Ishipane-gawa, Nishikawa-machi, 12.X.2009, Y. Kamite leg.”. SHIZUOKA PREF.: 26 immature larvae (CKN): “Inokashira-yūsuī, Inokashira, Fujinomiya-shi, 26.VI.2005, Y. Kamite leg.”.

**DESCRIPTION:** **Adult:** TL/EW 2.14–2.27 (2.21). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tibiae and tarsi paler. Color patterns of elytra: F<sub>2</sub>, F<sub>3</sub>, F<sub>6</sub> or F<sub>7</sub>; humeral yellowish patches at about basal 1/2 to 1/6, extend to 1<sup>st</sup> stria or reach to the suture in F<sub>3</sub>, sometimes not extend to 1<sup>st</sup> stria in F<sub>6</sub>.

Head almost flat on dorsal surface, sparsely granulate and densely pubescent. Eyes moderate in size; the distance between eyes about 1.24 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.2 : 2.0 : 1.7 : 1.0 : 1.0 : 1.0 : 1.1 : 1.0 : 1.5 : 1.6 : 3.2. Clypeus transverse, about 2.35 times as wide as long. Labrum transverse, about 1.70 times as wide as long.

Pronotum transverse (Fig. 51), slightly convex; lateral part moderately granulate; with shallow or without median longitudinal impression; without prescutellar pits; antero-lateral corners moderately or weakly produced anteriad. PW/PL 1.18–1.33 (1.27); sublateral carinae 0.27–0.35 (n = 10, 0.31) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin clearly serrate; intervals less rugose, slightly convex; punctate striae shallow or oblique; striae punctures of each stria somewhat large and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> (Fig. 63); EL/EW 1.53–1.66 (1.61); EL/PL 2.54–2.86 (2.65); EW/PW 1.23–1.40 (1.31).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 89–91; phallobase squamous at lateral and ventral surfaces; penis about 1.67 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 90); parameres slender, about 0.64 times as long as penis; lateral part of endophallus as in Fig. 91.

Ovipositor as in Fig. 92; coxite about 6.92 times as long as stylus; valvifer about 13.00 times as long as stylus.

MEASUREMENTS: MF ( $n = 10$ ): TL 2.73–3.04 (2.86) mm; PL 0.73–0.83 (0.78) mm; PW 0.93–1.07 (0.99) mm; EL 1.96–2.21 (2.08) mm; EW 1.22–1.42 (1.30) mm.

DESCRIPTION: **Larva:** Body cylindrical; TL/BW 7.28–7.83 (7.54). Color dark brown or brown, antennae, mouth parts and legs somewhat paler. Head about 1.09 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 110) widely falciform, 1.58 times as long as wide. Labrum about 1.72 times as wide as long. Pronotum slightly wider than long; PW/PL 1.25–1.35 (1.32), not humped in dorsal view. Abdominal segments 1–5 not humped and 6–8 slightly humped in dorsal view; abdominal segment 9 slightly keeled in sublateral view (Fig. 119).

MEASUREMENTS ( $n = 3$ ): TL 6.58–6.83 (6.73) mm; HW 0.43–0.44 (0.44) mm; PL 0.62–0.63 (0.63) mm; PW 0.79–0.85 (0.83) mm; BW 0.84–0.93 (0.89) mm.

DISTRIBUTION: Japan (Honshû).

BIOLOGICAL NOTES: The distribution of this species is similar to that of *O. maculatus*, but it is more widely distributed in the Chûbu District. The main habitat of this species is found in the upper reaches of rivers where they are abundant on small rocks and in the gravel of riffles.

DIFFERENTIAL DIAGNOSIS: In adult features, this species resembles *O. occidens* in general appearance, but is distinguishable from the latter by the following characteristics: body large; lateral margin of elytra clearly serrate; all tibiae reddish brown. In larval features, this species resembles *O. maculatus* in general appearance, but is distinguishable from the latter by the large body and head.

### *Optioservus yoshitomii* sp.n.

(Figs. 26–28, 45–46, 52, 60, 64, 93–96, 111, 120, 124, 128, 132–133; Table 1)

*Optioservus maculatus* NOMURA 1958: 50 (part of paratypes: Uriki [correct: Urugi] pass, Nagano Pref., Japan; type material: NSMT, examined); YOSHITOMI et al. 1999: 102, photo 3E; AKIYAMA 2005: 209, pl. 2, fig. 5; HAYASHI & SHIMADA 2006: 133, fig. 6K; HAYASHI 2007: 94; HAYASHI & KADOWAKI 2007: 164; YOSHIOKA 2007: 243, fig. 17L; YOSHIOKA 2008: 229; AKIYAMA 2008: 115; HAYASHI & KADOWAKI 2008a: 282; HAYASHI & KADOWAKI 2008b: 300; YAMAJI 2008: 8, fig. 17; HAYASHI 2009: 241; HAYASHI & KADOWAKI 2010: 176; HAYASHI et al. 2010: 203; HAYASHI & KADOWAKI 2011: 122; HAYASHI 2011: 104, fig. 47H; FUJIWARA 2012: 1–9.

TYPE MATERIAL: JAPAN: Holotype ♂ (F<sub>3</sub>; EUMJ): “Mitsukue-bashi, Funatani-gawa, Daisen, Tottori Pref., 26.XII.2007, H. Kadowaki leg.”. Paratypes 39 exs. (F<sub>3</sub>; CKN, EMEC, HOWP, NMW): same data as for the holotype. GUNMA PREF.: 6 exs. (F<sub>3</sub>; CKN): “Ôsawa-gawa, Harunagô-no-kitagawa, Matsunosawa, Misato-machi, Takasaki-shi, 2.I.2008, Masakazu Hayashi”; 12 exs. (F<sub>3</sub>; CKN): ditto but: “6.ix.2008, M. HAYASHI LEG.”. NAGANO PREF.: 2 exs.: “Uriki [correct: Urugi] pass, Nagano Pref., 25.VIII.1958, M. Satô & Z. Naruse leg. (Paratypes of *O. maculatus*)”; 5 exs. (F<sub>3</sub>; EUMJ): ditto but: “25.VIII.1958, M. Satô leg.”; 1 ex. (F<sub>3</sub>; CKN): “Urugitôge, Neba-mura, 24.V.2003, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Sachizawa-gawa, Kiso-machi, 12.VII.2008, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): “Sachizawa-gawa-shiryû, Kiso-machi, 28.VII.2007, Y. Kamite leg.”; 3 exs. (F<sub>3</sub>; CKN): ditto but: “29.VII.2007, Y. Kamite leg.”; 2 exs. (F<sub>3</sub>; CKN): ditto but: “12.VII.2008, Y. Kamite & T. Ikeda leg.”; 2 exs. (F<sub>3</sub>; CKN): “Karasawa-no-taki, Kiso-machi, 29.VII.2007, Y. Kamite leg.”; 4 exs. (F<sub>3</sub>; CKN): “Jizôtôge, Kiso-machi, 12.VII.2008, Y. Kamite leg.”; 9 exs. (F<sub>3</sub>; CKN): “Ôdaira, Iida-shi, 15.V.2010, Y. Kamite leg.”; 9 exs. (F<sub>3</sub>; CMS): “Ashino, Minowa-machi, 7.May.1997, H. Moriya leg.”; 2 exs. (F<sub>3</sub>; EUMJ): “Nebagawa, 24–IIX (IX?)–1958, M. Satô leg.”. AICHI PREF.: 4 exs. (F<sub>3</sub>; CKN): “Inahashi, Shitara-chô, 29.V.2005, Y. Kamite leg.”; 7 exs. (3F<sub>3</sub>; CKN): ditto but: “6.VIII.2006, Y. Kamite leg.”; 8 exs. (F<sub>3</sub>; CKN): ditto but: “5.VII.2008, Y. Kamite leg.”; 2 exs. (F<sub>3</sub>; CKN): “Noiri-gawa, Noiri, Toyota-shi, 5.VII.2008, Y. Kamite & T. Ikeda leg.”; 1 ex. (F<sub>3</sub>; CKN): “Yahagi-gawa, Kamigô, Toyota-shi, 5.VII.2008, Y. Kamite leg.”; 6 exs. (F<sub>3</sub>; EUMJ): “Mennoki-tôge, 5.V.1983, M. Satô leg.”; 4 exs. (F<sub>3</sub>; CMS): “Nakatô, Inabu-chô, 1997.10.10, H. Moriya leg.”; 20 exs. (F<sub>3</sub>; CMS): “Yahagi-gawa, Komagahara, Kuroda, Shitara-chô, Kitashitara-gun, 2001.8.6, Hirofumi Moriya leg.”; 1 ex. (F<sub>3</sub>; EUMJ): “Akazugawa (riv.), Seto-shi, 6.II.1994, H. Yoshitomi leg.”; 1 ex. (F<sub>3</sub>; EUMJ): “Ôtaga, Higashikamo-gun, 9.VII.1953, K. KAMIYA”; 1 ex. (F<sub>3</sub>; EUMJ): “Nagara River, 25.VIII.1958, Coll. Zen. Naruse”; 1 ex. (F<sub>3</sub>; EUMJ): “Toyokawa, VII.1978, H. Yamada”. GIFU PREF.: 15 exs. (F<sub>3</sub>; CKN): “Yamanomura, Kamioka-chô, Hida-shi, 30.IV.2005, Y. Kamite leg.”; 8 exs. (F<sub>3</sub>; CKN): ditto but: “31.VII.2005, Y. Kamite leg.”; 23 exs. (21F<sub>3</sub>; CKN): “Sugô-tôge,

