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Females, Pupae and Larvae of the *japonicus* Group of *Goerodes* (Trichoptera, Lepidostomatidae)

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Abstract The females of 6 species of the *japonicus* group of *Goerodes*, *G. complicatus*, *G. nukabiraensis*, *G. bipertitus*, *G. japonicus*, *G. satoi* and *G. elongatus*, and the pupae of the 5 species excluding *G. elongatus* are described. Additional descriptions are given of the larvae of the 5 species. Setae on meso- and metanotum of the larvae decrease in order of *G. complicatus*, *G. nukabiraensis*, *G. bipertitus* and *G. japonicus*. As a whole, the larvae of the 4 species appear to have a tendency to become more setose in southern localities of Japan.

Seven Japanese species of Lepidostomatidae are referable to the *japonicus* group of *Goerodes*: *G. complicatus*, *G. nukabiraensis*, *G. bipertitus*, *G. japonicus*, *G. satoi*, *G. elongatus* and *G. kurentzovi*. Up to the present, they have been known by males and larvae in 4 species, and by males alone in 3 species (MARTYNOV 1935, TSUDA 1936, KOBAYASHI 1955, 1964, 1968, ITO 1978). In this paper, I will describe the females of the 6 species excluding *G. kurentzovi*, and the pupae of the 5 species excluding *G. kuentzovi* and *G. elongatus*. Morepver, I will give additional description for the larvae of these 5 species.

Morphology of the genus *Goerodes* and terms used in this paper are given in another paper (ITO, 1984). Measurements of adults and pupae are based on the 10 specimens.

Material

G. complicatus. 109 adults (78 ♂♂, 31 ♀♀), 62 pupae (including exuviae) and 424 larvae from the following localities: Hokkaidô: Takino, Jôzankei, Makomanai, Hassamu, Mt. Muine, Mt. Moiwa and Mt. Yoichi, Sapporo; Mt. Yûbari, Yûbari; Kanayama, Tonashibetsu and Furebetsu, Furano; Ikushumbetsu, Mikasa; Furubira; Zenibako; Mt. Ashibetsu; Kimobetsu; Tôya-kohan; Atsuta-mura; Rankoshi, Chitose; Miruto, Kurisawa-chô; Shiriuchi-chô; Mena, Rankoshi-chô; Futamata-onsen, Oshima-hantô; Takaoka, Tomakomai; Miyakoshinai-sawa, Kaminokuni-chô; Ônuma-kôen, Nanae-chô; Ten-ninkyô, Asahikawa; Okuniikappu, Hidaka; Kamikawa-chô; Otofuke, Shikaribetsu, Hombetsu and Rikubetsu, Tokachi; Okushirataki and Kitami-aioi, Kitami; On-nebetsu, Shiretoko; Shari-chô; Shokambetsu and Nobusha, Mashike-chô. Honshû: Sendai-gawa, Shimokita, Aomori-ken; Jimba, Ôdate, Akita-ken; Omoshiroyama, Yamagata-ken; Hiratsuto,

Kawai-mura, Iwate-ken; Shin-namari-onsen, Hanamaki, Iwate-ken; Saigawa and Shimizumata-dani, Hakusan, Ishikawa-ken; Kumanosawa, Kuriyama-mura, Tochigi-ken; Okuchichibu, Saitama-ken; Mt. Yamizo, Ibaragi-ken; Yamabana, Oze, Gumma-ken; Hisari-gawa, Nishi-tanzawa, Kanagawa-ken; Kazuma, Okutama, Tôkyô; Ôizumi-mura, Yamanashi-ken; Ninosawa and Kurumidaira, Kita-arupusu, Nagano-ken; Nakatsuna-kohan and Sugadaira, Nagano-ken; Ômata, Yoshino, Nara-ken; Okutsugawa, Shôhoku-chô, Okayama-ken.

G. nukabiraensis. 194 adults (127 ♂♂, 67 ♀♀), 45 pupae (including exuviae) and 2327 larvae from the following localities: Hokkaidô: Takino and Jôzankei, Sapporo; Rankoshi, Chitose; Shakotan; Niseko-chô; Mori-chô; Ônuma-kôen; Shiriuchi-chô; Kanayama, Furano; Hombetsu, Otofuke, Iwamatsu, Shôtoshibetsu, Rikubetsu, Ashoro and Shimo-niinai, Tokachi; Nobusha and Shokambetsu, Mashike-chô; Kitami-aioi; Kitami-esashi; Shari-chô; Koshimizu-chô; Rausu-onsen, Shiretoko. Honshû: Suriage-gawa, Iizaka-onsen, Fukushima-ken; Yukawa and Jigoku-zawa, Nikkô, Tochigi-ken; Sakagawa, Okutama, Tôkyô; Ôizumi-mura, Yamanashi-ken; Kanazawa, Chino, Nagano-ken.

