

# 沖縄島北部山地帯から採集されたAmynthus属(フトミミズ科)の3新種

誌名	Edaphologia
ISSN	03891445
著者名	安座間,安史 石塚,小太郎
発行元	日本土壌動物研究会
巻/号	103号
掲載ページ	p. 25-32
発行年月	2018年11月

農林水産省 農林水産技術会議事務局筑波産学連携支援センター  
Tsukuba Business-Academia Cooperation Support Center, Agriculture, Forestry and Fisheries Research Council  
Secretariat



# Three new earthworm species of the genus *Amynthas* (family Megascolecidae) from northern mountainous part of Okinawa-jima Island, Japan

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Received: 31 October 2017; Accepted 20 August 2018

**Abstract** Three new earthworm species of the genus *Amynthas* (Family Megascolecidae) were described from the forest area, northern part of Okinawa-jima Island. *A. surculatus* sp. nov. is characterized by single large circular sucker-shaped genital markings at mid-ventral line and post-setal on segments 7–8 (occasionally 6–8); scientific name refers to the large circular sucker-shaped genital marking at pre-clitellar. *A. glaucus* sp. nov. is characterized by thick-short figure and greenish body color; scientific name refers to greenish body color. *A. cucurbitae* sp. nov. is characterized by large gourd-shaped colored patch types external markings, close to male pore; scientific name refers to the gourd-shaped external markings. Three new species are distinguishable from the other congeneric species by combinations of the following character status; 1) number of spermathecal pore, 2) number and situation of genital markings, 3) external markings, 4) spermathecae, 5) genital glands, 6) body size and body color.

**Key words:** *Amynthas*, Megascolecidae, new species, Okinawa-jima Island

## Introduction

To date, sixteen species of the genus *Pheretima* s. lat. have been recorded from Okinawa-jima Island (Kobayashi, 1941; Ohfuchi, 1956, 1957a,b; Ishizuka *et al.*, 2000). These Okinawa *Pheretima* s. lat. species could be divided into four genera, *Amynthas*, *Metaphire*, *Pithmera* and *Polypheretima*, according to the recent classification suggested by Sims and Easton (1972) and Easton (1979, 1981).

Recently, we collected a lot of earthworms from northern mountainous part of Okinawa-jima Island. We recognized some described species belongs to genus *Amynthas* and three new species were found from these specimens. These species distinctly differs in several characters from the other congeneric species and will be described here in as new species. The holotype and paratypes are deposited in The University Museum (Fujyukan) University of the Ryukyus (RUMF), Okinawa Prefecture.

## Materials and Methods

Collected earthworms were carried to the laboratory

keeping alive and anesthetized in water by dropping 70% ethanol. Anesthetized worms were killed by 10% formalin and fixed within over 12 hours. Fixed specimens were preserved in glass tubes with 5% formalin-water solution. External and internal morphology of the earthworms were observed by stereoscopic microscopes (Nikon SMZ800). Terminology is used mainly that of Sims and Easton (1972), but partly based on Ishizuka (1999, 2001, 2015).

## Systematics

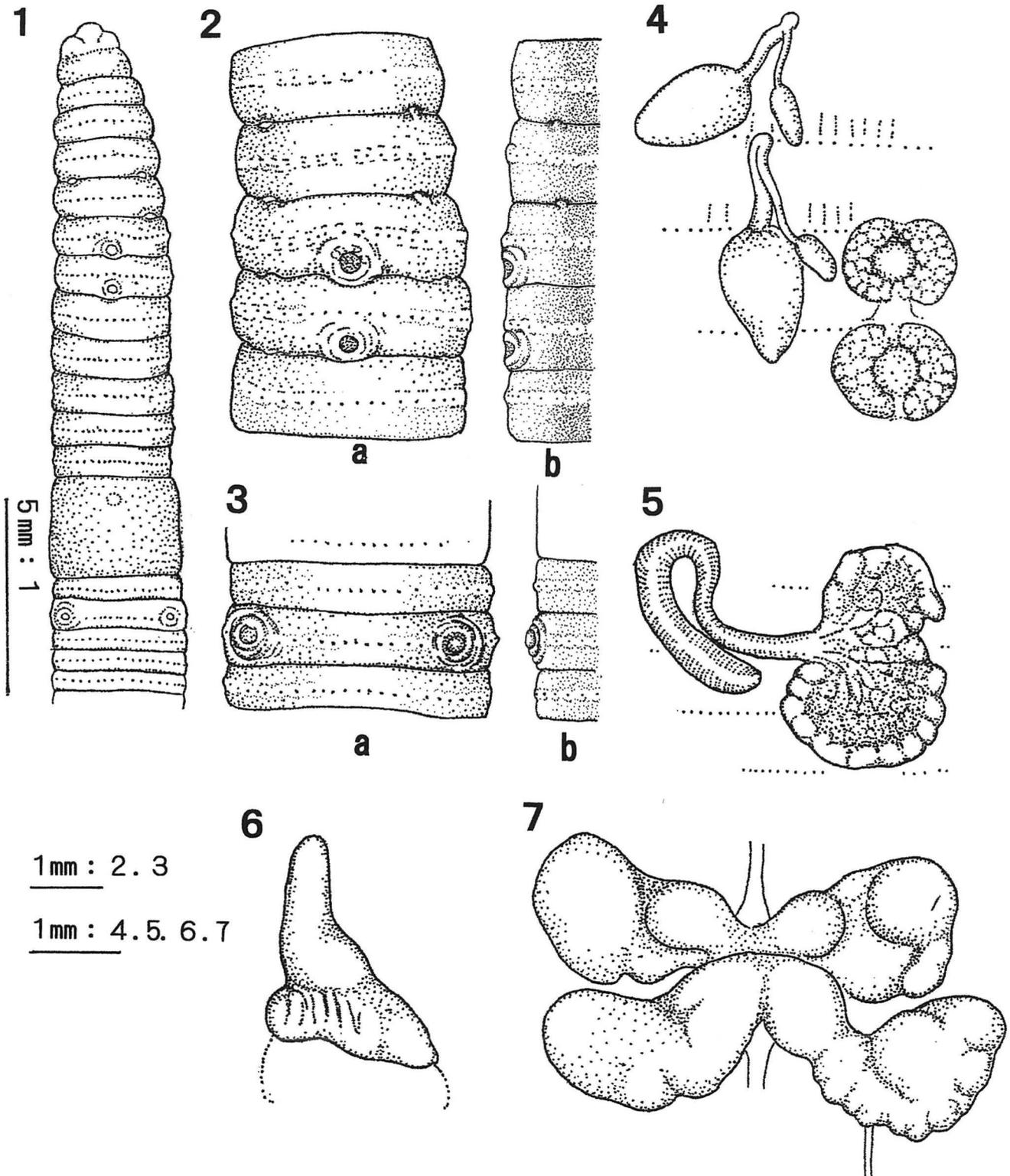
### *Amynthas surculatus* sp. nov.

[Japanese name: Munemaru-mimizu]

(Fig.1)

## Diagnosis

Two pairs of spermathecal pores in furrows 5/6/7. Male pores superficial at large sucker shaped porophore on segment 18. Genital markings single, large circular sucker shape at mid-ventral line, post-setal of segments 7–8. Simple intestinal caeca, originating in segment 27.



**Fig. 1.** *Amynthus surculatus* sp. nov. Holotype (RUMF-ZO-00013). 1: Ventral view of anterior body. 2: Spermathecal pores and genital markings on segments 5–9 (a: ventral view, b: lateral view). 3: Male pores on segments 18 (a: ventral view, b: lateral view). 4: Spermathecae and genital glands. 5: Prostate glands with a duct. 6: Intestinal caecum. 7: Dorsal view of testes and seminal vesicles.

### Material examined

Holotype (RUMF-ZO-00013): collected from litter and humus soil under the natural forest dominated by *Castanopsis sieboldii*, nearby Mt. Nishime-dake, Kunigami Village, Okinawa-jima Island, southwestern Japan, 26°48' 12" N, 128°16' 22" E, 350 m a.s.l., 15-II-1999, collected by Y. Azama and K. Ishizuka. One paratype (RUMF-ZO-00014): collected from same locality as holotype, 7-XII-2014, by Y. Azama. Three paratypes (RUMF-ZO-00015-17): same data as the holotype.

### Description

**Measurement and color:** Body length 60–90 mm, width 2.8–3.5 mm in segment 13. Number of segments 91–115. Dark-brown dorsally, light-brown ventrally, dark-brown clitellum.

**External characters:** Two pairs of spermathecal pores situated in furrows 5/6/7, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings single, large circular sucker shape, situated on mid-ventral line, post-setal on segments 7–8, occasionally segments 6–8 in pre-clitellar, absent in post-clitellar. First dorsal pore beginning in furrow 11/12. Clitellum occupying segments 14–16. Female pore single, mid-ventrally on segment 14. Male pore paired in segment 18, simple, superficial, separated by a distance of ca. 1/3 body circumference. Setal number 40–54 in segment 7, 45–52 in segment 20, 8–11 between male pores.

**Internal characters:** Two pair spermathecae situated in segments 6–7; ampulla large and peach-shape, duct almost equal in length of ampulla; diverticulum with slender duct and oval-shaped chamber. Genital glands situated in segments 7–8 (occasionally segments 6–8), glandular masses type, large round shape, associated with the genital markings restricted to body wall. Septa absent in 8/9/10 thickened in 5/6–7/8 and slightly thickened in 10/11–13/14. Seminal vesicles large, extending to the dorsal line in segments 11–12. Intestine begins in segment 15. Prostate glands pairs in segment 18, extending through segments 17–20, U-shaped long duct associated with male pores. Simple intestinal caeca paired, originating in segment 27, extending anteriorly for 3–4 segments.

**Etymology:** The specific epithet "*surculatus*" in Latin word means "sucker". This name refers to the morphological characteristics of this species which has large circular sucker-shaped genital markings in pre-clitellar.

### Remarks

The new species is distinguishable from the other congeneric species which shared morphological characteristics

such as two pairs of spermathecal pores in furrows 5/6/7 and simple intestinal caeca, by single large circular sucker-shaped genital markings, at mid-ventral line post-setal on segments 7–8 (occasionally 6–8) in pre-clitellar (Chang *et al.*, 2009; Chen, 1931, 1933, 1935, 1936, 1938, 1946; Chen *et al.*, 1975; Gates, 1935, 1972; Ishizuka, 2001, 2015; Ishizuka and Minagoshi, 2014).

### *Amyntas glaucus* sp. nov.

[Japanese name: Midori-futomimizu]

(Fig.2, Table 1)

### Diagnosis

Three pairs of spermathecal pores in furrows 6/7/8/9. Male pores paired on segment 18, transverse slit on top of elliptical protuberance. Genital markings absent. Simple intestinal caeca, originating in segment 27.

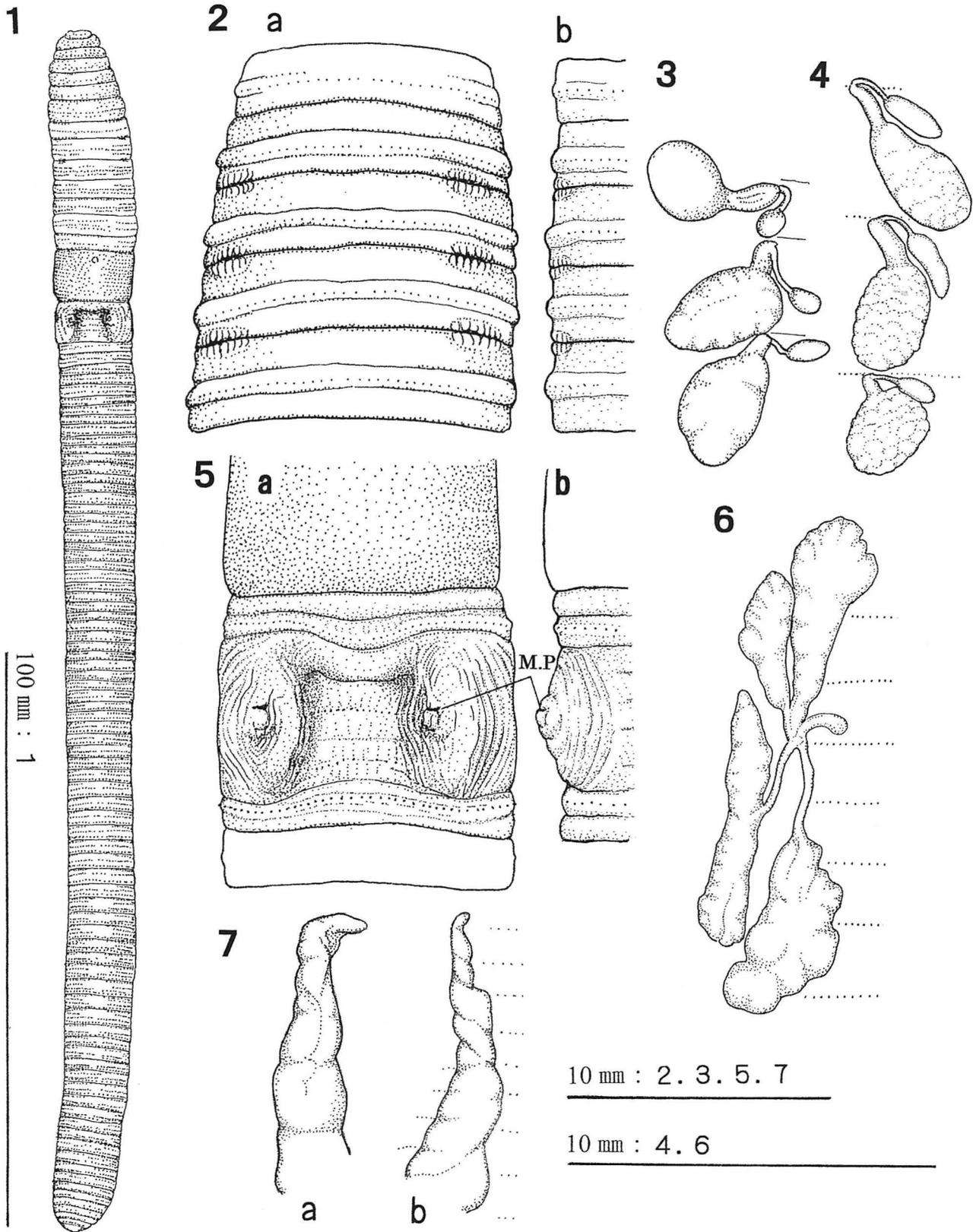
### Material examined

Holotype (RUMF-ZO-00018): collected from the road just after the rain under the natural forest dominated by *C. sieboldii*, nearby Mt. Nishime-dake, Kunigami Village, Okinawa-jima Island, 26°48' 12" N, 128°16' 22" E, 320 m a.s.l., 4-X-1999, by Y. Azama. One paratype (RUMF-ZO-00019): collected from same locality as holotype, 15-II-1999, by Y. Azama and K. Ishizuka. Another paratype (RUMF-ZO-00020): collected from accumulated layer of litter and humus soil on a road, path through the secondary forest of broad-leaved tree, nearby Mt. Nago-dake, Nago city, Okinawa-jima Island 26°34' 52" N, 128°00' 34" E, 250 m a.s.l., 27-III-2015, by Y. