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Fujientomon primum, a Rare Proturan Species, Collected in a Survey of "Flora and Fauna of the Imperial Palace, Tokyo II"

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Abstract. Four specimens of a rare proturan species, *Fujientomon primum*, were collected in a soil animal survey during "Flora and Fauna of the Imperial Palace, Tokyo II" from 2009 to 2010. These specimens are described, and the structure of the labial palpus, porotaxy, and intraspecific chaetotaxic variations are reported.
Key words: Protura, Fujientomidae, labial palpus, chaetotaxy, porotaxy.

Introduction

Fujientomon primum was originally described from a single specimen collected at Asakawa, Tokyo, Japan (Imadaté, 1964). However, some characters such as mouthparts were not observed due to poor condition of the specimen (Imadaté, 1974). Since the original description, two males and one female have been reported from Nikko, Tochigi Prefecture (Imadaté & Ishii, 1987), and one female was reported from Funabashi, Chiba Prefecture (Nakamura, 1999). However, both records reported only the occurrence of this species and provided no description or taxonomical notes.

In this study, one male and three females were collected in a soil animal survey during the "Flora and Fauna of the Imperial Palace, Tokyo II." These specimens are described with newly introduced characters such as porotaxy.

Materials and Methods

Protura were extracted from litter and soil in Tullgren funnels and preserved in 80% ethanol. The specimens were individually mounted in polyvinyl-lactophenol medium, and the slides were dried for about 100 h in an oven at 60°C. Morphological observations were made using differential interference microscopy, and drawings were created using a drawing tube.

The specimens examined here are deposited in the collection of the National Museum of Nature and Science, Tokyo (NSMT).

Fujientomon primum Imadaté, 1964
[Japanese name: Fuji-kamaashimushi]
Figs. 1–20, Table 1

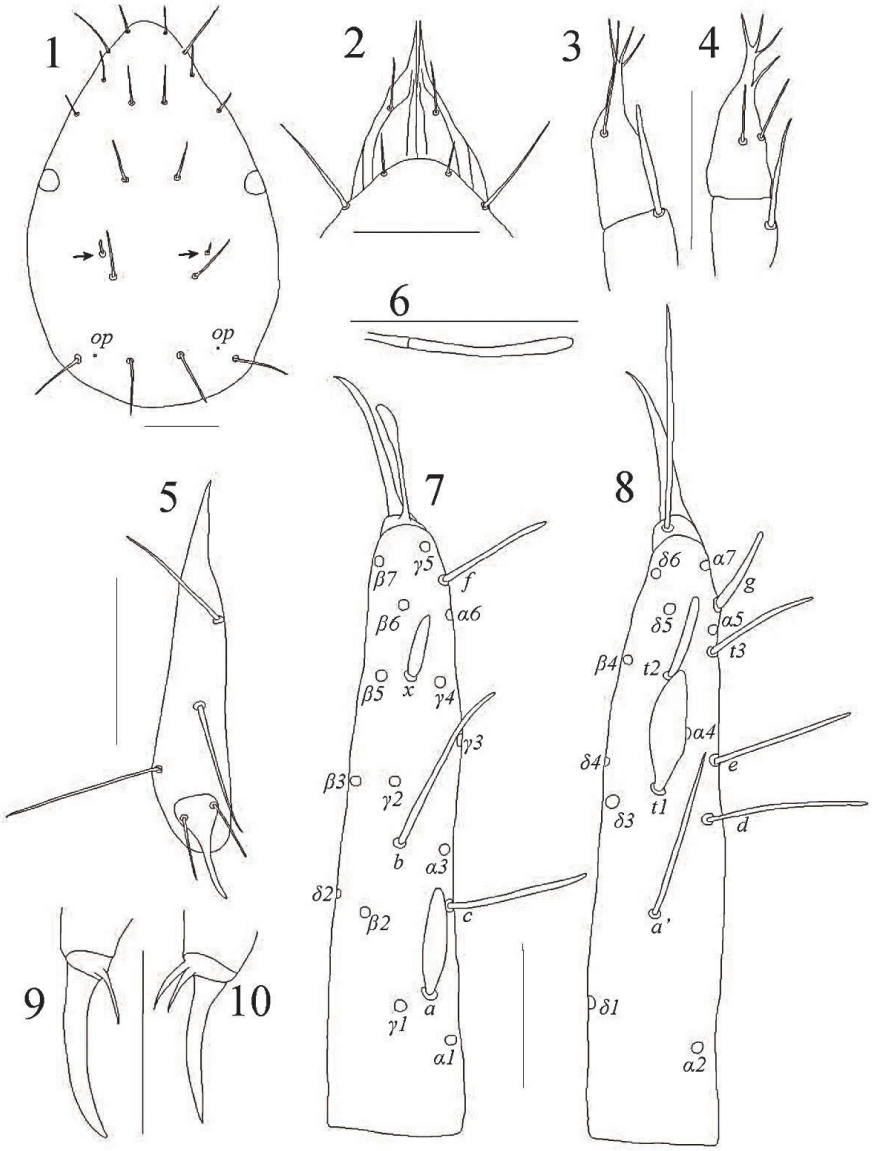
Fujientomon primum Imadaté, 1964: 65; Imadaté, 1974: 341.

