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Chromosomes of a Macrostromid Species from Central Japan: *Macrostromum gigas* Okugawa, 1930 ?

Probably a synonym of *Macrostromum tuba* (von Graff, 1882)

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Introduction

In October of 2002, Mr. H. Kuroda found the occurrence of several specimens of a very small flatworm (planarian) in an aqualium for *Chara* (Charophyceae) culture placed in the laboratory of the Education Research Center, Tomobe-chô, Nishi-Ibaraki-gun, Ibaraki Prefecture, Honshû (ca. 140km NE of Tôkyô). He informed this news to Sasaki with 2 digital photographs of the animal.

Kawakatsu, who received the information from Sasaki, considered the animal in question seems to be a macrostromid species — and asked a favor of the collector to send living specimens to Yamamoto for chromosomal analysis. Fortunately, this attempt was succeeded. In the present web article, our karyological data are given, together with some taxonomic remarks on Japanese macrostromid species.

Taxonomic Account

Macrostromidae Beneden, 1870

Macrostromum Schmidt, 1848

Macrostromum gigas Okugawa, 1930 ?

(Japanese name: Hirahime-uzumushi)

(Figs. 1-4)

External appearance

The living specimens measure 2 - 2.5mm in length and 0.3mm in width (Fig. 1, top-left photograph). The head is of a rotund shape with a gentle swelling on either side. According to Yamamoto's observation, the anterior end in creeping animals formed an obtuse protrusion. The posterior end of the body is rotundate or subtruncate (Fig. 1, a photograph and photomicrographs).

The 2 eyes are conspicuous on the dorsal side of the head; the distance between them is narrow (Fig. 1, photomicrographs). The coloration of the body shows a pale brown except for the mid-longitudinal area. Numerous, small, red-brownish pigments occur at the entire region of the body (Fig. 1, photomicrographs; see also Fig. 2, 1 and 2).

Anatomy

A large, oblong pharynx, intestine, testes, ovaries, and a slightly curved penis stylet can be seen in living specimens (Fig. 1, photomicrographs). We have not more detailed data of anatomy and histology of the samples examined.