G. bipertitus. 16 adults (7 ♂♂, 9 ♀♀), 33 pupae (including exuviae) and 125 larvae from the following localities: Hokkaidô: Shiriuchi-chô; Hombetsu, Tokachi; Nobusha and Shokambetsu, Mashike-chô. Honshû: Suriage-gawa, Iizaka-onsen, Fukushima-ken; Sakagawa, Okutama, Tôkyô; Mizunashi-gawa, Tanzawa, Kanagawa-ken; Kushida-gawa, Mie-ken; Kibune-gawa and Kiyotaki-gawa, Kyôto; Shigô-gawa, Yoshino, Nara-ken; Sandankyô and Kake-chô, Hiroshima-ken.

G. japonicus. 34 adults (20 ♂♂, 14 ♀♀), 59 pupae (including exuviae) and 703 larvae from the following localities: Hokkaidô: Takino, Sapporo; Shiriuchi-chô; Nobusha, Mashike-chô; Hombetsu, Tokachi. Honshû: Oippe, Shimokita, Aomori-ken; Jûniko, Aomori-ken; Jimba, Ôdate, Akita-ken; Moichi, Iwate-ken; Kaminoyama, Yamagata-ken; Nakayamajuku and Iizaka-onsen, Fukushima-ken; Shiman-onsen, Gumma-ken; Yukawa, Nikkô, Tochigi-ken; Tokigawa, Okumusashi, Saitama-ken; Sakagawa, Hontani-keikoku and Unazawa, Okutama, Tôkyô; Mizunashi-gawa, Tanzawa, Kanagawa-ken; Hisari-gawa, Minase-gawa, Taki-zawa, Ashigara, Kanagawa-ken; Hakone-gairinzan, Kanagawa-ken; Mizusawa and Kushigawa, Higashi-tanzawa, Kanagawa-ken; Naka-gawa and Takiguchi-zawa, Nishi-tanzawa, Kanagawa-ken; Karigawa, Shizuoka-ken; Jôetsu, Niigata-ken; Iiyama and Ôkuwa-mura, Nagano-ken; Kôchi-dani and Hakusan, Ishikawa-ken; Samegai and Ôtsu, Shiga-ken; Kurama, Iwakura and Hozukyô, Kyôto; Ômata and Aridô-shi, Yoshino, Nara-ken; Hamasaka-chô, Hyôgo-ken; Okutsugawa, Shôhoku-chô, Okayama-ken; Kake-chô and Sandankyô, Hiroshima-ken. Other districts: Mukokurogô, Mts. Kujû, Ôita-ken, Kyûshû; Wakamatsu Island, Nagasaki-ken, Kyûshû; Aira-gawa, Iriomote Island, Okinawa-ken.

G. satoi. 39 adults (23 ♂♂, 16 ♀♀), 247 pupae (including exuviae) and 997 larvae from the following localities: Hokkaidô: Takino, Jôzankei, Makomanai, Mt. Moiwa and Mt. Muine, Sapporo; Hidarimata, Atsuta-mura; Gumbetsu,

Hamamasu-mura; Mt. Yûbari, Yûbari; Shikotsu-kohan; Yoichi; Mena, Rankoshi-chô; Shiriuchi-chô; Ônum-kôen; Takaoka, Tomakomai; Sarugawa and Horobetsu-gawa, Hidaka; Shokambetsu, Nobusha and Hashibetsu, Mashike-chô; Shumarinai and Moshiri, Horokanai-chô; Hombetsu, Tokachi; Chimikeppu, Kitami; Kussharo-kohan; Akan-kohan; Shari-chô. Honshû: Ôhazama-chô, Iwate-ken; Iizaka-onsen, Fukushima-ken; Mt. Tanigawa, Gumma-ken; Sakagawa and Minami-akigawa, Okutama, Tôkyô; Kuratani-gawa, Ishikawa-ken; Tenryû-gawa, Nagano-ken; Kanagawa, Kita-arupusu, Nagano-ken; Ôkuzure-gawa, Nagano-ken; Iwakura, Kyôto; Ômata, Yoshino, Nara-ken; Okutsugawa, Shôhoku-chô, Okayama-ken.

G. elongatus. 5 adults (4 ♂♂, 1 ♀), Russky Island, Primorye, Far East of USSR (22. VIII. 1978, T. VSHIVKOVA).

Goerodes complicatus (KOBAYASHI)

Dinarthrodes complicata KOBAYASHI, 1968, Bull. Kanagawa Pref. Mus., **1**: 8.
Dinarthrodes complicata: TANI, 1971, Bull. Osaka Mus. nat. Hist., **24**:i67–68.
Dinarthrodes complicatus: TANI, 1977, Col. Ill. Ins. Jap., **2**: 199–200.
Dinarthrodes complicata: ITO, 1978, Kontyû, Tokyo, **46**: 575–581.

Female (Fig. 1). Body 5.5–7.5 mm in length. Fore wing ca. 7–9 mm long and ca. 2.5 mm wide. Hind wing 6–7.5 mm long and ca. 2 mm wide. First segment of antenna long, about 4 times as long as head.

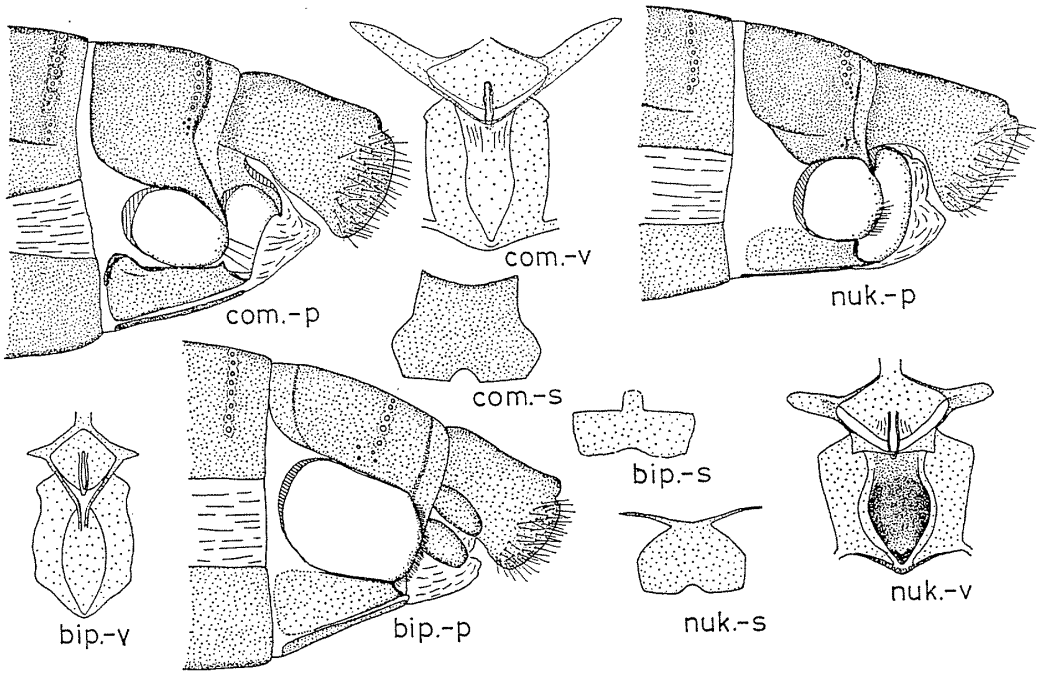

Fig. 1. Females of *G. complicatus* (com.), *G. nukabiraensis* (nuk.) and *G. bipertitus* (bip.). p, Posterior parts of abdomen, lateral view; s, subgenital plate, ventral view; v, vaginal apparatus, ventral view.

Table 1. Number of hooks on the clinging apparatus in the pupa.

Species	*n*	3a	4a	5a	5p	6a	7a
G. complicatus	21	3–5	2–5	2–5	3–10	2–5	2–6
G. nukabiraensis	25	3–6	3–5	3–6	5–9	3–5	3–6
G. bipertitus	39	2–4	2–4	2–4	4–10	2–4	2–4
G. japonicus	33	2–4	2–6	2–5	4–11	2–5	2–6
G. satoi	28	3–6	3–6	3–5	6–13	3–6	3–6

n, number of specimens examined; 3–7, 3rd–7th abdominal segments; a and p, anterior and posterior positions of segment; all specimens collected from Hokkaidô.

Posterolateral end of 8th tergite very sharply pointed. Subgenital plate weakly sclerotized and nearly square, with a round dent on posterior margin. Three deep and sclerotized external pockets on 8th segment; 2 pockets on the lateral sides and 1 on the posterior side. Vaginal apparatus a wide lozenge in form, with lateral projections elongated anterolaterally and pointed apically. Ventral bridge thin and sclerotized. Lateral bands weakly sclerotized. Connecting folds octagonal in ventral view.

Pupa (Table 1). Body 7–9 mm in length. Rudiments of genitalia as long as anal appendages and pointed apically, widely separated from each other. Abdominal gills present both dorsally and ventrally, on posterior margins of 2nd-7th segments as in the larva.

Goerodes nukabiraensis (Kobayashi)

Dinarthrodes nukabiraensis Kobayashi, 1964, Bull. nat. Sci. Mus., **7**: 88–90.
Dinarthrodes nukabiraensis: Tani, 1971, Bull. Osaka Mus. nat. Hist., **24**: 69–70.
Dinarthrodes nukabiraensis: Tani, 1977, Col. Ill. Ins. Jap., **2**: 200.
Dinarthrodes nukabiraensis: Ito, 1978, Kontyû, Tokyo, **46**: 582–583.

Female (Fig. 1). Body about 5–7 mm in length. Fore wing ca. 7 mm long and ca. 2.5 mm wide. Hind wing ca. 6 mm long and ca. 2.5 mm wide. First segment of antenna long, ca. 3.5–4 times as long as head.

Posterolateral end of 8th tergite sharply pointed. Subgenital plate weakly sclerotized and subsquare, with a round dent posteriorly and thin lateral projections anteriorly. Two shallow and sclerotized external pockets on 8th segment, 1 on each lateral side. Vaginal apparatus a wide lozenge in form, with lateral projections elongate laterally and not pointed apically. Ventral bridge thin and with 2 flaps. Lateral bands elongate tonguelike in form and heavily sclerotized. Connecting folds sclerotized and nearly hexagonal in ventral view.

Pupa (Table 1). Body 5.5–8.5 mm in length. Rudiments of male genitalia as long as anal appendages, leaflike in form and pointed apically, widely separated from each other. Abdominal gills arranged as in larva (of 25 pupae examined, 1 with no gill on dorsal side of 5th segment).

Goerodes bipertitus (KOBAYASHI)

Dinarthrodes bipertita KOBAYASHI, 1955, Bull. nat. Sci. Mus., **2**: 70–71.
Dinarthrodes bipertita: TANI, 1971, Bull. Osaka Mus. nat. Hist., **24**: 66–67.
Dinarthrodes bipertitus: TANI, 1977, Col. Ill. Ins. Jap., **2**: 200.

Female (Fig. 1). About 6.5–8 mm in body length. Fore wing 7.5–9 mm long and ca. 2 mm wide. Hind wing 6.5–7.5 mm long and ca. 2 mm wide. First segment of antenna long, 2.5–3.5 times as long as head.

Posterolateral end of 8th tergite slightly pointed. Subgenital plate very weakly sclerotized and nearly square in form, with a projection on the middle of anterior margin. Two lateral, deep and sclerotized external pockets on the 8th segment and 2 weakly sclerotized humps on the posterior margin of this pocket. Vaginal apparatus small, lozenge-form, with small lateral projections, and appearing suspended from connecting folds. Ventral bridge absent. Lateral bands elongate tongue-shaped and weakly sclerotized. Connecting folds almost hexagonal in ventral view.

Pupa and larva (Table 1). Body 5–6.5 mm in length. Rudiments of male genitalia leaflike in ventral view, with a wide space between. Seventh abdominal gills: Of 39 pupae examined, 2 with posteroventral gill on either lateral side,

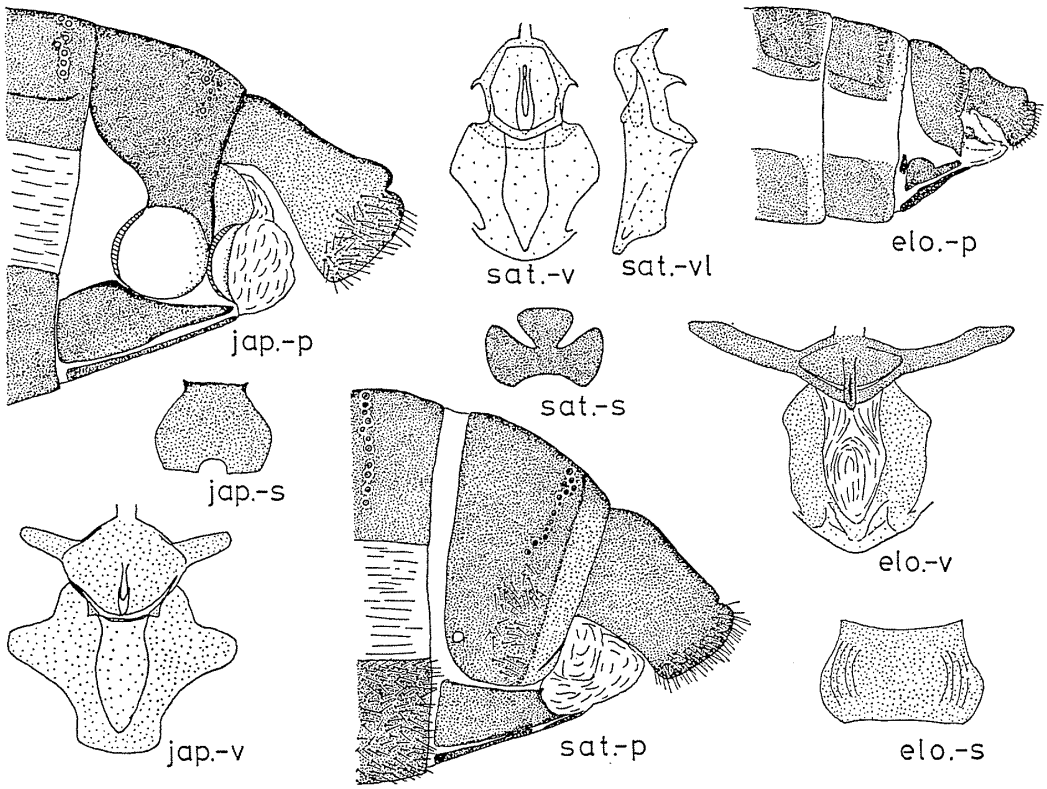

Fig. 2. Females of *G. japonicus* (jap.), *G. satoi* (sat.) and *G. elongatus* (elo.). Lettering as in Fig. 1; vl, vaginal apparatus, lateral view, left end of the figure is the ventral side.

14 with it on right or left side, and 23 without it. Larvae of this species are mostly distinguished from those of *G. japonicus* by the absence of posteroventral gill on one or either side of 7th segment.

Goerodes japonicus (Tsuda)

Atomyiella japonica Tsuda, 1936, Annot. Zool. Jap., **15**: 401–409.
Dinarthrodes japonica: Tsuda, 1942, Mem. Coll. Sci., Kyoto Imp. Univ., (B) **17**: 329.
Dinarthrodes japonica: Chihara, 1956, Kontyû, Tokyo, **24**: 84–86.
Dinarthrodes japonica: Tani, 1971, Bull. Osaka Mus. nat. Hist., **24**: 64–66.
Dinarthrodes japonicus: Tani, 1977, Col. Ill. Ins. Jap., **2**: 199–200.
Dinarthrodes japonica: Ito, 1978, Kontyû, Tokyo, **46**: 583.

Female (Fig. 2). Body about 5–7 mm in length. Fore wing 6–9 mm long and 3 mm wide. Hind wing 5–7 mm long and ca. 2.5 mm wide. First segment of antenna long, 2.5–4.5 times as long as head.

Posterolateral end of the 8th tergite sharply pointed. Subgenital plate subsquare, with a round dent in the posterior margin and convex laterally. Three deep and sclerotized external pockets on the 8th segment, 2 on the lateral sides and 1 on the posterior side. Vaginal apparatus a wide lozenge in form, with lateral projections elongated anterolaterally and not pointed apically. Ventral bridge thin and with small flaps. Lateral bands weakly sclerotized. Connecting folds sclerotized and projected laterally.