Specimens examined. One female (NSMT-Ap 535), 13-X-2009, one female (NSMT-Ap 536), 23-XI-2009, one female (NSMT-Ap 537), 18-XII-2009, and one male (NSMT-Ap 538), 22-I-2010, Chushunkakuato, 20 m a.s.l., 35°41'18"N, 139°45'03"E, Imperial Palace, Chiyoda-ku, Tokyo, K. Ishii *et al*. leg.

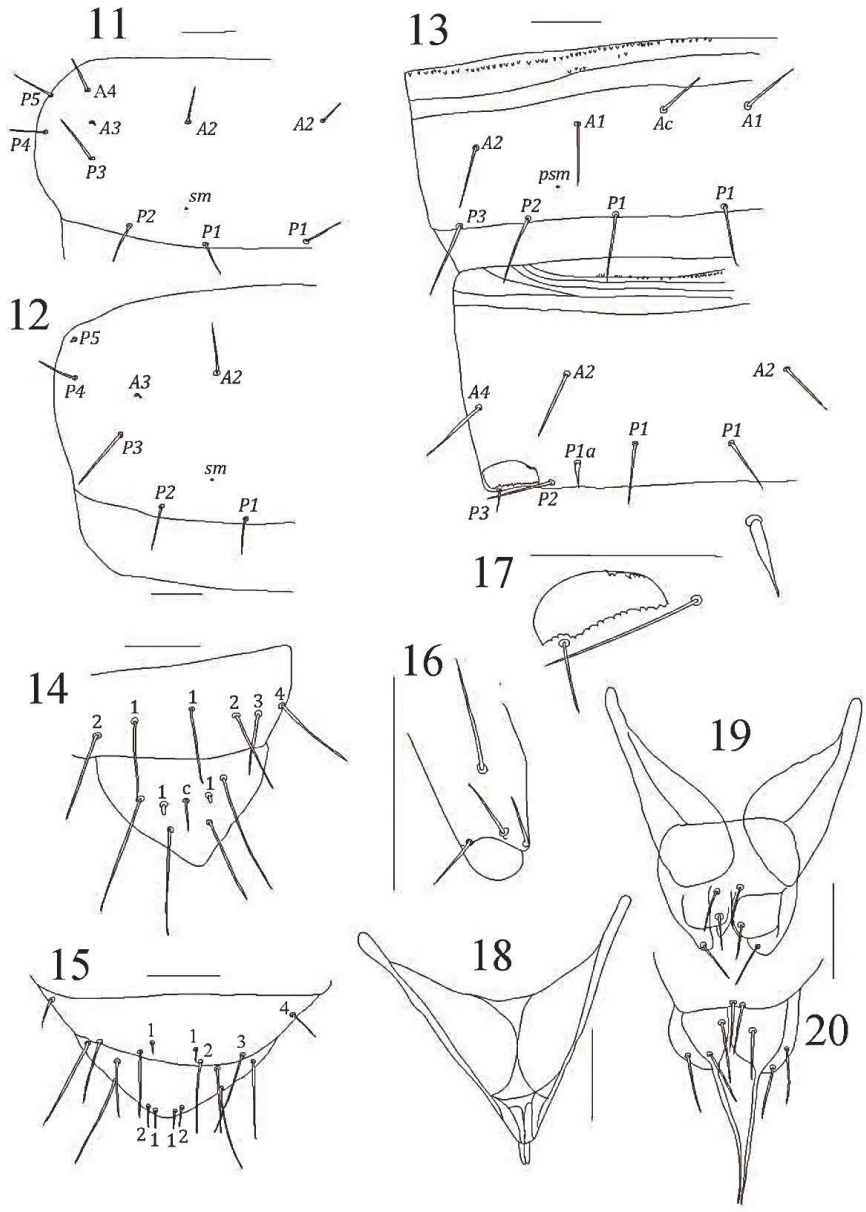
Diagnosis. Abdominal appendages I–III with four setae and a terminal vesicle; foretarsus sensilla *t1* and *a* extremely broad, additional sensillum *x* present; thoracic tergites II–III without setae *M*, abdominal tergites I–VII with three anterior setae of *Ac* and *A2*, sternite VIII with eight setae.