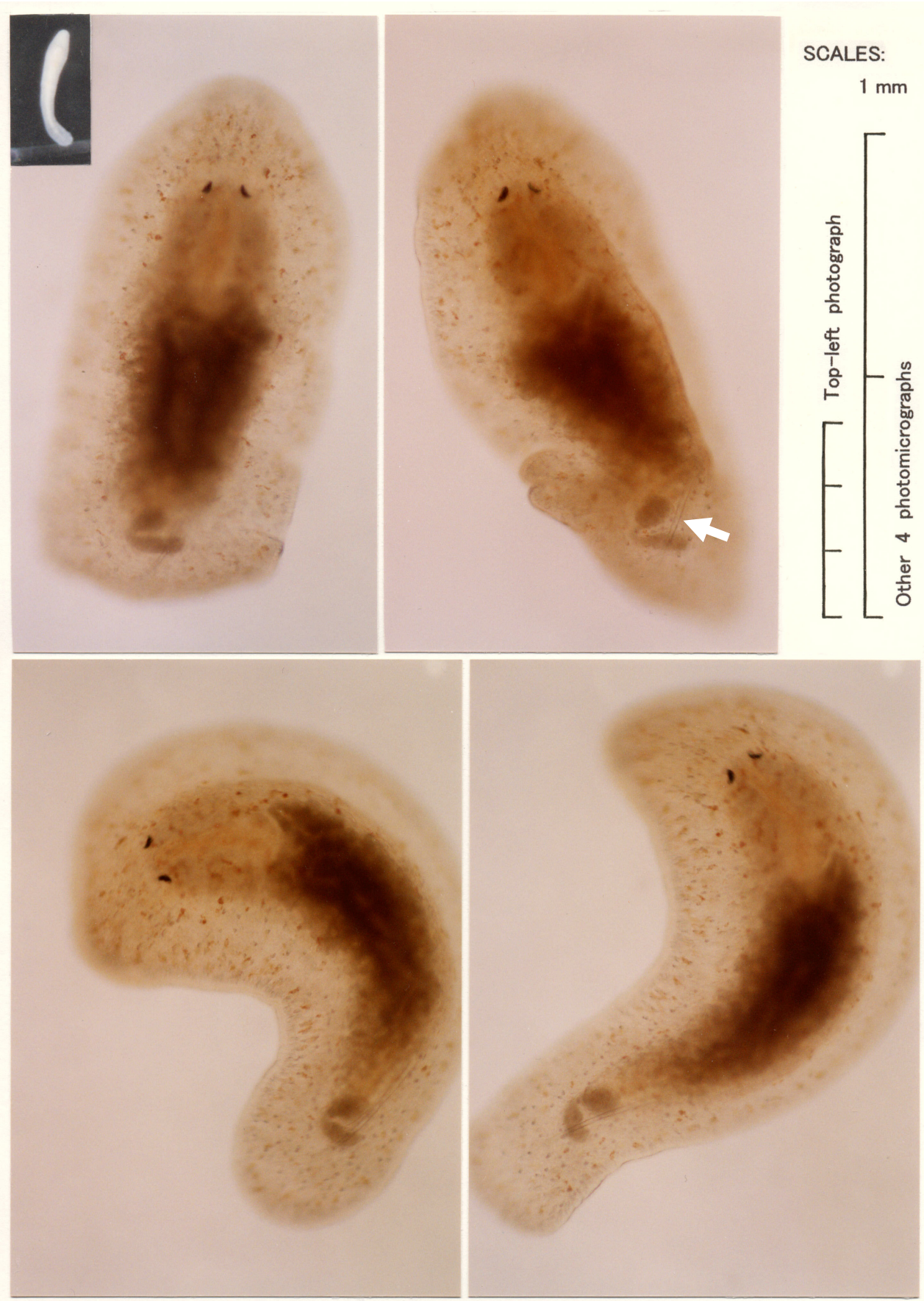


Fig. 1. *Macrostomum gigas* Okugawa, 1930 ? from Ibaraki Prefecture (the correct locality is not known). Top-left: Photograph of a live specimen (dorsal view). The other 4 photomicrographs were taken from the same specimen (dorsal views). Notice the penis stylet (shown by the white arrow in one photomicrograph). All these photographs were taken by Yamamoto.

8. *Macrostomum tuba* var. *gigas* var. nov. (Figs. 1 to 5)

Observed in numbers during the summer among algae and water-weeds in Lake Biwa, some ponds, and the rice-fields near Kyôto and Ôsaka. The anterior end is rather pointed but not very sharply, posteriorly becoming gradually broader and reaching a maximum breadth at the middle portion of the body. The posterior end forms a spatula-shaped tail with adhesive cells. The eyes are black and kidney-shaped with a distinct lens (Fig. 5). The ovaries and the testis are similar in structure to those of *Mac. tuba*. The chitinous portion of the penis is slightly curved and longer than in *Mac. tuba*; its terminal opening forms a spherically inflated "Mundstück" (Figs. 3, 4). The other type of penis described by A. LUTHER was never met with. Thus it differs from *Mac. tuba* in the general contour of the body, the form of the eyes, and the shape of the penis.

The chitinous portion of the penis is more than 200 μ in length. Length of the body 3.5 mm. Width 0.8 mm.

