

New Species of the Genus *Pheretima* s. lat. (Annelida, Oligochaeta, Megascolecidae) from Tokyo, Japan—Part III. Species with Simple Intestinal Caeca (1)

Kotaro Ishizuka

Seikei High School, 3–10–13 Kichijoji-kitamachi, Musashino City, Tokyo, 180–8633 Japan

Abstract In the third series of the study on the genus *Pheretima* s. lat. (family Megascolecidae) collected from Tokyo, a group of the species with Simple intestinal caeca is dealt with and 7 new species are described here: *Pheretima imperfecta*, *Ph. tamaensis*, *Ph. hiberna*, *Ph. hypogaea*, *Ph. stipata*, *Ph. elliptica* and *Ph. quintana*.

Key words: Megascolecidae, *Pheretima* s. lat., new species, Tokyo.

Introduction

Forty seven undescribed species of the genus *Pheretima* s. lat. were found from Tokyo. Among them, 11 new species of manicate intestinal caeca were described in the first part (Ishizuka, 1999a) and 10 new species of serrate intestinal caeca in Part II (Ishizuka, 1999b). In Part III, 7 new species of simple intestinal caeca are described.

***Pheretima imperfecta* sp. nov.**

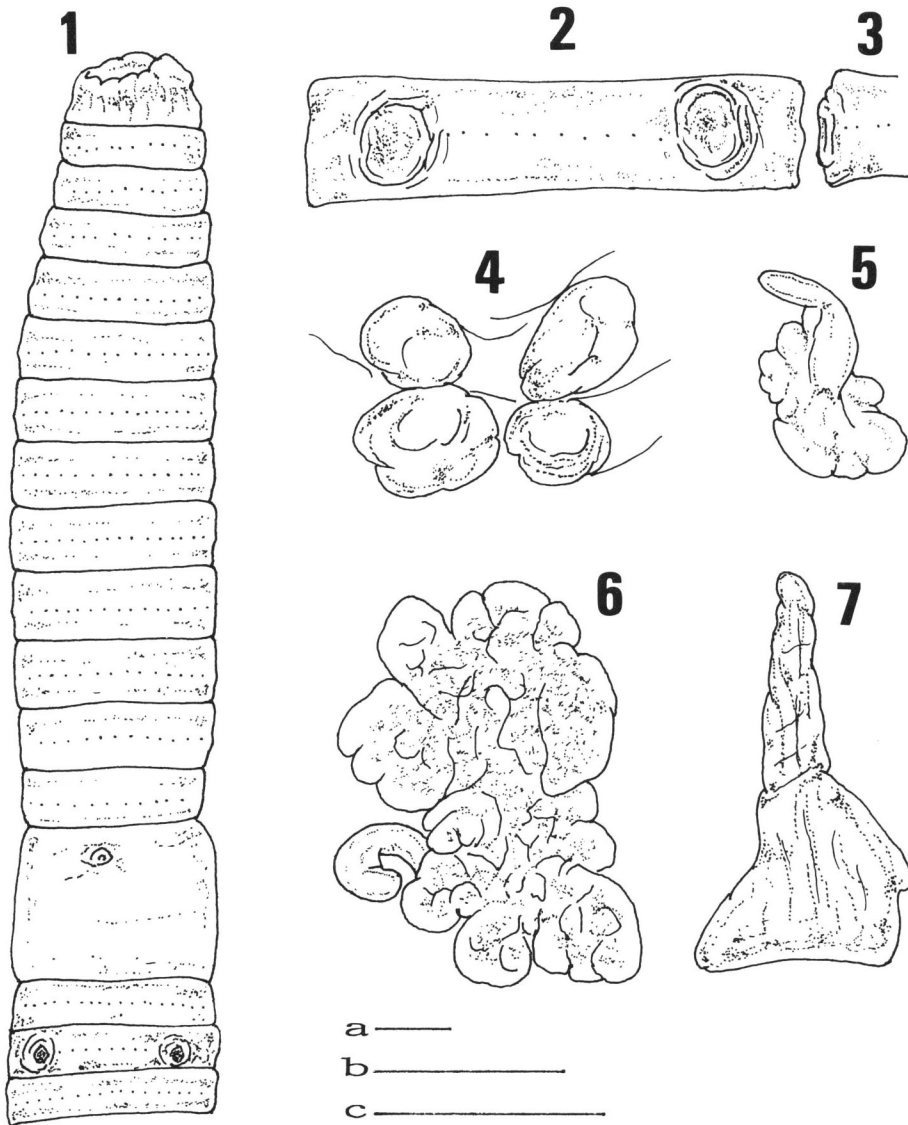
[New Japanese name: Tsuchihiroko-mimizu]

(Figs. 1–7, Table 3)

Description. Body. Length 49–92 mm, width 2.4–3.6 mm. Number of segments 95–96. Brown dorsally, yellowish grey ventrally.

External characters. Spermathecal pores absent, occasionally situated in furrow 5/6 (one side) or 7/8 (one side). Genital markings absent. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/4 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 75–80 in segment VII, 79–86 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4 segments. Intestine begins in XV. Genital glands absent. Septa absent in 8/9/10, delicate in 5/6/7/8 and slightly thickened in 10/11/12/13/14. Spermathecae absent, occasionally present (ampulla only). Seminal vesicles small, extending to the dorsal line in segments XI–XII. Prostata extending through segments XVIII–XX and occasionally absent, ducts associated with male pores.



Figs. 1–7. *Pheretima imperfecta* sp. nov. Holotype (NSMT-An 279). 1: Ventral view of anterior body. 2: Male pores on segment XVIII. 3: Lateral view of segment XVIII. 4: Dorsal view of seminal vesicles. 5: Spermathecae. 6: Prostate gland with a duct. 7: Intestinal caecum. (Scale bars. a: 1 mm for 1, b: 1 mm for 4, 6–7, c: 1 mm for 2–3, 5.)

Material examined. Holotype (NSMT-An 279) and 5 paratypes (NSMT-An 280): From soil under a mixed forest of evergreen and deciduous trees, Mt. Takao, 14-X-1998, K. Ishizuka. Other specimens examined: 4 exs. with same data as the

type series.

Remarks. The new species resembles *Pheretima oyuensis* Ohfuchi 1937, but is distinguishable from the latter species by (1) the presence of male pores, and (2) occasionally presence of spermathecal pores (one side only).

***Pheretima tamaensis* sp. nov.**

[New Japanese name: Tama-mimizu]

(Figs. 8–17, Tables 1–2)

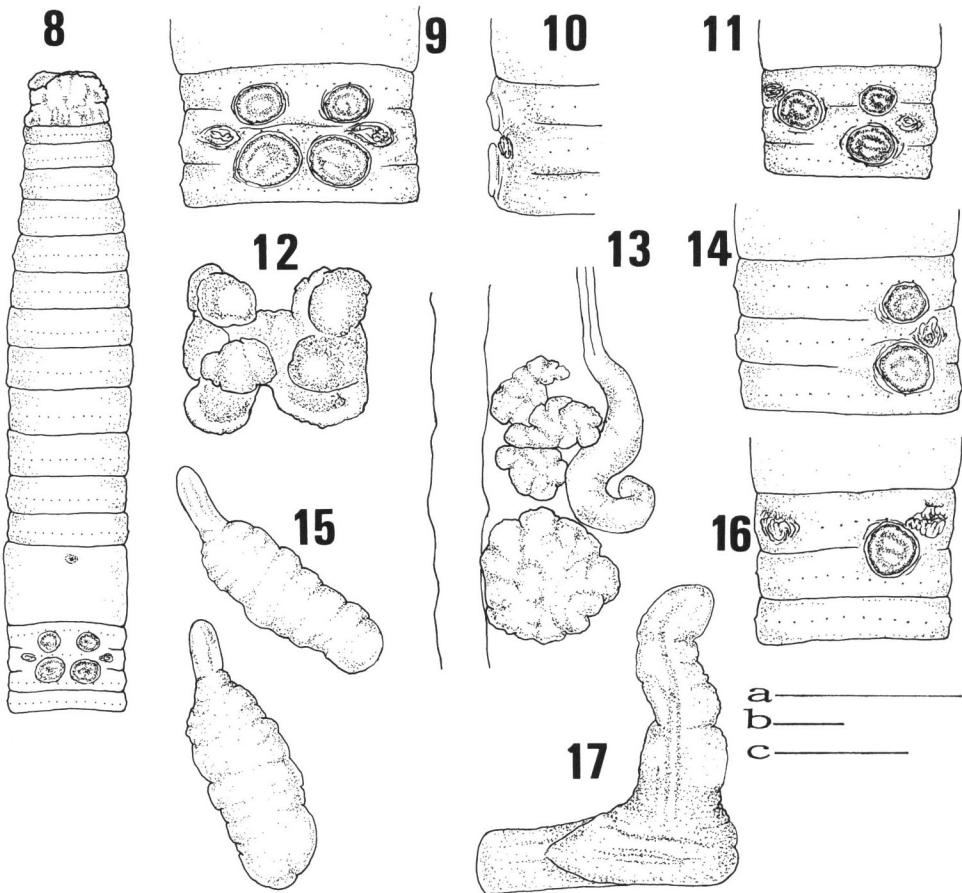
Description. Body. Length 60–90 mm, width 2.5–3.5 mm. Number of segments 65–105. Light purplish brown dorsally, giving out a beautiful luster of violet light, yellowish grey ventrally.

External characters. Two pairs of spermathecal pores small, paired, situated in furrow 6/7/8, in ventro-lateral side, separated by a distance of ca. 1/4 body circumference. Genital markings very large, paired, circular to oval sucker-shape; postclitellar median to the line of male pore, postsetal on segments XVII–XVIII (extending to the intersegmental at 17/18 and 18/19), variable in the number and situation. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 26–32 in segment VII, 30–37 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4–5 segments. Intestine begins in XV. Genital glands large, paired, glandular masses, on segments XVII–XVIII (extending to the intersegmental at 17/18 and 18/19), associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8, slightly thickened in 10/11/12/13/14. Two pairs of spermathecae in segments VII–VIII; ampulla, a long pouch with a stout

Table 1. The number and the position of genital markings of *Ph. tamaensis* sp. nov. Eighty individuals of from Tokyo.

| Number of genital markings | Position | Number of individuals |
|----------------------------|--|-----------------------|
| 0 | Absent | 0 |
| 1 | One on either side of 7/8 | 1 |
| 1 | One on either side of 8/9 | 11 |
| 2 | One pair on 8/9 | 4 |
| 2 | One on either side of 7/8 and 8/9 | 6 |
| 3 | One pair on 7/8, one on either side of 8/9 | 1 |
| 3 | One pair on 8/9, one on either side of 7/8 | 13 |
| 4 | One pair on 7/8/9 | 44 |



Figs. 8–17. *Pheretima tamaensis* sp. nov. Holotype (NSMT-An 281). 8: Ventral view of anterior body. 9, 11, 14, 16: Male pores and genital markings on segment XVIII. 10: Latetal view of segments XVIII–XIX. 12: Dorsal view of seminal vesicles. 13: Prostate duct and glandular masses. 15: Spermathecae. 17: Intestinal caecum. (Scale bars: a: 5 mm for 8, 11, b: 1 mm 9–10, 12, 14, 16, c: 1 mm for 13, 15, 17.)

short duct; diverticulum absent. Seminal vesicles extending to the dorsal line in segments XI–XII. Prostata ducts associated with male pore.

Material examined. Holotype (NSMT-An 281) and 5 paratypes (NSMT-An 282): From soil under a mixed forest of evergreen and deciduous trees, Higashi-kurume City 19–VII–1981, K. Ishizuka. Other specimens examined: 74 exs. with same data as the type series, 68 exs. Hoya City, 29–VII–1983. 26 exs. Rikugien, 25–VII–1983. 18 exs. Meiji-jingu, 2–VIII–1983. 27 exs. Asukayama Park, 25–VIII–1983. 30 exs. The Imperial Palace, 22–VII–1996. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima micronaria* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) two pairs of spermathecal pores, and (2) genital markings so large, that they touch with neighboring ones (twice to thrice the size of those in *Ph. micronaria*).

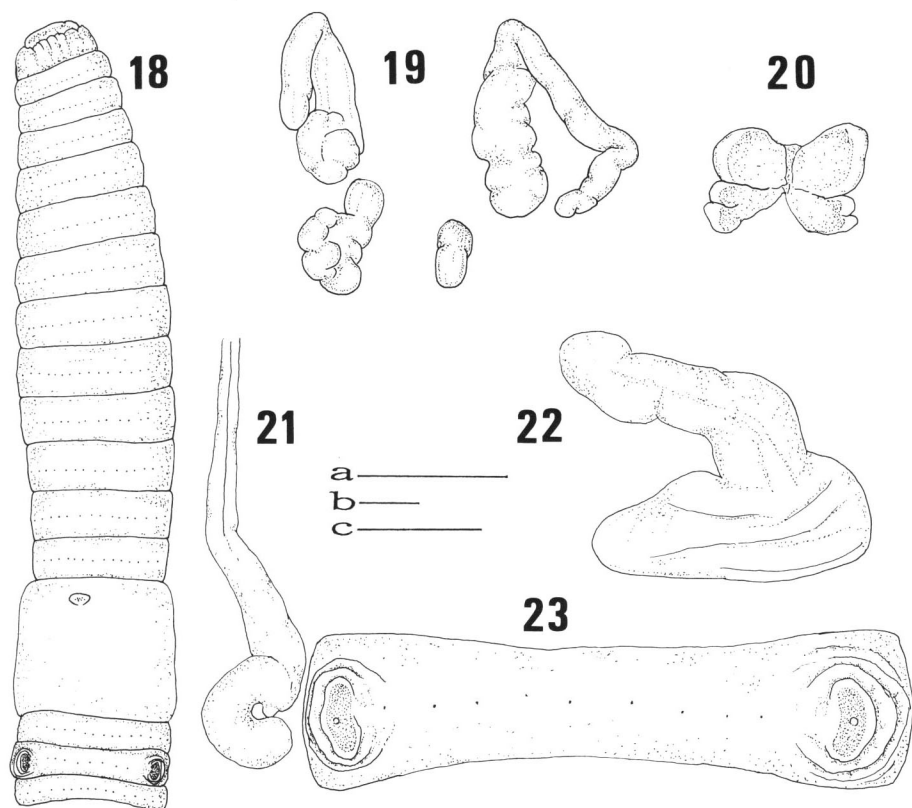
***Pheretima hiberna* sp. nov.**

[New Japanese name: Fuyu-mimizu]

(Figs. 18–23, Table 3)

Description. Body. Length 114 mm, width 4.1 mm. Number of segments 94. Light brown dorsally, yellowish grey ventrally.

External characters. Two pairs of spermathecal pores small, paired, situated in furrows 7/8/9 in ventro-lateral sides, separated by a distance of ca. $2/5$ body circum-



Figs. 18–23. *Pheretima hiberna* sp. nov. Holotype (NSMT-An 283). 18: Ventral view of anterior body. 19: Spermathecae. 20: Dorsal view of seminal vesicles. 21: Prostate duct. 22: Intestinal caecum. 23: Male pores on segment XVIII. (Scale bars. a: 5 mm for 18, b: 1 mm for 20, c: 1 mm for 19, 21–23.)

ference. Genital markings absent. Male pores simple, broad bean-shape, superficial on segment XVIII, separated by a distance of ca. $2/5$ body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 44 in segment VII, 44 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3 segments. Intestine begins in XIV. Genital glands absent. Septa absent in 8/9/10, thickened in 5/6/7/8 and 10/11/12/13/14. Two pairs of spermathecae small, in segments VIII–IX, occasionally poorly developed; ampulla, a saccular pouch with a stout duct; diverticulum, a long tubed pouch, occasionally poorly developed or lacking. Seminal vesicles small, extending to the dorsal line in segments XI–XII. Prostata ducts associated with male pore.

Material examined. Holotype (NSMT-An 283): Mt. Mitake 27–VII–1980, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees.

Remarks. The new species resembles *Pheretima phaselus* Hatai 1930, but is distinguishable from the latter species by (1) two pair of spermathecal pores, (2) two pair of spermathecae, and (3) saccular shaped ampulla.

***Pheretima hypogaea* sp. nov.**

[New Japanese name: Jingu-mimizu]

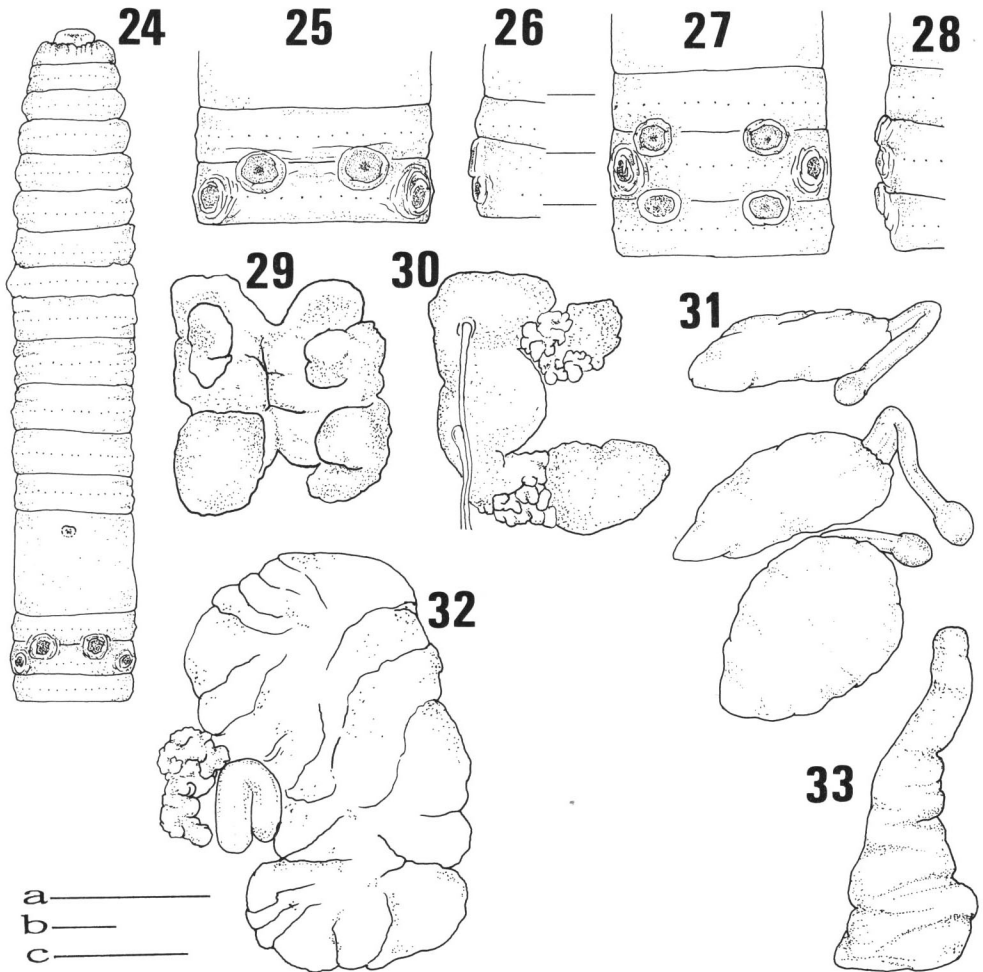
(Figs. 24–33, Table 2)

Description. Body. Length 65–100 mm, width 2.5–3.5 mm. Number of segments 90–105. Light brown dorsally, with light yellowish grey ventrally.

External characters. Three pairs of spermathecal pores large, situated in furrows 6/7/8/9 in ventro-lateral sides separated by a distance of ca. $1/3$ body circumference. Genital markings large, paired, circular to oval sucker-shape; postclitellar median to the line of the male pores, presetal on segments XVIII–XIX, variable in the number and situation (out of the eleven individuals, six have a pair of genital mark-

Table 2. Characters of the three related species with genital markings posterior to clitellum of the genus *Pheretima*.

| | Spermathecal pores | Size of genital markings | Dorsal coloration | Habitat |
|--|--------------------|--------------------------|----------------------|-----------|
| <i>Ph. micronaria</i> (Goto et Hatai) | Four pairs | Large | Light pinkish brown | Grassland |
| <i>Ph. tamaensis</i> sp. nov. | Two pairs | Very large | Light purplish brown | Coppice |
| <i>Ph. hypogaea</i> sp. nov. | Three pairs | Large | Light brown | Coppice |



Figs. 24–33. *Pheretima hypogaea* sp. nov. 24–26, 29–33: Holotype (NSMT-An 284). 27–28: Paratype (NSMT-An 285). 24: Ventral view of anterior body. 25: Male pores and genital markings on segments XVII–XVIII. 26: Lateral view of segments XVII–XVIII. 27: Male pores and genital markings on segments XVII–XIX. 28: Lateral view of segments XVII–XIX. 29: Dorsal view of seminal vesicles. 30: Lateral view of seminal vesicles. 31: Spermathecae. 32: Prostate gland with a duct and glandular masses. 33: Intestinal caecum. (Scale bars: a: 5 mm for 24, b: 1 mm for 25–28, 31, c: 1 mm for 29–30, 32–33.)

ings on segments XVIII–XIX and five a pair, on segment XVIII). Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 31–37 in segment VII, 38 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XIV and occasionally XV. Genital glands, paired, glandular masses, paired, on segments XVIII–XIX (extending to the intersegmental at 17/18 and 18/19), associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8, slightly thickened in 10/11/12/13/14. Spermathecae three pairs in segments VII–IX; ampulla consisting of a large pouch and a short duct; diverticulum consisting of a small oval and a tubular duct. Seminal vesicles, extending on segments XI–XII. Prostata large, extending through segments XVII–XX, ducts corresponding to male pores.

Material examined. Holotype (NSMT-An 284) and 5 paratypes (NSMT-An 285): Meiji-Jingu, 24–IX–1985, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 1 ex. with same data as the type series. 5 exs. Ueno Park, 5–X–1985. All the specimens were collected by the authors.

Remarks. The position of postclitellar genital markings are peculiar in this species. The new species resembles *Pheretima micronaria* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) three pairs of spermathecal pore, and (2) presence of diverticulum.

***Pheretima stipata* sp. nov.**

[New Japanese name: Soramame-mimizu]

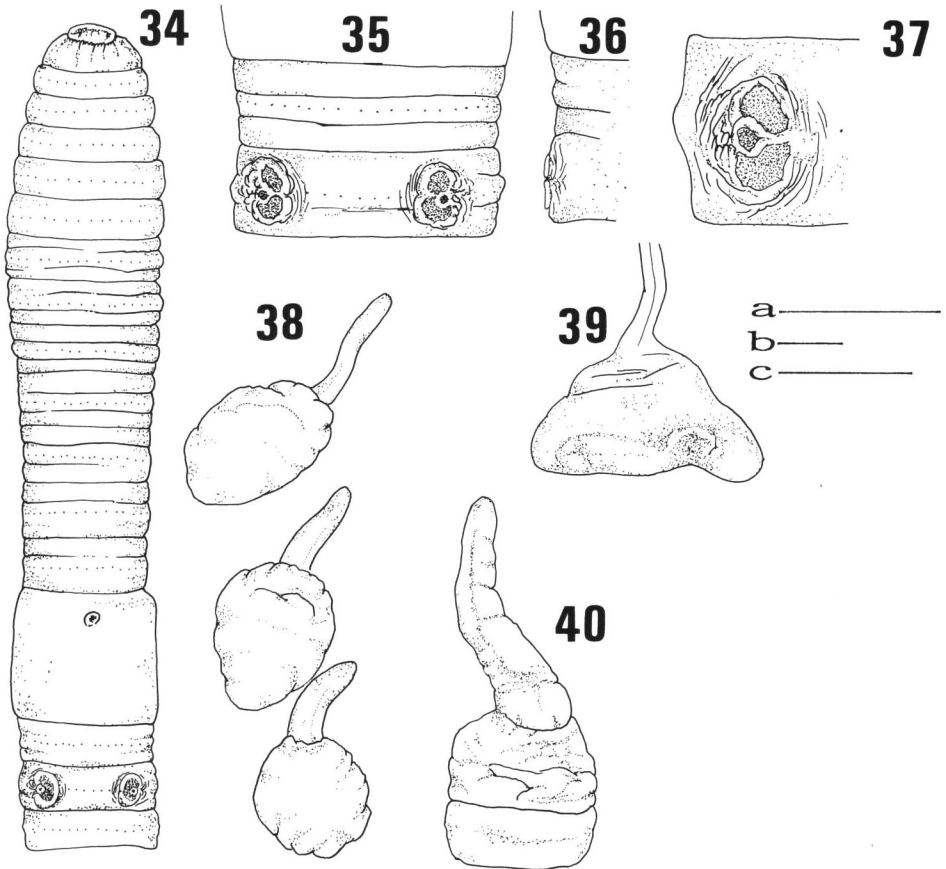
(Figs. 34–40, Table 3)

Description. Body. Length 85–130 mm, width 3.0–4.5 mm. Number of segments 80–115. Light brown dorsally, greyish white ventrally.

External characters. Three pairs of spermathecal pores minute, situated in furrows 6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings absent. Male pore large, broad bean shape, superficial on segment XVIII, separated by a distance of ca. 1/5 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Setal number 35–40 in segment VII, 41–48 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XV. Genital glands absent. Septa absent in 8/9/10, thickened in 5/6/7/8 slightly thickened in 10/11/12/13/14. Three pairs of spermathecae, in segments VII–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum absent. Seminal vesicle small, extending in segments XI–XII. Prostata glands often lacking, ducts associated with male pores.

Material examined. Holotype (NSMT-An 286) and 5 paratypes (NSMT-An 287): Meiji-jingu, 24–IX–1985, K. Ishizuka. from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 10 exs. with same data as the type series. 1 ex. Ueno Park, 5–X–1985. All the specimens were collected by the au-



Figs. 34–40. *Pheretima stipata* sp. nov. Holotype (NSMT-An 286). 34: Ventral view of anterior body. 35, 37: Male pores and genital markings on segment XVIII. 36: Lateral view of segment XVIII. 38: Spermathecae. 39: Prostate duct. 40: Intestinal caecum. (Scale bars: a: 5 mm for 34, b: 1 mm for 35–36, 40, c: 1 mm for 37–39.)

thors.

Remarks. The new species resembles *Pheretima mutica* Chen 1938, but is distinguishable from the latter species by (1) position of spermathecal pores in furrows 6/7/8/9, and (2) absence of diverticulum.

***Pheretima elliptica* sp. nov.**

[New Japanese name: Ichou-mimizu]

(Figs. 41–48, Table 3)

Description. Body. Length 90–125 mm, width 3.5–4.5 mm. Number of seg-

Table 3. Characters of the seven related species with simple intestinal caeca of the genus *Pheretima*.

| | Spermathecal pores | Male pores | Genital markings | Genital glands | Spermathecae | Body length |
|-----------------------------------|--------------------|------------------------------|------------------|------------------------|--------------|-------------|
| <i>Ph. oyuenis</i> Ohfuchi | Absent | Absent | Absent | Absent | Absent | 50–55 mm |
| <i>Ph. mutica</i> Chen | Three pairs | Present Bean-shape | Absent | Absent | Present | ? |
| <i>Ph. phaselus</i> Hatai | Three pairs | Present Kidney bean-shape | Absent | Absent | Present | 80–130 mm |
| <i>Ph. imperfecta</i> sp. nov. | Absent | Present Simple | Absent | Absent | Absent | 50–90 mm |
| <i>Ph. hiberna</i> sp. nov. | Two pairs | Present Broad bean-shape | Absent | Absent | Present | 114 mm |
| <i>Ph. stipata</i> sp. nov. | Three pairs | Present Broad bean-shape | Absent | Absent Only ampulla | Present | 85–130 mm |
| <i>Ph. elliptica</i> sp. nov. | Three pairs | Present Simple | Absent | Absent | Present | 90–120 mm |

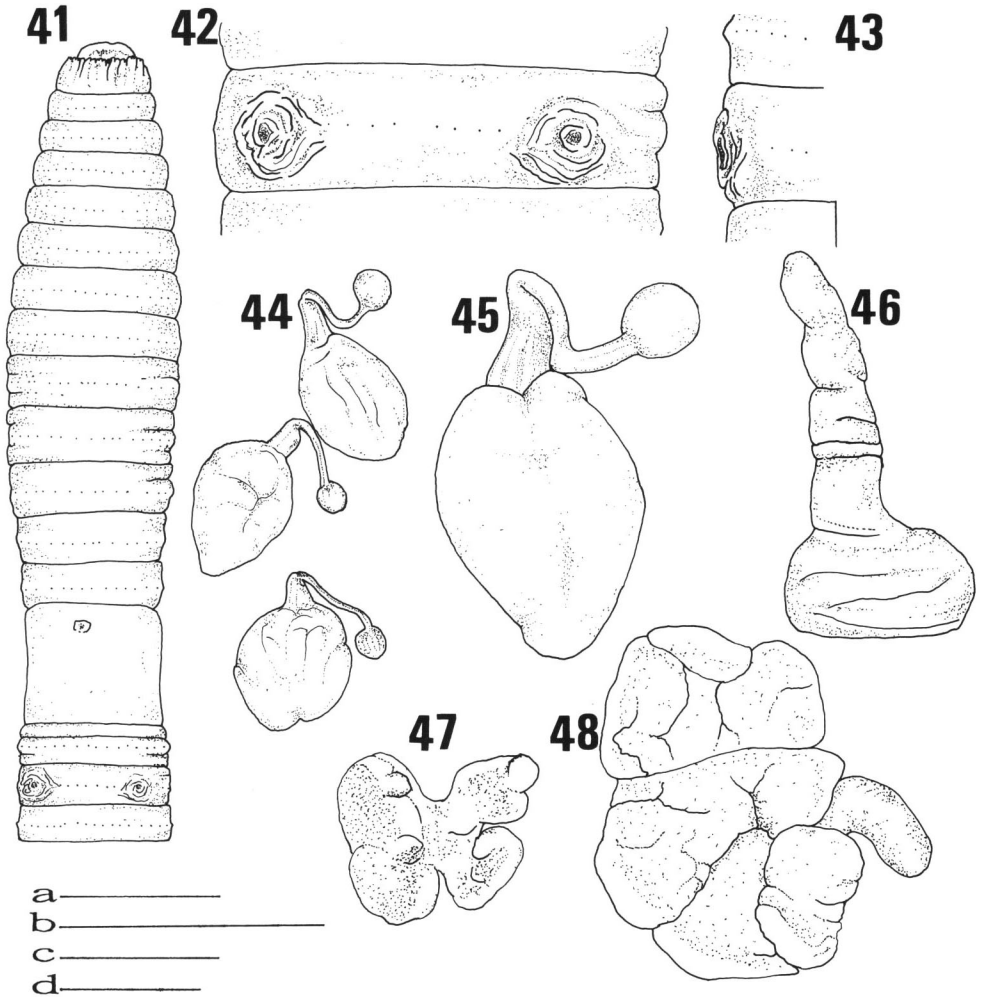
ments 80–115. Light brown dorsally, greyish white ventrally.

External characters. Three pairs of spermathecal pores minute, situated in furrows 6/7/8/9 in ventro-lateral sides, separated by a distance of ca. 1/4 body circumference. Genital markings absent. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/4 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 36–42 in segment VII, 44–50 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XIV or XV. Genital glands absent. Septa absent in 8/9/10, thickened in 5/6/7/8, slightly thickened in 10/11/12/13/14. Three pairs of spermathecae on segments VII–IX; ampulla consisting of a shovel-shaped pouch and a short duct; diverticulum a small and oval, with a slender tubular duct. Seminal vesicles very small, extending to the dorsal line in segments XI–XII. Prostata extending through segments XVII–XIX, ducts corresponding to male pores.

Material examined. Holotype (NSMT-288) and 5 paratypes (NSMT-An 289): Botanical Gardens, Graduate School of Science, The University of Tokyo, 18-X-1985, K. Ishizuka, from soil of a grassy place. Other specimens examined: 22 exs. with same data as the type series. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima phaselus* Hatai 1930, but is distinguishable from the latter species by (1) position of spermathecal pores in furrows 6/7/8/9, (2) simple male pores, on medium-sized porophores, and (3) a small



Figs. 41–48. *Pheretima elliptica* sp. nov. Holotype (NSMT-An 288). 41: Ventral view of anterior body. 42: Male pores on segment XVIII. 43: Lateral view of segment XVIII. 44–45: Spermathecae. 46: Intestinal caecum. 47: Dorsal view of seminal vesicles. 48: Prostate gland with a duct. (Scale bars: a; 5 mm for 41, b; 1 mm for 45, c; 1 mm for 42–43, 48, d; 1 mm for 44, 46–47.)

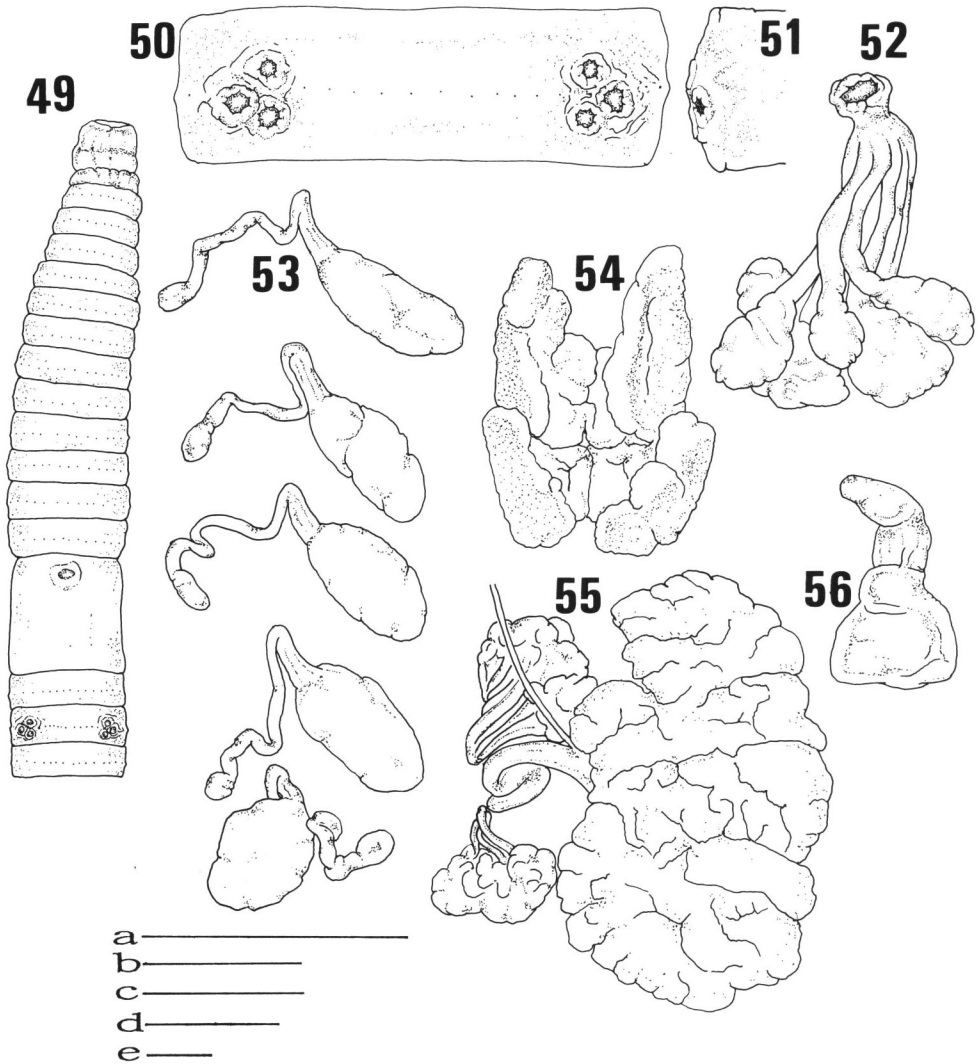
oval diverticulum, and a slender tubular duct.

Pheretima quintana sp. nov.

[New Japanese name: Gotsui-mimizu]

(Figs. 49–56)

Description. Body. Length 65–80 mm, width 2.5–3.0 mm. Number of seg-



Figs. 49–56. *Pheretima quintana* sp. nov. Holotype (NSMT-An 290). 49: Ventral view of anterior body. 50: Male pores and genital markings on segment XVIII. 51: Lateral view of segment XVIII. 52: genital gland (complex duct). 53: Spermathecae. 54: Dorsal view of testes and seminal vesicles. 55: Prostate gland with duct and genital glands (complex duct). 56: Intestinal caecum. (Scale bars. a: 1 mm for 50–52, b: 5 mm for 49, c: 1 mm for 55, d: 1 mm for 53, e: 1 mm for 54, 56.)

ments 72–90. Reddish brown dorsally, light yellowish grey ventrally.

External characters. Five pairs of spermathecal pores situated in furrows 4/5/6/7/8/9 in ventr-olateral sides, separated by a distance of ca. 1/3 body circumference.

Genital markings paired, circular sucker-shape, depressed; postclitellar slightly median to the line of the male pores, closely associated with male pores, pre- and postsetal on segment XVIII. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Genital markings and male pores of the same size and form. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 42–46 in segment VII, 44–46 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4 segments. Intestine begins in XV. Genital glands on segment XVIII as complex duct bearing several capsulogenous glands, with a stout duct, which has a dozen pieces of large capsulogenous glands. Septa absent in 8/9, very delicate in 9/10, thin in 5/6/7/8 and 10/11/12/13/14. Five pairs of spermathecae in segments V–IX; ampulla consisting of a shovel-shaped pouch and a short thick duct; diverticulum comprising of a small oval pouch and a slender twisted tubular duct. Sernal vesicle large, extending to the dorsal line on segments XI–XII. Prostata large, extending through segments XVII–XX, ducts corresponding to male pores.

Material examined. Holotype (NSMT-An 290) and 5 paratypes (NSMT-An 291): Ohtanba Valley, 30–VIII–1985, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 2 exs. with same data as the Holotype. 32 exs. Ohtanba Valley, 30–VIII–1985, 11 exs. Mt. Mitake, 21–IX–1985. 16 exs. Mizunesawa, 7–IX–1985. All the specimens were collected by the authors.

Remarks. Five pairs of spermathecal pores and the complex duct bearing several capsulogenous glands are peculiar in this species. The new species resembles *Pheretima micronaria* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) five pairs of spermathecal pores, (2) presence of diverticulum, and (3) the complex duct bearing several capsulogenous glands.

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