Kamioka-chô, Hida-shi, 29.IV.2007, Y. Kamite leg.”; 120 exs. (119F<sub>3</sub>, 1F<sub>5</sub>; CKN): ditto but: “2.V.2009, Y. Kamite leg.”; 5 exs. (F<sub>3</sub>; CMS): “Mano, Kamiyahagi-chô, 1997.10.10, H. Moriya leg.”; 10 exs. (F<sub>3</sub>; CMS): “Sasahara, Kamiyahagi-chô, 1998.10.10, H. Moriya leg.”; 12 exs. (F<sub>3</sub>; CMS): “Nakasawa, Kushihara-mura, 1999.10.2, H. Moriya leg.”. **TOYAMA PREF.**: 12 exs. (F<sub>3</sub>; CKN): “Yatsuomachitochiori, Toyama-shi, 21.IX.2009, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; NMW): “Yatsuomachitochiori, Toyama-shi, ca. 26 km S Toyama, 36°30'43.14"N, 137°03'42.58"E, 425 m a.s.l., 19.IX.2013, leg. M.A. Jäch (12)”. **MIE PREF.**: 1 ex. (F<sub>3</sub>; EUMJ): “Ohtokodani, Ise, 9-IV-1976, T. Ohkawa”. **KYOTO PREF.**: 1 ex. (F<sub>3</sub>; EUMJ): “Kitashirakawa, 8-III-1983, H. Yamada leg.”. **NARA PREF.**: 9 exs. (F<sub>3</sub>; CMS): “Midu, Yoshino-chô, 1997.9.3, H. Moriya leg.”. **OSAKA PREF.**: 5 exs. (F<sub>3</sub>; CKN): “Kongô-san, Chihayaakasaka-mura, 700m, 16-Aug-06, Masato MORI Leg.”; 2 exs. (F<sub>3</sub>; CKN): “around ropeway-eki, Kongô-san, Chihayaakasaka-mura, 31.xii.2007, Masakazu Hayashi”. **TOTTORI PREF.**: 24 exs. (23F<sub>3</sub>; CKN): “Funatani-gawa, Mitsukue, Kôfû-chô, 16.IX.2003, T. Ogata leg.”; 4 exs. (F<sub>3</sub>; CKN): “Ebi, Kôfû-chô, 19.IX.2006, Y. Kamite leg.”; 1 ex. (F<sub>3</sub>; CKN): ditto but: “S. Ôta leg.”; 25 exs. (F<sub>3</sub>; CKN): “Ônarubara, Kôfû-chô, 19.IX.2006, Y. Kamite leg.”; 16 exs. (F<sub>3</sub>; CKN): ditto but: “S. Ôta leg.”; 7 exs. (F<sub>3</sub>; CKN): “Funatani-gawa, Ônarubara, Kôfû-chô, 700m, 24-IX-2006, Masato MORI Leg.”; 11 exs. (F<sub>3</sub>; CKN): “Ôtaki, Houki-chô, 18.XII.2007, J. Fujiwara leg.”; 10 exs. (F<sub>3</sub>; CKN): ditto but: “19.I.2008, J. Fujiwara leg.”; 6 exs. (F<sub>3</sub>; CKN): “Kidani-sawa, Funatani-gawa, Daisen, 26.XII.2007, H. Kadawaki leg.”; 2 exs. (F<sub>3</sub>; CKN): “Mikuni-yama-hokuroku, Wakasugi, Nichinan-chô, 18.ix.2009, M. HAYASHI LEG.”; 72 exs. (65F<sub>3</sub>, 7F<sub>5</sub>; CKN): “Inadumi-yama-tozando, Yukuwa-gawa-siryu, Okuyudani, Nichinan-cho, alt.860m, 15.XI.2009, H. KADOWAKI LEG.”. **OKAYAMA PREF.**: 15 exs. (11F<sub>3</sub>; CKN): “Myôren-gawa, Hiruzen, Maniwa-shi, 18.IX.2006, Y. Kamite leg.”; 2 exs. (F<sub>3</sub>; CKN): ditto but: “S. Ôta leg.”; 2 exs. (F<sub>3</sub>; CKN): “Hiruzen, Maniwa-shi, 28.VIII.2010, H. Fujimoto leg.”; 2 exs. (F<sub>3</sub>; CKN): “Myôren-keikoku, Maniwa-shi, 28.IV.2007, Kazunari Nakano leg.”; 2 exs. (F<sub>3</sub>; CKN): “Wakasugi-keikoku, Nishiwakura-son, 5.X.2003, Osamu Yamaji leg.”; 1 ex. (F<sub>3</sub>; CKN): “Okutsu-gawa-keikoku, Kamo-chô, 1.VI.2003, Osamu Yamaji leg.”. **SHIMANE PREF.**: 3 exs. (F<sub>3</sub>; CKN, HOWP): “Hii-gawa-genryû, Sentsû-zan-tozanguchi, 8.IX.2006, M. Hayashi leg.”. **HIROSHIMA PREF.**: 2 exs. (F<sub>3</sub>; CKN): “Kannose-gawa-shiryû, Sunagahara, Takano-chô, Syôbara-shi, 25-IX-2006, Masato MORI Leg.”.

#### ADDITIONAL MATERIAL EXAMINED:

**Larvae: JAPAN: YAMANASHI PREF.**: 4 immature larvae (CKN): “Hara, Sudama-chô, 15.XII.2003, T. Ogata leg.”.

**NAGANO PREF.**: 9 immature larvae (CKN): “Ôdaira, Iida-shi, 15.V.2010, Y. Kamite leg.”. **AICHI PREF.**: 8 immature larvae (CKN): “Inahashi, Shitara-chô, 29.V.2005, Y. Kamite leg.”. **GIFU PREF.**: 97 immature larvae (CKN): “Yamanomura, Kamioka-chô, Hida-shi, 30.IV.2005, Y. Kamite leg.”; 34 immature larvae (CKN): “Sugô-tôge, Kamioka-chô, Hida-shi, 2.V.2009, Y. Kamite leg.”. **TOTTORI PREF.**: 2 immature larvae (CKN): “Ebi, Kôfû-chô, 19.IX.2006, Y. Kamite leg.”; 3 mature larvae and 15 immature larvae (CKN): “Iwatake, Houki-chô, N 35°21.43', E 133°28.49', 9.I.2009, alt 380m, LEG. J. FUJIWARA”; 10 mature larvae (CKN): ditto but: “14.II.2009, LEG. J. FUJIWARA”.

**DESCRIPTION: Adult:** TL/EW 2.02–2.12 (2.08). Coloration of body black, but ventral surface, antennae, mouth parts and legs reddish brown to blackish brown; antennomeres 1–8, tarsi paler. Color patterns of elytra: F<sub>3</sub> or F<sub>5</sub>; humeral yellowish patches relatively small, at about basal 1/3 to 1/5, not extend to 1<sup>st</sup> stria in F<sub>3</sub> (Fig. 26).

Head almost flat on dorsal surface, densely granulate and pubescent. Eyes moderate in size; the distance between eyes about 1.23 times as long as the maximum diameter of an eye. Antennae with dense setae at antero-lateral corners of antennomeres 9 and 10 and apical part of antennomere 11; approximate ratio of each antennomere as 2.7 : 2.4 : 1.9 : 1.0 : 1.0 : 1.0 : 1.0 : 1.7 : 1.7 : 3.6. Clypeus transverse, about 2.81 times as wide as long. Labrum transverse, about 1.84 times as wide as long.

Pronotum transverse (Fig. 52), slightly convex; lateral part moderately granulate; with deep median longitudinal impression; without prescutellar pits; antero-lateral corners moderately produced anteriad. PW/PL 1.33–1.42 (1.37); sublateral carinae 0.28–0.34 (n = 10, 0.31) times as long as PL.

Elytra elongate oval; moderately convex; lateral margin weakly serrate; intervals less rugose, slightly convex; punctate striae shallow; striae punctures of each stria relatively small and deep; basal part of 4<sup>th</sup> interval wider than 3<sup>rd</sup> (Fig. 64); EL/EW 1.42–1.52 (1.48); EL/PL 2.37–2.65 (2.49); EW/PW 1.20–1.26 (1.22).

Prosternal process narrowing posteriorly and broadly rounded at apex. Anterior part of mesoventral groove relatively narrow. Abdominal ventrite 5 clearly granulate in male, medial part somewhat weakly granulate in female; apex slightly emarginated and with spinulate setae.

Aedeagus as in Figs. 93–95; phallobase squamous at lateral and ventral surfaces; penis about 1.77 times as long as phallobase, dilated at base, gradually narrowed and apical part somewhat pointed, curved ventrad in lateral view (Fig. 94); parameres slender, about 0.63 times as long as penis; lateral part of endophallus as in Fig. 95.

Ovipositor as in Fig. 96; coxite about 7.46 times as long as stylus; valvifer about 11.54 times as long as stylus.

MEASUREMENTS: MF (n = 10): TL 2.30–2.53 (2.41) mm; PL 0.66–0.73 (0.69) mm; PW 0.89–1.02 (0.95) mm; EL 1.63–1.80 (1.72) mm; EW 1.10–1.23 (1.16) mm.

DESCRIPTION: **Larva:** Body cylindrical; TL/BW 6.85–7.14 (7.00). Color dark brown, antennae, mouth parts and legs somewhat paler. Head about 1.11 times as wide as long; dorsal surface with widely spaced setiferous tubercles; each tubercle relatively large. Mandible (Fig. 111) falciform, 1.78 times as long as wide. Labrum about 1.73 times as wide as long. Pronotum slightly wider than long; PW/PL 1.30–1.42 (1.35), not humped in dorsal view. Abdomen not humped in dorsal view; abdominal segment 9 not keeled in sublateral view (Fig. 120).

MEASUREMENTS (n = 5): TL 5.41–5.51 (5.46) mm; HW 0.39–0.40 (0.39) mm; PL 0.53–0.55 (0.54) mm; PW 0.69–0.75 (0.72) mm; BW 0.76–0.79 (0.78) mm.

DISTRIBUTION: Japan (Honshû).

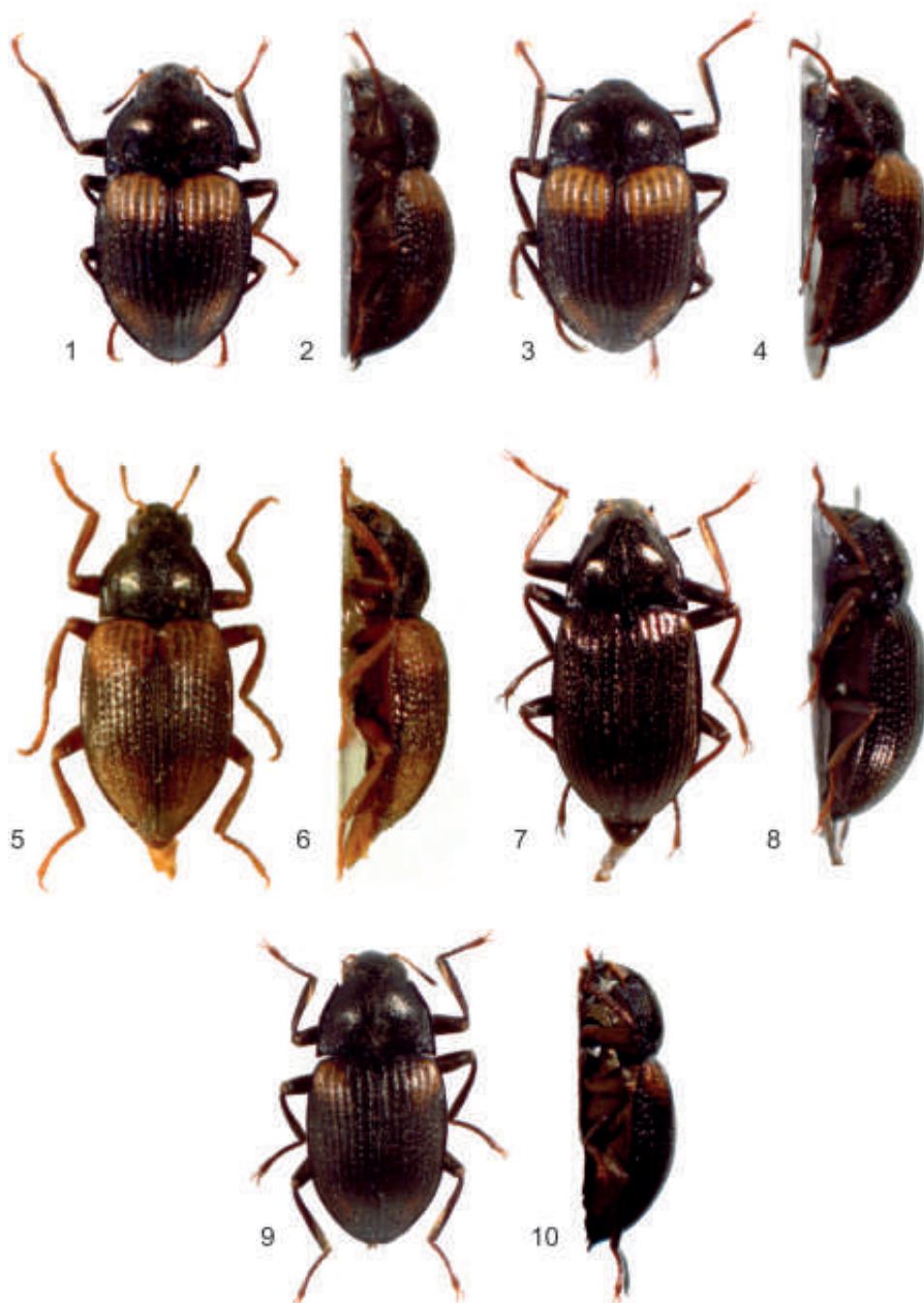
BIOLOGICAL NOTES: This is a relatively rare species in the western part of Honshû. The populations from Kantô and Chûbu Districts are always found in the upper reaches of the rivers, but the population of San'in District is widely distributed lower to upper reaches. This species prefers sandy substrates. FUJIWARA (2012) described the life history of specimens from the southwestern area of Mt. Daisen, Tottori Prefecture, under the name of *O. maculatus*.

ETYMOLOGY: The specific name is dedicated to Dr. Hiroyuki Yoshitomi who offered the collection of EUMJ and helped in many ways.

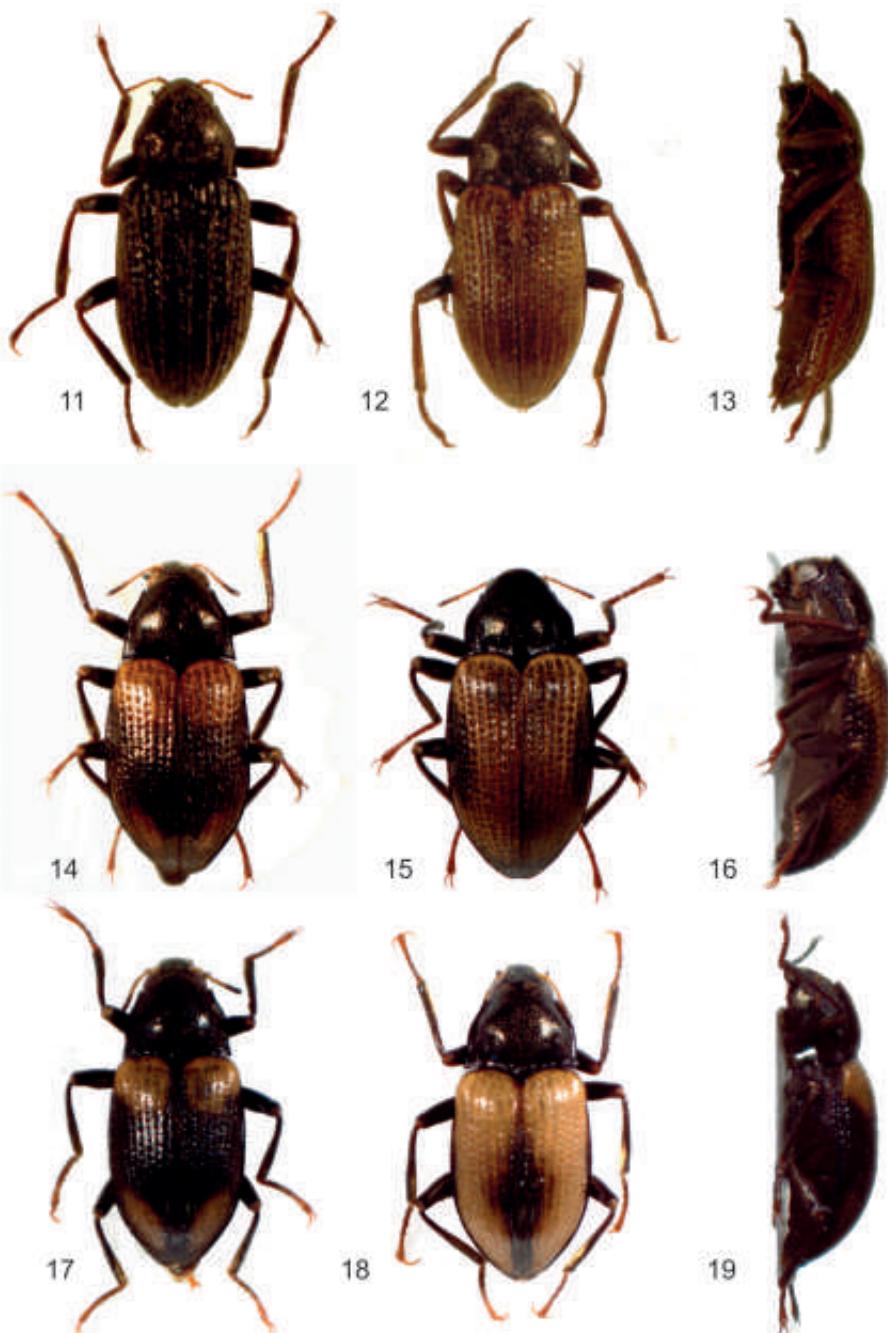
DIFFERENTIAL DIAGNOSIS: This new species resembles *O. sakaii* in general appearance, but is distinguishable from the latter by the following characteristics: [adult] body large; intervals of elytra less rugose (Fig. 64); [larva] head large; mandible falciform (Fig. 111).

### Acknowledgements

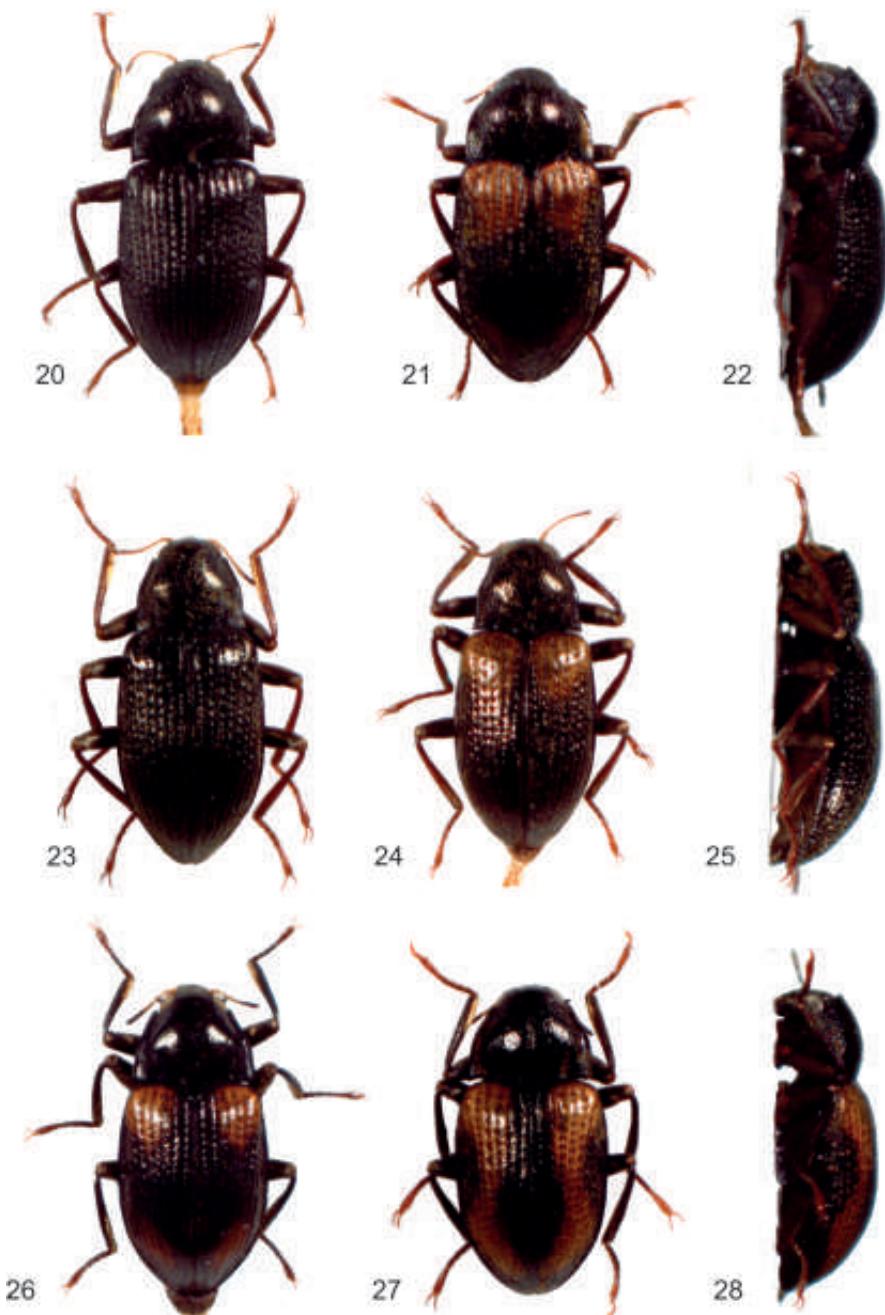
I wish to express my sincere gratitude to Dr. Masahiro Sakai (Tôon, Japan) and Dr. Hiroyuki Yoshitomi (EUMJ) for their continuous encouragement. I would also like to acknowledge the late Dr. Masataka Satô, the late Mr. Takeshi Ogata and Dr. Masakazu Hayashi (HOWP), and Dr. Manfred A. Jäch (NMW) for lending or offering specimens and providing many useful comments. Thanks are also due to Dr. Masahiro Sakai, Dr. William D. Shepard (EMEC) and Dr. Hiroyuki Yoshitomi, for reading an early draft of this paper. I would like to express my indebtedness to the following persons for their help in various ways: Mr. Yoshifumi Akiyama, Mr. Kôji Arai, Mrs. Shihô Arai, Mr. Mamoru Chachin, Mr. Toshiaki Dejima, Mr. Hirofumi Fujimoto, Mr. Jun'ichi Fujiwara, Mr. Naoyuki Hikida, Mr. Yoshihiro Hori, Mr. Toshiya Ikeda, Mr. Noriaki Inahata, Mr. Yasuyuki Iwata, Mr. Hisashi Kadokawa, Mr. Kyoichi Kinomura, Dr. Tadashi Kitano, Dr. Takashi Kurihara, Dr. Munetoshi Maruyama, Dr. Yûsuke Minoshima, Mr. Masato Mori, Mr. Hirofumi Moriya, Dr. Jun Nakajima, Dr. Shûhei Nomura, Mr. Naofumi Ogawa, Mr. Ichirô Ôshio, Mr. Sang Woo Jung, Mr. Kôichi Satô, Mr. Takashi Shimada, Mr. Yoshiaki Tahira, Mr. Osamu Yamaji and Mr. Hiroaki Yokoi. Finally, my heartily thanks are due to my wife, Nami Kamite, who has continuously supported my field work in Japan.



Figs. 1–10: Habitus of *Optioservus maculatus* species group (adults); 1–4) *O. hagai*; 1–2) BF; 1) dorsal view ( $F_3$ ); 2) lateral view; 3–4) MF; 3) dorsal view ( $F_3$ ); 4) lateral view; 5–6) *O. gapyeongensis*; 5) dorsal view ( $F_3$ ); 6) lateral view; 7–8) *O. masakazui*; 7) dorsal view ( $F_7$ ); 8) lateral view; 9–10) *O. sakaii*; 9) dorsal view ( $F_3$ ); 10) lateral view.



Figs. 11–19: Habitus of *Optioservus maculatus* species group (adults); 11–13) *O. inahatai*; 11) dorsal view ( $F_7$ ); 12) dorsal view ( $F_1$ ); 13) lateral view; 14–16) *O. maculatus*; 14) dorsal view ( $F_3$ ); 15) dorsal view ( $F_1$ ); 16) lateral view; 17–19) *O. occidens*; 17) dorsal view ( $F_3$ ); 18) dorsal view ( $F_2$ ); 19) lateral view.



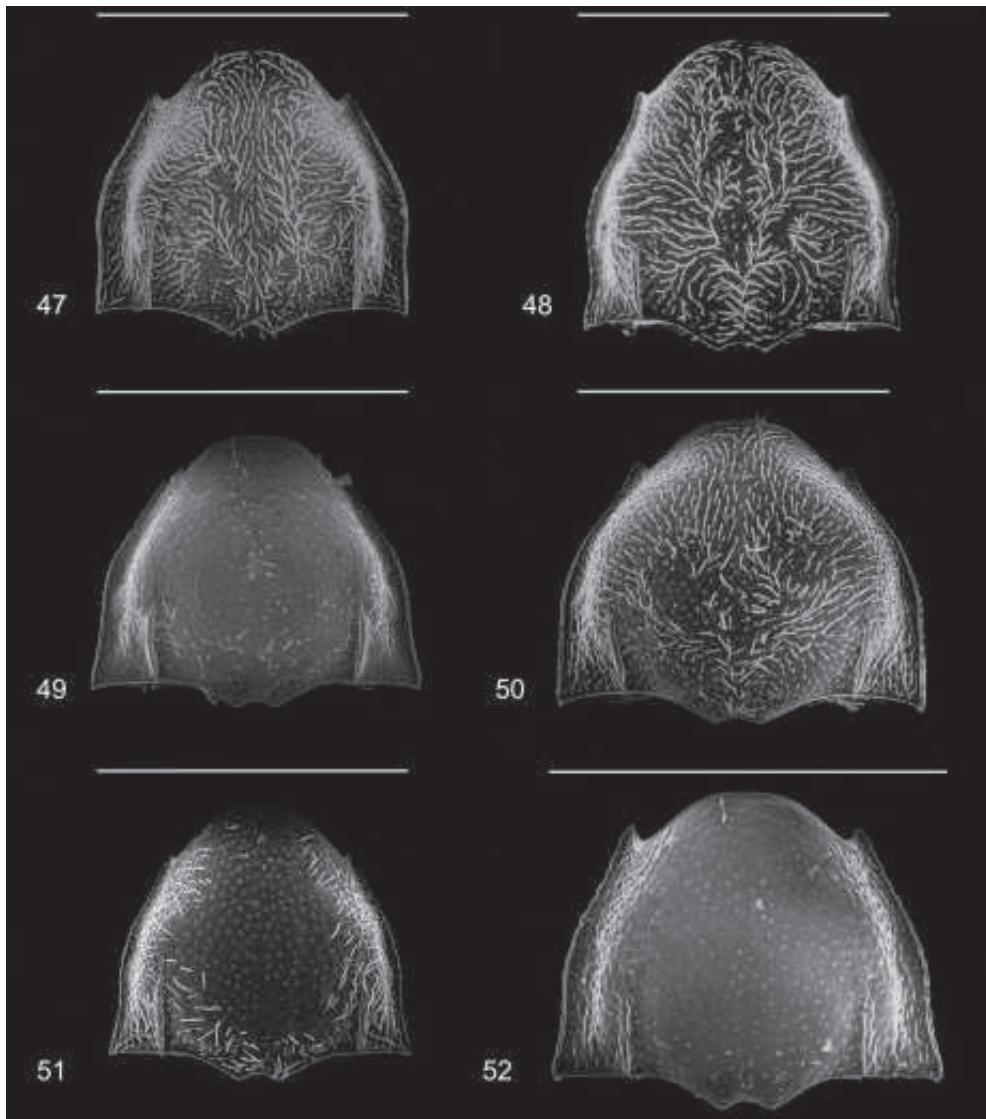
Figs. 20–28: Habitus of *Optioservus maculatus* species group (adults); 20–22) *O. ogatai*; 20) dorsal view ( $F_7$ ); 21) dorsal view ( $F_3$ ); 22) lateral view; 23–25) *O. variabilis*; 23) dorsal view ( $F_7$ ); 24) dorsal view ( $F_6$ ); 25) lateral view; 26–28) *O. yoshitomii*; 26) dorsal view ( $F_3$ ); 27) dorsal view ( $F_5$ ); 28) lateral view.