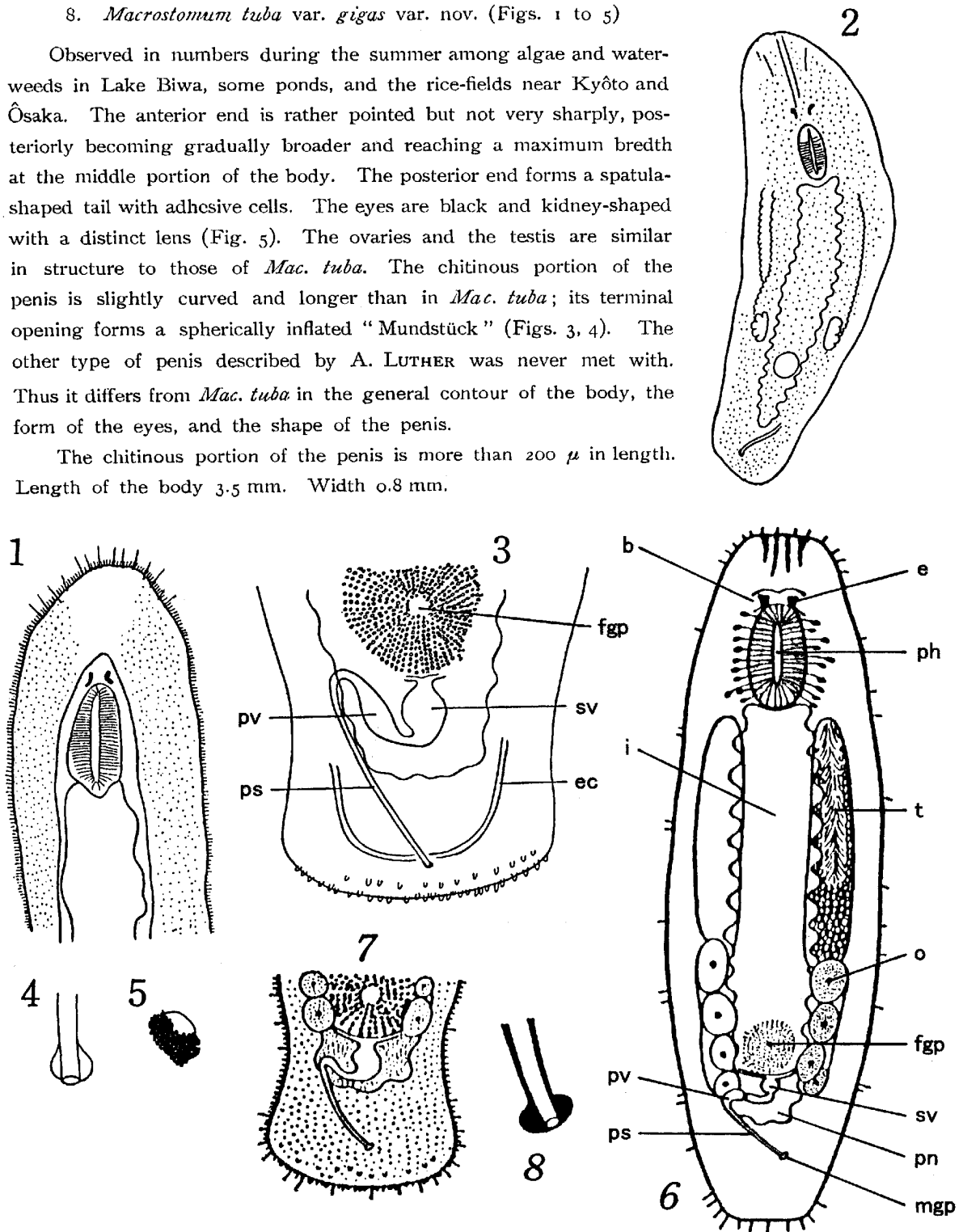


Fig. 2. *Macrostomum gigas*? Top-left text with 5 figures (1-5) was reproduced from Okugawa (1930: 77-78, pl. III, figs. 1-5) (original description). The other 3 figures (6-8) were reproduced from Okugawa (1965: 313, article 10 with 3 figures). All figures are enlarged and retouched; new abbreviations are also added.

1: Anterior portion of the animal (dorsal view); 2: diagrammatic sketch figure (dorsal view); 3: posterior portion (ventral view); 4: terminal opening of the penis stylet (male genital pore); 5: eye. 6: Schematic figure (ventral view); 7: posterior portion (ventral view); 8: terminal opening of the penis stylet (ventral view).
b, brain; e, eye; ec, excretory canal; fgp, female genital pore; i, intestine; mgp, male genital pore; o, ovary; ph, pharynx; pn, protonephridia; pv, prostatic vesicle (vesicula granulorum); ps, penis stylet (chitinous penis); sv, seminal vesicle (vesicula seminalis); t, testis.