Pupa and larva (Table 1). Body 5.5–7.5 mm in length. Rudiments of genitalia leaflike in form and pointed apically. Abdominal gills present both ventrally and dorsally on anterior margins of 3rd to 6th segments and posterior margins of 2nd to 7th segments; of 33 pupae examined, 1 with no gill on left postroventral corner of 7th segment). Chihara (1956) described a pupa lacking the gill on the dorsal side of the 2nd to 7th segments, but no pupa lacking the dorsal gills was observed in this study. Larvae of this species are mostly distinguished from those of *G. bipertitus* by the presence of posteroventral gills on both sides of 7th segment.

Goerodes satoi (Kobayashi)

Dinarthrodes satoi Kobayashi, 1968, Bull. Kanagawa Pref. Mus., **1**: 9–10.
Gen. *satoi*: Tani, 1978, Essa Kontyû Dôkôkai-hô, **49**: 10–11.
Dinarthrodes satoi: Ito, 1978, Kontyû, Tokyo, **46**: 581–582.

Female (Fig. 2). Body 6–7.5 mm in length. Fore wing 6–7 mm long and ca. 2.5 mm wide. Hind wing 4.5–6.5 mm long ca. 2.5 mm wide. First segment of antenna long, 2–3 times as long as head.

Lateral end of 8th tergite not pointed. A light colored spot and 30–40 short setae on lateral side of 8th tergite. Subgenital plate heavily sclerotized and divided into 3 broad, apically dilated lobes. Lateral pocket absent. Numerous short

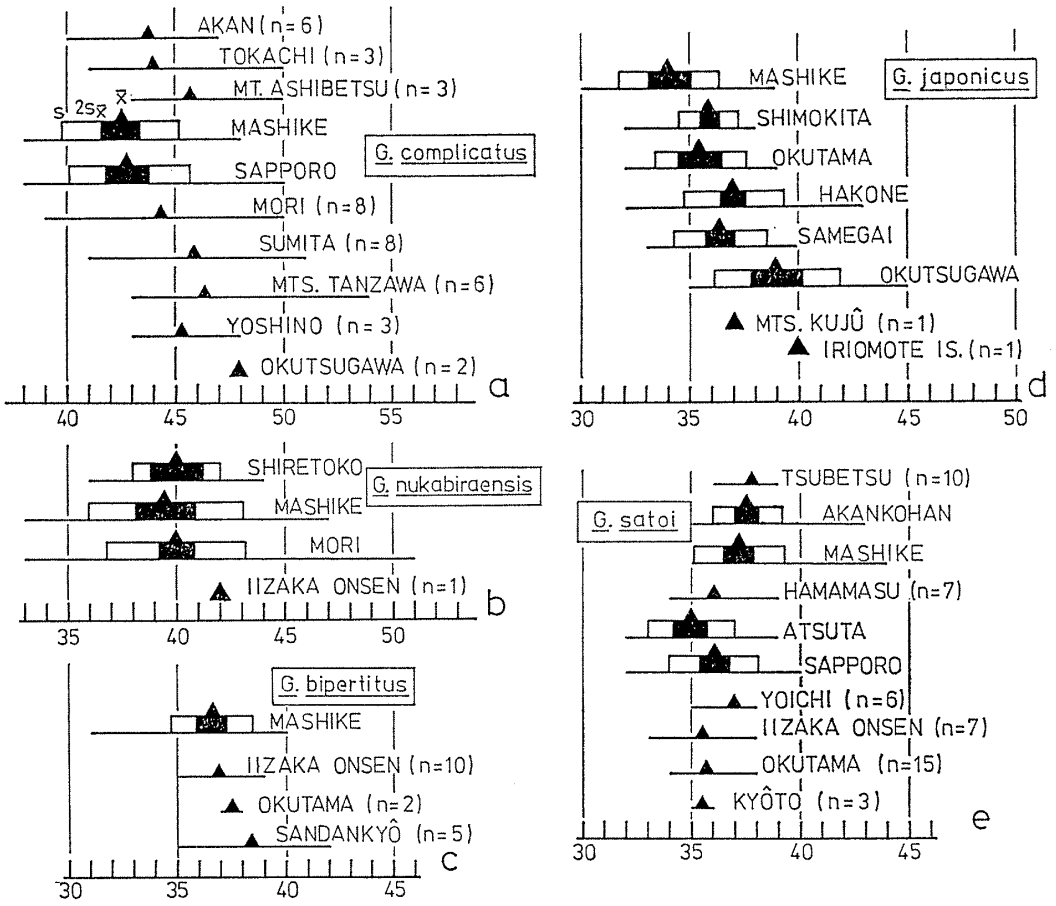

Fig. 3. Local variation in total number of setae on meso- and metanotum. The localities are arranged from north to south. a, *G. complicatus*; b, *G. nukabiraensis*; c, *G. bipertitus*; d, *G. japonicus*; e, *G. satoi*.

setae on ventral side of 7th segment. Vaginal apparatus nearly hexagonal in ventral view and crown-form in lateral view. Lateral projections short, directed posterolaterally and pointed apically. Lateral bands sclerotized and pointed apically. Connecting folds nearly hexagonal in ventral view.