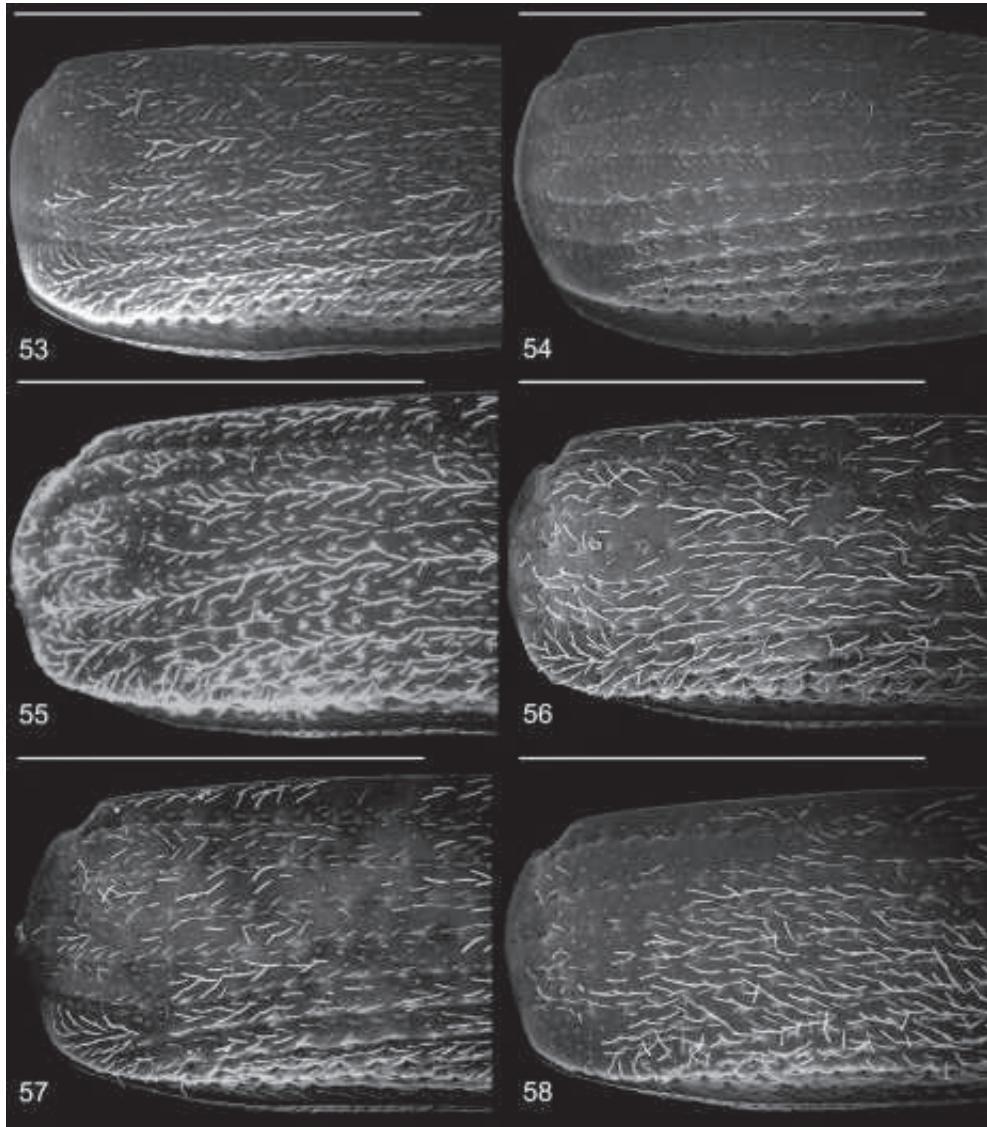
Figs. 29–38: Habitus of *Optioservus maculatus* species group (larvae); 29–30) *O. gappyeongensis*; 29) dorsal view; 30) lateral view; 31–32) *O. hagai*; 31) dorsal view; 32) lateral view; 33–34) *O. maculatus*; 33) dorsal view; 34) lateral view; 35–36) *O. masakazui*; 35) dorsal view; 36) lateral view; 37–38) *O. occidens*; 37) dorsal view; 38) lateral view.



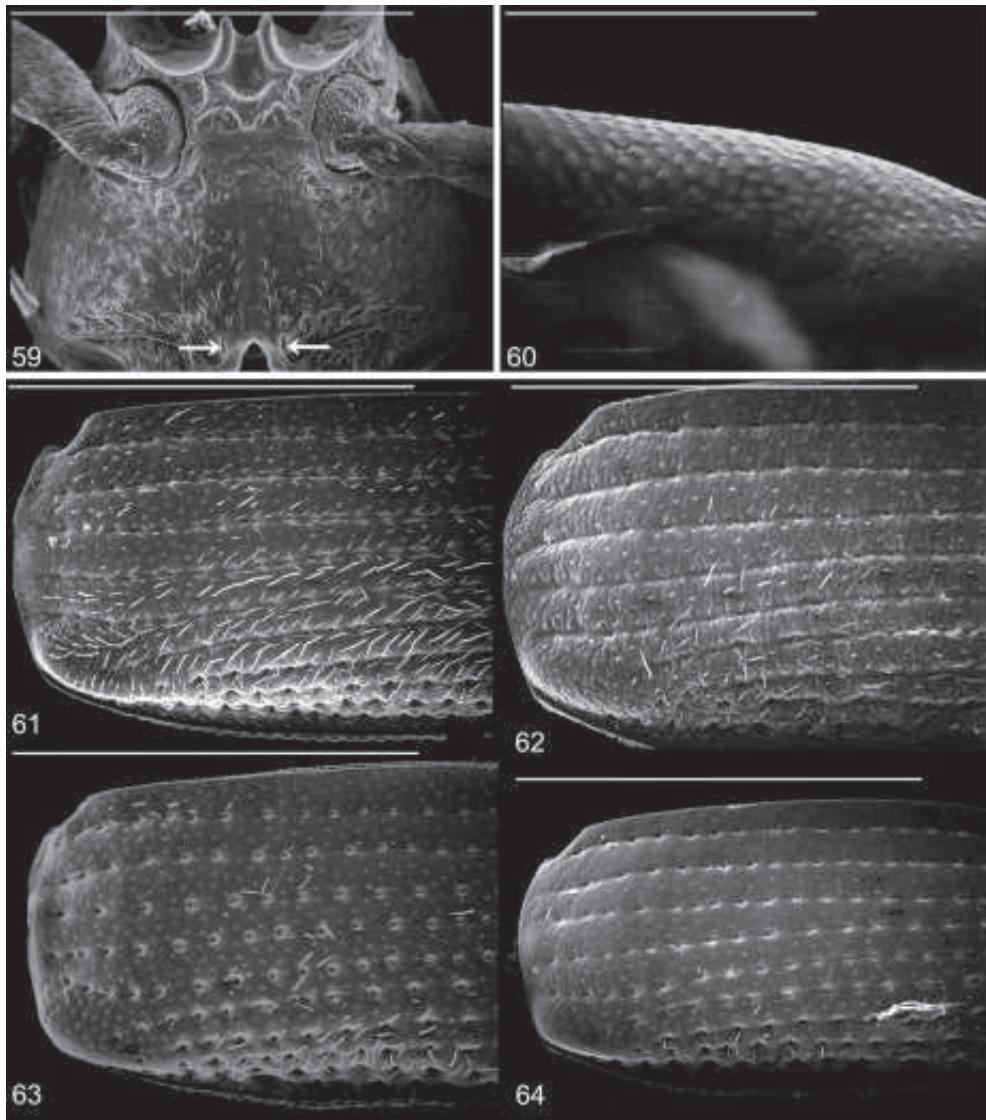
Figs. 39–46: Habitus of *Optioservus maculatus* species group (larvae); 39–40) *O. ogatai*; 39) dorsal view; 40) lateral view; 41–42) *O. sakaii*; 41) dorsal view; 42) lateral view; 43–44) *O. variabilis*; 43) dorsal view; 44) lateral view; 45–46) *O. yoshitomii*; 45) dorsal view; 46) lateral view.



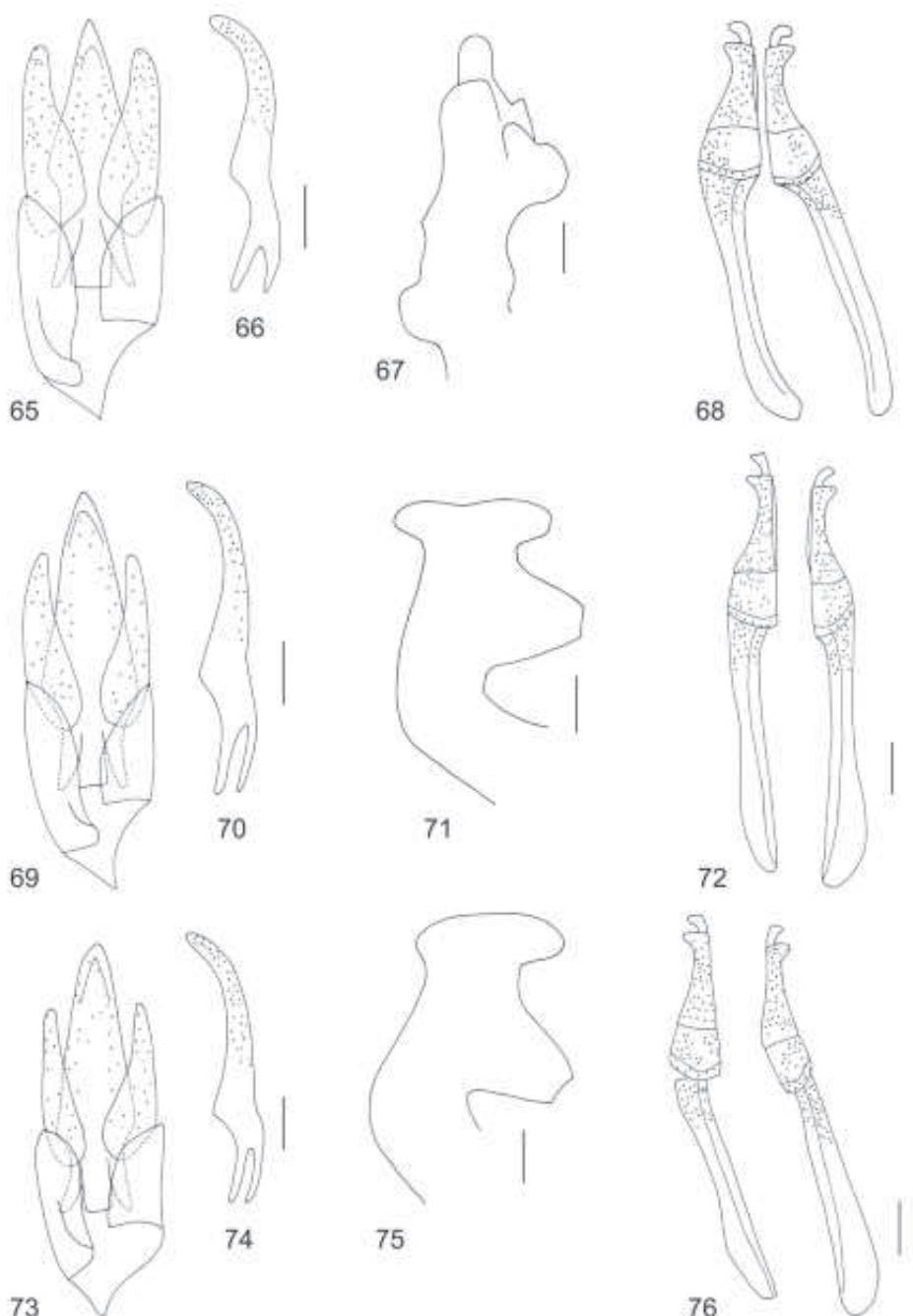
Figs. 47–52: Pronotum (adults); 47) *Optioservus gapyeongensis*; 48) *O. inahatai*; 49) *O. masakazui*; 50) *O. ogatai*; 51) *O. variabilis*; 52) *O. yoshitomii*. Scales: 1.0 mm.