The text of the original description of *Macrostomum gigas* and its morphological and anatomical figures reproduced from Okugawa's paper (1930) and his article in the New Encyclopedia of the Fauna of Japan, Part I (1965) are shown in Fig. 2 (1-5, 6-8).

Taxonomic remarks. The species was at first described as *Macrostomum tuba* var. *gigas* Okugawa, 1930 (loc. Lake Biwa-ko, Shiga Pref., Honshû). (See Fig. 2, reproduced figs. 1-5).

Marcus (1946: 7-13, 158-159, 190-193, pls. I-II, figs. 1-3, p. 250, pl. XXXI, fig. 1) classified the animal as *Macrostomum gigas* Okugawa, 1930. Ferguson (1954: 146) considered that Okugawa's variety is conspecific with "*Macrostomum tubum*" (*Macrostomum tuba* is correct — Kawakatsu). Luther (1960: 85-88) classified tentatively Okugawa's species as *Macrostomum tuba* (von Graff, 1882). See also Tyler & Bush (Online database).

Okugawa (1953: 26) employed the name *Macrostomum gigas*; later, he (1965) used the name *M. tuba* var. *gigas* (Fig. 1, reproduced figs. 6-8). In his 1973 article, Okugawa (on p. 218, fig. 15) used the following names for a single Japanese species: *Macrostomum tuba* (Graff) and *Macrostomum gigas* Okugawa.

In a previous bibliographic report (Kawakatsu & Nishino, 1994: 95, Note, 6), Marcus' (1946) classification system was employed. However, Luther's (op. cit.) system may be correct.

The other 3 *Macrostomum* species are reported from Central Japan: *Macrostomum hystricinum* Beklemischev, 1951 (syn.? *Macrostomum appendiculatum* (Fabricius, 1826)), *Macrostomum japonicum* Okugawa, 1930, and *Macrostomum saifunicum* Nassonov, 1929 (syn. *Macrostomum kawamurai* Okugawa, 1930). (Cf. Kawakatsu, 1998.)

The correct identification of the samples used in the present study is difficult for Kawakatsu. Thus, we tentatively identified the species as *Macrostomum gigas* Okugawa, 1930?. The species is also reported from a stagnant water of rice-field of Kawachi-chô, Inashiki-gun, Ibaraki Prefecture (Horikoshi & Kinouchi, 1977).

A detailed, modern taxonomic study of this animal group in Japan should be highly necessary.

Karyological Observation

Yamamoto succeeded in his karyological analysis of *Macrostomum gigas*? from the Ibaraki population in spite of technical difficulties mainly due to a small size of samples. A total of 28 mitotic figures of somatic cells were observed.

The animal has 6 metacentric chromosomes (Fig. 3; $2x=6$). The diploid karyotype consists of $2m + 2m + 2m$ (Fig. 4). The size of the first set of chromosomes is the largest; that of the second and third sets of chromosomes are nearly the same.



Fig. 3. *Macrostomum gigas*? A photomicrograph of somatic chromosomes ($2x=6$).

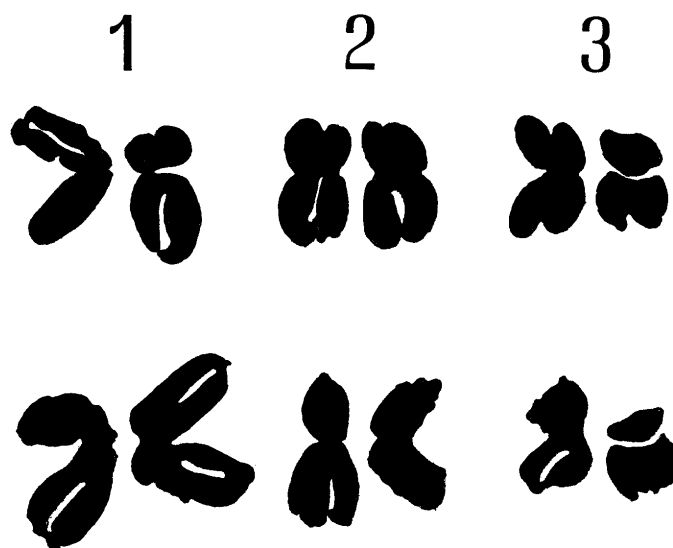


Fig. 4. *Macrostomum gigas*? Two idiograms ($2x=6: 2m + 2m + 2m$).

Karyological remarks. Up to the present, the karyological data of 12 *Macrostomum* species were reported (cf. Benazzi & Benazzi-Lentati, 1976: 5, table 1; Ferguson, 1937, 1939; Jones, 1944; Luther, 1947; Phillips, 1935, 1936; Marcus, 1946). Eleven species have chromosome numbers of $2x=6$ (and $n=3$); only *Macrostomum hustedi* Jones, 1944, a marine species from Massachusetts, U.S.A., has chromosome numbers of $4x=12$ (cf. Benazzi & Benazzi-Lentati, op. cit.).

Chromosomes of 2 somatic cells of North American *Macrostomum tuba* from Virginia reported by Phillips (1936: 323-324, fig. 1-1) are shown in Fig. 5 (top). Their idiograms prepared by Kawakatsu are also shown (Fig. 1, bottom).

The idiograms of *Macrostomum gigas*? from Japan reported in the present paper (Fig. 4) are very similar to those of *M. tuba* from the United States (Fig. 5, bottom).

Note. Ferguson (1954) proposed a different classification system of the *Macrostomum* group (see also Cannon, 1986: 29). For example, *M. hustedi* cited above is classified as *Archimacrostomum hustedi* (Jones, 1944).

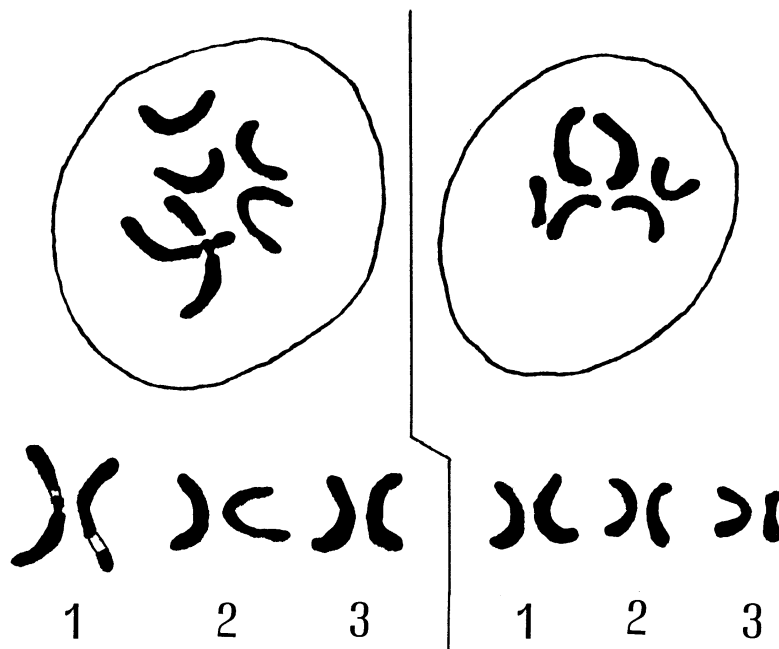


Fig. 5. *Macrostomum tuba* (von Graff, 1882). Top: Somatic mitosis showing chromosomes of mesenchymal cells (after Phillips, 1936: 324, fig. 1-1; highly enlarged). Bottom: Idiograms prepared by Kawakatsu based upon Phillips' figures cited above ($2x=6: 2m + 2m + 2m$).

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Summary

A small flatworm found in an aqualium for *Chara* culture (Ibaraki Pref., Honshû, Japan) was tentatively identified as *Macrostomum gigas* Okugawa, 1930? Its chromosome number is $2x=6$, with a karyotype of $2m + 2m + 2m$.

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