Pupa (Table 1). Body 5–7 mm in length. Space formed by rudiments of male genitalia very narrow. Abdominal gills on posterior margins of 2nd to 6th segments both dorsally and ventrally and of 7th segment dorsally (of 28 pupae observed, 2 with no gill on 7th segment).

Goerodes elongatus (MARTYNOV)

Dinarthrodes elongata MARTYNOV, 1935, Trav. Inst. Zool. Acad. Sci. USSR, **2**: 379–384.
Dinarthrodes elongata: TANI, 1977, Col. Ill. Ins. Jap., **2**: 200.

Female (Fig. 2). Body 6.5 mm in length. First segment of antenna long, 3.2

times as long as head. Fore wing 7.3 mm long and 2.7 mm wide. Hind wing 7 mm long and 2.9 mm wide.

Posterolateral end of the 8th tergite somewhat pointed. Subgenital plate weakly sclerotized, gently concave at anterior margin and convex at basal half of lateral margin; with a few oblique lines on each side. Sclerotized pocket absent. Lateral plate semicircular at anterior half and thin at caudal half; with a small detached plate near the anterior margin. Vaginal apparatus a wide lozenge in form, with lateral projections thick, elongated anterolaterally and blunt at apex. Ventral bridge wide and sclerotized. Lateral bands very weakly sclerotized. Connecting folds nearly octagonal in ventral view. Spermatheca reaching 4th abdominal segment.

Pupa and larva. Unknown.

Larval Setae

Number of setae on the meso- and metanotum of larvae collected from Mashike-chô, Hokkaidô, is given in Table 2. The total number of these setae decreases in the order *G. complicatus*, *G. nukabiraensis* *G. bipertitus* and *G. japonicus*, which successively occur in upper to lower streams in summer (Ito, 1983). The setal number of *G. satoi*, which lives in upper and middle streams in winter (Ito, 1983), is similar to those of *G. bipertitus* and *G. nukabiraensis*.

Table 2. Number of setae on meso- and metanotum of the larvae of 5 species of *Goerodes japonicus* group from Mashike-chô, Hokkaidô.

Species	*n*		Mesonotum			Metanotum			Total
			sa1	sa2	sa3	sa1	sa2	sa3	
G. complicatus	40	range	1	7–11	15–22	1	3	9–13	38–48
		$\bar{x}$	1	8.7	18.2	1	3	10.8	42.5
		S.D.	0	1.0	1.6	0	0	0.8	2.7
G. nukabiraensis	25	range	1	5–10	13–20	1	3	8–14	33–47
		$\bar{x}$	1	7.6	16.5	1	3	10.3	39.5
		S.D.	0	1.1	2.1	0	0	1.4	3.6
G. bipertitus	26	range	1	5–8	12–19	1	3	8–11	31–40
		$\bar{x}$	1	6.3	15.8	1	3	9.5	36.6
		S.D.	0	0.7	1.6	0	0	0.8	1.9
G. japonicus	20	range	1	5–8	11–17	1	3	8.11	30–39
		$\bar{x}$	1	6.3	13.4	1	3	9.4	34.1
		S.D.	0	0.8	1.7	0	0	0.8	2.3
G. satoi	38	range	1–2	5–10	14–19	1	3	7–11	34–44
		$\bar{x}$	1.0	6.7	16.4	1	3	9.1	37.2
		S.D.	0.2	1.2	1.2	0	0	1.0	2.1

n, number of larvae examined.

The larvae of *G. japonicus* collected from Japan show a wide range of variation in the number of those setae, and as a whole, they appear to have a tendency to become more setose in southern localities (Fig. 3d). The larvae of *G. complicatus*, *G. nukabiraensis* and *G. bipertitus* also appear to have the same tendency except in northeastern Hokkaidô (Figs. 3a, b, c). But, there is no clear geoclinal tendency in the larvae of *G. satoi* (Fig. 3e).

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