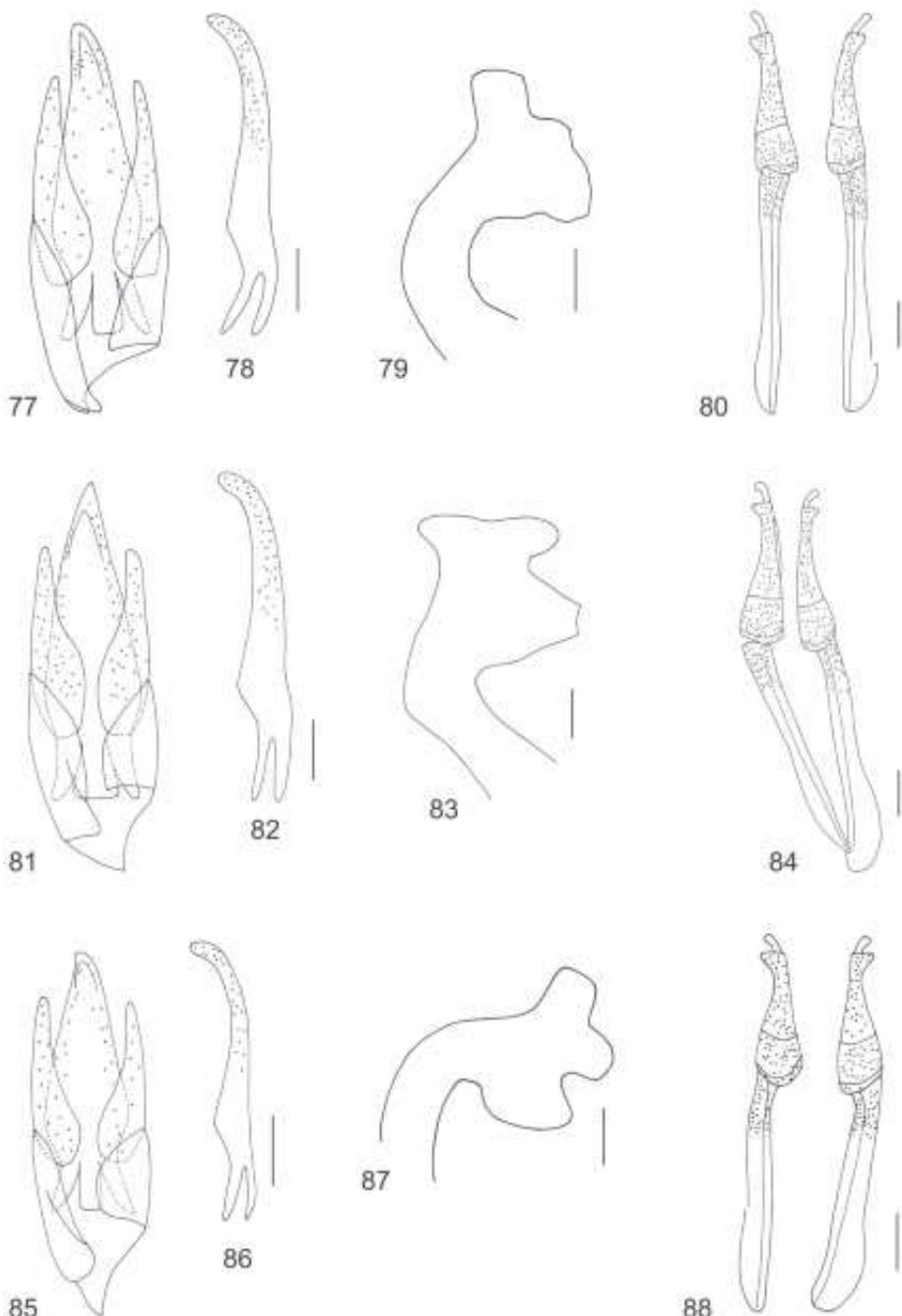
Figs. 53–58: Left elytron, anterior; 53) *Optioservus gapyeongensis*; 54) *O. hagai*; 55) *O. inahatai*; 56) *O. maculatus*; 57) *O. masakazui*; 58) *O. occidens*. Scales: 1.0 mm.



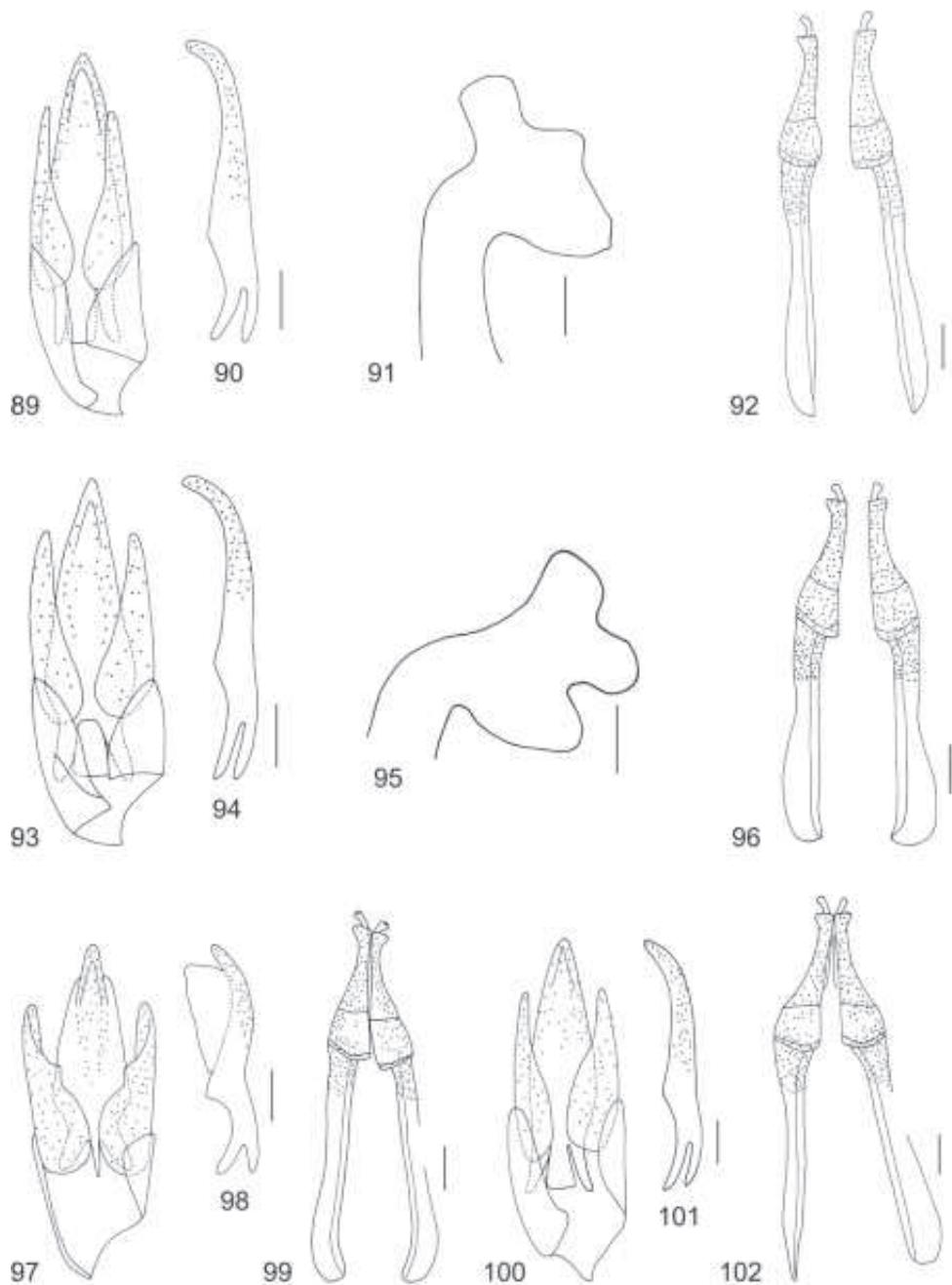
Figs. 59–60: *Optioservus occidens* (59) and *O. yoshitomii* (60) (adults); 59) meso- and metaventrite, ventral view; 60) phallobase, ventral view. Scales: 59: 1.0 mm; 60: 100 µm.  
Figs. 61–64: Left elytron, anterior part; 61) *Optioservus ogatai*; 62) *O. sakaii*; 63) *O. variabilis*; 64) *O. yoshitomii*. Scales: 62: 100 µm; 61, 63–64: 1.0 mm.