Description. Body length 1,030 μm in an expanded condition.

Head oval, 100–110 μm in length, 64–77 μm in width (Fig. 1). One pair of modified setae present (Fig. 1). Occipital pores (*op*) present, other pores invisible (Fig. 1). Pseudoculus circular, 7 μm, but often indistinct, PR = 12 (Fig. 1). Rostrum not protruded (Figs. 1 & 2). Mandible sharply pointed, labral setae



Figs. 1–10. *Fujientomon primum* Imadaté from the Imperial Palace. 1, head; 2, mandible; 3, maxillary palpus, dorsal view; 4, maxillary palpus, ventral view; 5, labial palpus; 6, canal of maxillary gland; 7, foretarsus, interior view; 8, foretarsus, exterior view; 9, empodium of hind tarsus; 10, tunica-lobe of hindtarsus. op: occipital pore. Arrows show modified setae. Scale, 20 μm.



Figs. 11–20. *Fujientomon primum* Imadaté from the Imperial Palace. 11, thoracic tergite II; 12, thoracic tergite III; 13, abdominal tergites VII-VIII; 14, tergites of abdomen XI and telson; 15, sternites of abdomen XI and telson; 16, abdominal appendage III; 17, comb on abdomen VIII; 18, female squama genitalis; 19, male squama genitalis, dorsal view; 20, male squama genitalis, ventral view. psm: posteromedial pore. Scale, 20 μm.

present (Fig. 2). Maxillary palpus with two sensilla on penultimate segment; two sensilla almost same length, 11–12 μm, but dorsal sensillum thicker than ventral sensillum (Figs. 3 & 4). Labial palpus ending in broad seta and with two setae, without basal sensillum (Fig. 5). Canal of maxillary gland simple, and proximal part rather evenly dilated, but often invisible, CF = 8 (Fig. 6).

Foretarsus (Figs. 7 & 8) 72–87 μm; claw with no inner flap, 21–24 μm, TR = 3.7–4.2; empodium slightly shorter than claw, 15–18 μm, EU = 0.6–0.7; S-shaped seta about 1.5 times longer than claw, 30–35 μm. Dorsal sensillum *t1* extremely broad, surpassing base of *t2*, BS = 1.3–1.5; *t2* thick, reaching base of *g*; *t3* slender. Exterior sensillum *a* very broad, surpassing base of *c*; *b* distal to *c* ; *c* long, surpassing base of *d*; *d* nearer to *e* than to *c*; *f* and *g* distal to *t3*; *g* slightly thick; additional sensillum *x* present and thick. Interior sensillum *a'* seta-like, reaching base of *e; b'* and *c'* absent. Middle tarsus 20–23 μm, claw 18–20 μm; hind tarsus 23–24 μm, claw 20–21 μm; both empodia about 6 μm (Fig. 9); both tarsi with tunica-lobe (Fig. 10).

Chaetotaxy given in Table 1. *A3* on thoracic tergites II and III very short, sensillum-like, often absent (Figs. 11 & 12); *P5* on thoracic tergite III small, sensillum-like (Fig. 12). Accessory setae absent on thorax and abdomen except for *P1a* on abdominal tergite VIII. *P1a* on tergite VIII inflated (Figs. 13 & 17). Dorsal seta *1* on telson small and oblong (Fig. 14). Ventral setae *1* on XI and *1* and *2* on telson small (Fig. 15).