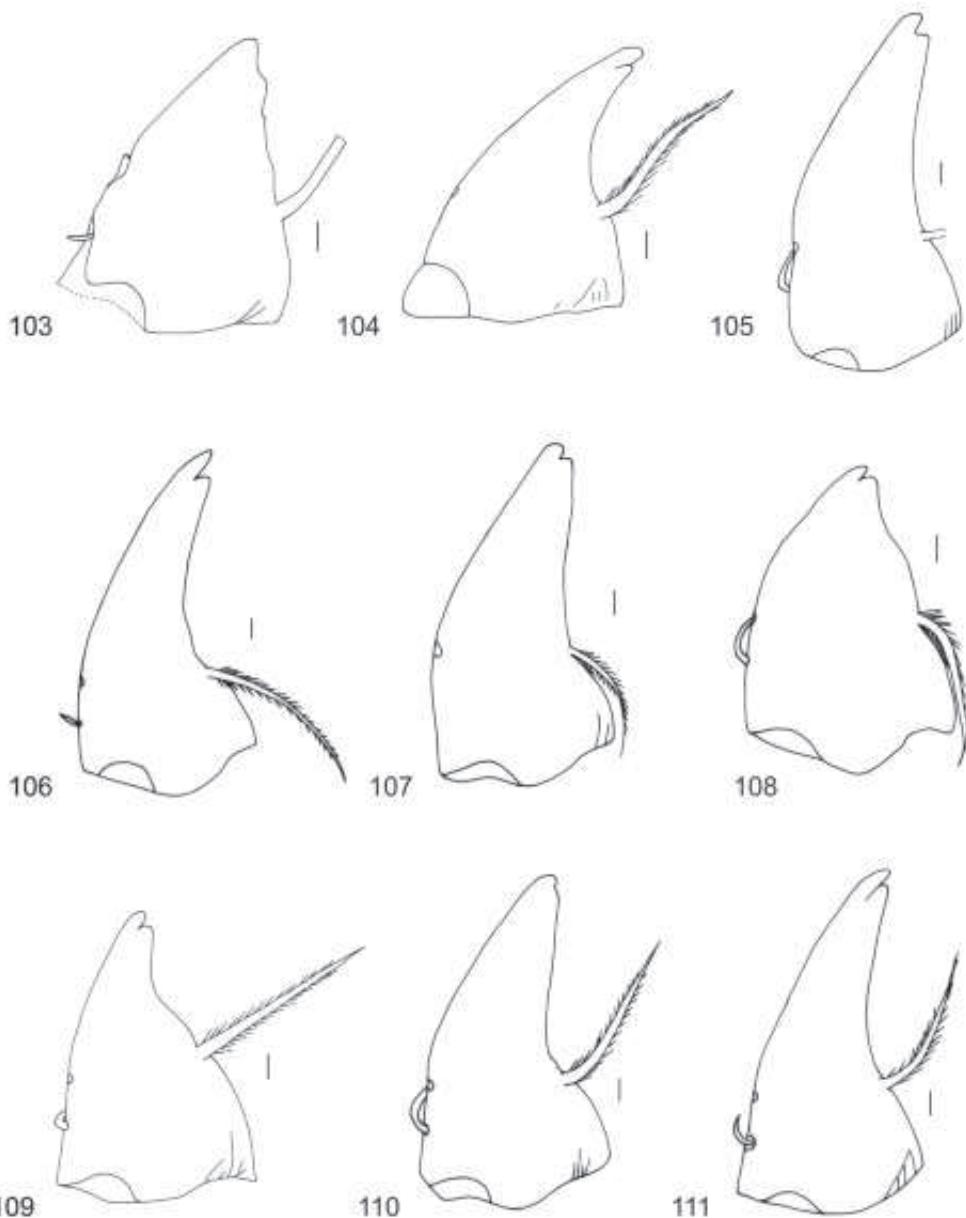
Figs. 65–76: *Optioservus maculatus* species group, aedeagus in dorsal view (65, 69, 73), penis in lateral view (66, 70, 74), endophallus in lateral view (67, 71, 75), ovipositor (68, 72, 76); 65–68) *O. hagai*; 69–72) *O. maculatus*; 73–76) *O. masakazui*. Scales: 100 µm.



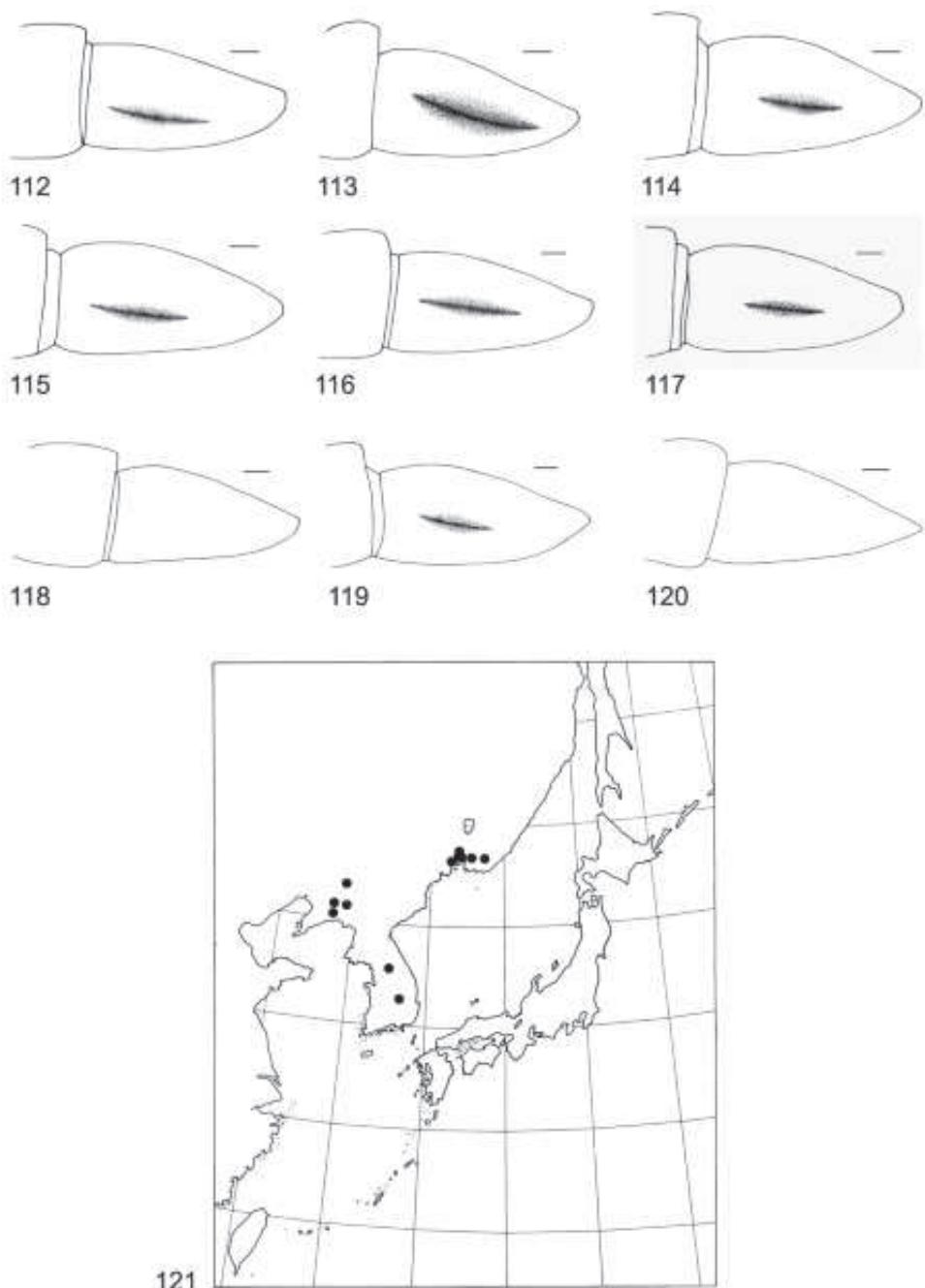
Figs. 77–88: *Optioservus maculatus* species group, aedeagus in dorsal view (77, 81, 85), penis in lateral view (78, 82, 86), endophallus in lateral view (79, 83, 87), ovipositor (80, 84, 88); 77–80) *O. occidens*; 81–84) *O. ogatai*; 85–88) *O. sakaii*. Scales: 100 µm.



Figs. 89–102: *Optioservus maculatus* species group, aedeagus in dorsal view (89, 93, 97, 100), penis in lateral view (90, 94, 98, 101), endophallus in lateral view (91, 95), ovipositor (92, 96, 99, 102); 89–92) *O. variabilis*; 93–96) *O. yoshitomii*; 97–99) *O. gapyeongensis*; 100–102) *O. inahatai*. Scales: 100 µm.

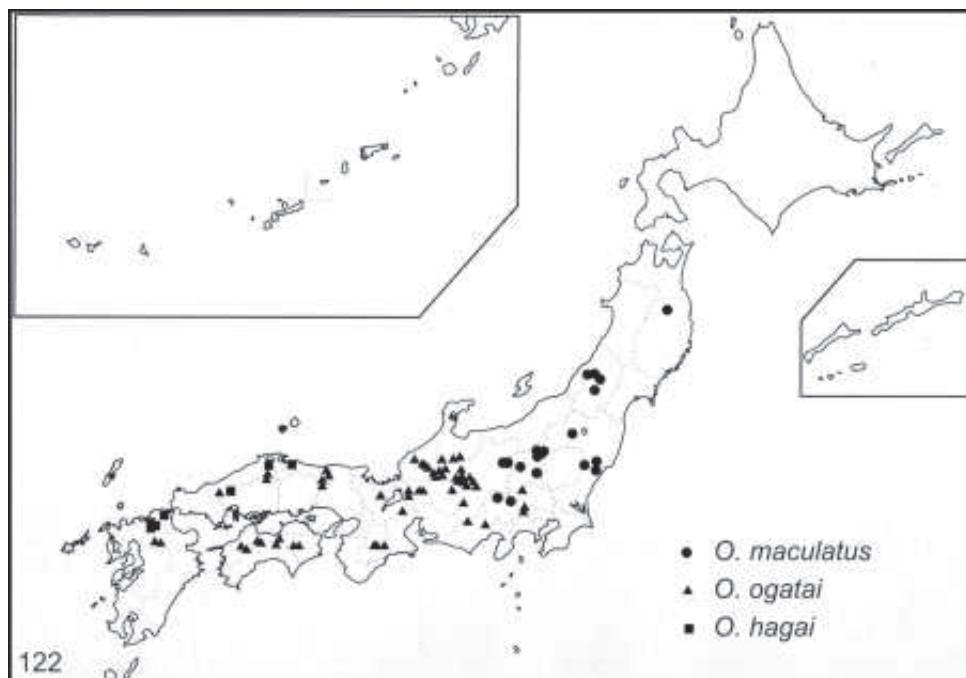


Figs. 103–111: Mandibles (larvae); 103) *Optioservus gapyeongensis*; 104) *O. hagai*; 105) *O. maculatus*; 106) *O. masakzui*; 107) *O. occidens*; 108) *O. ogatai*; 109) *O. sakaii*; 110) *O. variabilis*; 111) *O. yoshitomii*. Scales: 10 µm.

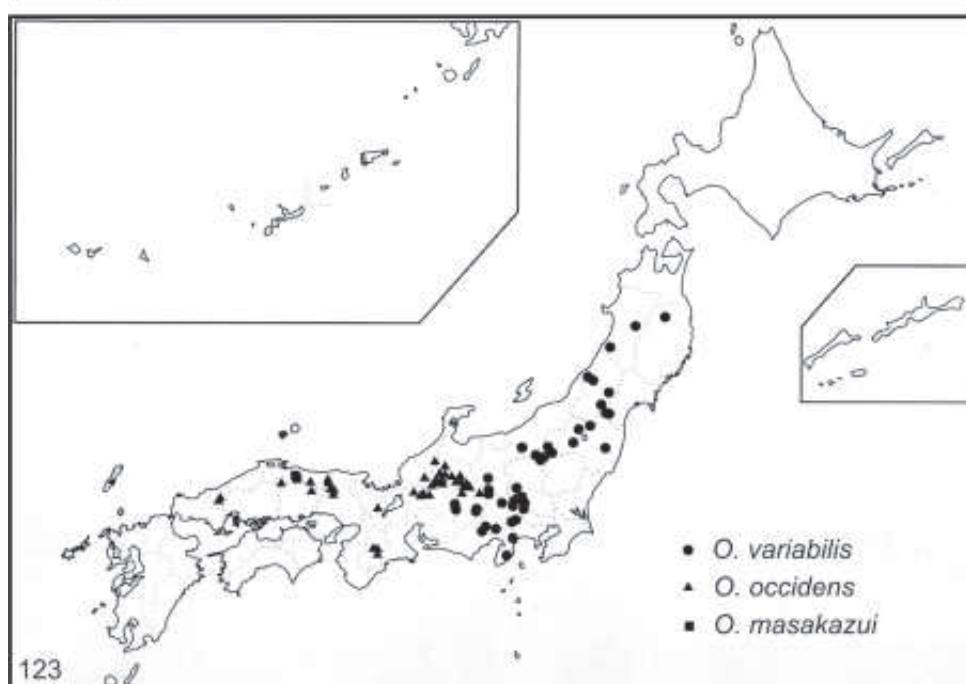


Figs. 112–120: Abdominal segment 9 (larvae), in lateral view; 112) *Optioservus gapyeongensis*; 113) *O. hagai*; 114) *O. maculatus*; 115) *O. masakazui*; 116) *O. occidens*; 117) *O. ogatai*; 118) *O. sakaii*; 119) *O. variabilis*; 120) *O. yoshitomii*. Scales: 100 µm.

Fig. 121: Geographical distribution of *Optioservus gapyeongensis*.



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Figs. 122–123: Geographical distribution of 122) *Optioservus maculatus*, *O. ogatai* and *O. hagai*, and 123) *O. variabilis*, *O. occidens* and *O. masakazui*.

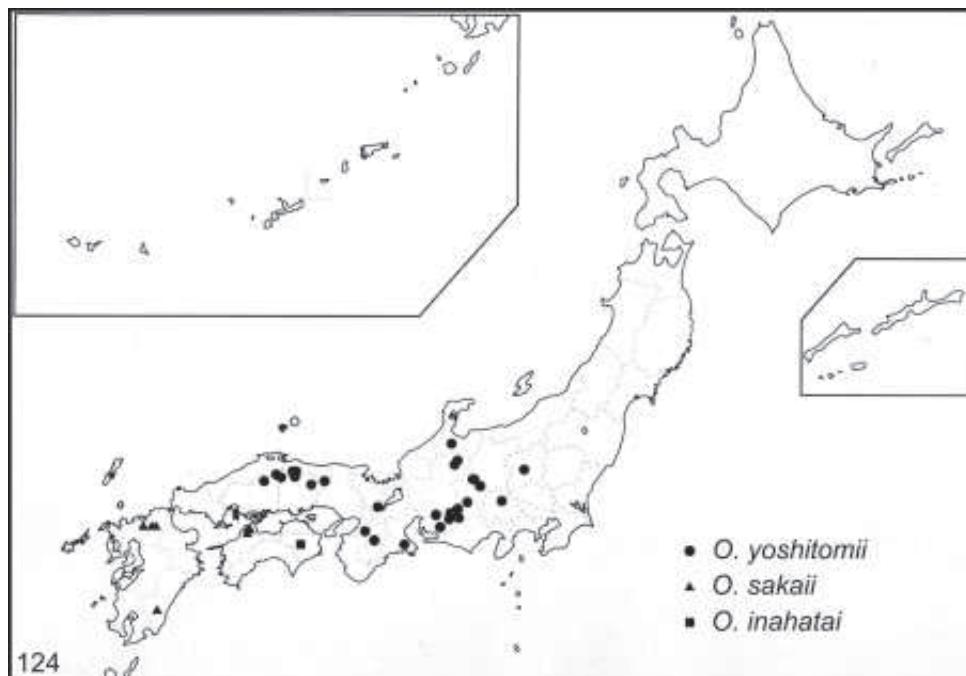


Fig. 124: Geographical distribution of *Optioservus yoshitomii*, *O. sakaii* and *O. inahatai*.

Figs. 125–128: Photographs of *Optioservus maculatus* species group (adults); 125) *O. maculatus*; 126) *O. ogatai*; 127) *O. variabilis*; 128) *O. yoshitomii*.



Figs. 129–130: Habitats of *Optioservus maculatus* species group; 129) Taraga-dani, locality of *O. occidens*; 130) Bansyô-dani, type locality of *O. ogatai*.



Figs. 131–132: Habitats of *Optioservus maculatus* species group; 131) Nippara-keikoku, locality of *O. variabilis*; 132) Sugô-tôge, locality of *O. yoshitomii*.

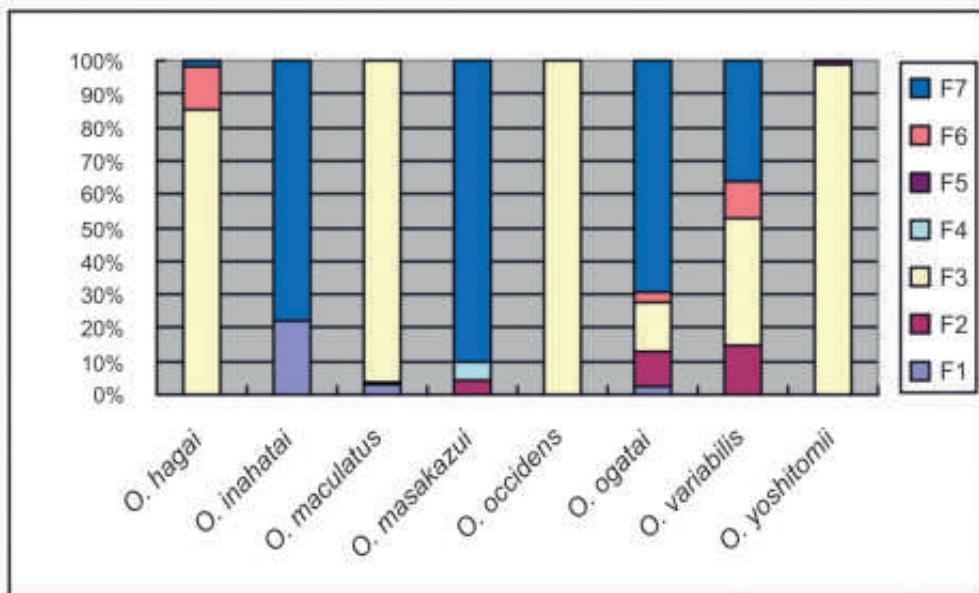


Fig. 133. Percentage of elytral color patterns of Japanese species of the *Optioservus maculatus* group.

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