Thoracic tergites II and III with submedial pore (*sm*) (Figs. 11 & 12). Posteromedial pore (*psm*) present on abdominal tergites I–VII but often indistinct on I–IV (Fig. 13). Other pores indistinct on thorax and abdomen.

Abdominal appendages I–III with four setae and a terminal vesicle (Fig. 16). Transverse row of small granules present on anterior part of tergite VII; row of granules present at anterior central part of tergite VIII (Fig. 13). Striate band on VIII absent (Fig. 13). Two transverse lines present on tergite VII; several transverse lines on tergite VIII (Fig. 13). Comb on tergite VIII with about 15 small teeth, anterior part with a few small teeth (Fig. 17). Female squama genitalis with rod-like acrostylus (Fig. 18). Male squama genitalis with 3 + 3 dorsal (Fig. 19) and 4 + 4 ventral setae (Fig. 20).

Table 1. Chaetotaxy of *Fujientomon primum* Imadaté from the Imperial Palace.

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4	1, 2	2-2 6	A, M P1, 2, 3
	II	(4) 6 10	A2, (3), 4 P1, 2, 3, 4, 5	4-2 4	A1, 2, M P1, 2
	III	(2) 4 10	A2, (3) P1, 2, 3, 4, 5	4-2 4	A1, 2, M P1, 2
Abdomen	I-III	3 8	Ac, 2 P1, 2, 3, 5	4 4	A1, 2 P1, 2
	IV-VII	3 10	Ac, 2 P1, 2, 3, 4, 5	4 6	A1, 2 P1, 2, 3
	VIII	6 12	A2, 4, 5 P1, 1a, 2, 3, 4, 5	4 4	A1, 2 P1, 2
	IX-X	10	1, 2, 3, 4, 5	4	1, 2
	XI	10	1, 2, 3, 4, 5	8	1, 2, 3, 4
Telson		9	c, 1, 2, 3, 4	10	1, 2, 3, 4, 5

Remarks. Imadaté (1974) wrote that "The mouthparts seem to be similar to those of *Hinomotentomon*, but an exact observation is impossible, as the only existing specimen is in poor condition. The apices of maxillary and labial palpi are ornamented with a tuft of setae." However, this study proved that the labial palpus ended in a thick seta, i.e., without a tuft of setae, and has no basal sensillum. This structure is unique among Protura. Another species of this genus, *F. dicestum,* from China has the same structure (Yin, 1977; Fig. 2). Hence, this is certainly a diagnostic character for this genus.

Foretarsal sensillum *c* is placed in about the same row as *b* in the original description. However, all specimens examined show that *c* is posterior to *b* and *b* is situated in the same row with seta *α3*. It seems likely that the positions of *α3* and *c* are reversed in the original description. Setae *A3* on thoracic tergites II and III were not recognized in the original description. In this study, two specimens had the setae, whereas the other two did not. *A3* is very short and sensillum-like. This is a unorthodox shape for the principal seta. Hence, more specimens are needed to clarify whether the setae are stable or not. Slight differences were found between the original description and these results for the position of foretarsal sensilla *d*, *f* and *g*, and the chaetotaxy of abdominal tergites VIII–XI and sternite of telson. However, it is likely that these discrepancies are due to intraspecific variations.

The head chaetotaxy of this species is more similar to that of Acerentomata (Rusek *et al*., 2012) than that of Eosentomidae (Bernard, 1990). However, the number of setae of this species is fewer than that of Acerentomata. Although it is difficult to apply the terms used by Rusek *et al*. (2012) to this species, the modified setae on the head likely correspond to *sd5*.

Chaetotaxic variations were observed. *A3* on abdominal tergite III was asymmetrically present in one female. In one female, *A1* on abdominal tergites II and III were present instead of *Ac*, and *A2* on abdominal sternites II–IV were microsetae. Nine anterior setae (*Ac, 2, 3, 4, 5*) on abdominal tergite VII were observed in another female.

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「皇居の生物相調査第 II 期」で得られたカマアシムシの稀種，フジカマアシムシ

中村　修美

「皇居の生物相調査第 II 期」により，2009年と2010年に皇居の駐春閣跡近辺からフジカマアシムシ科フジカマアシムシ属の稀種，フジカマアシムシが採集されたので，これらの標本に基づき記載した．下唇肢の形態，皮孔の分布，毛序の個体変異について報告した．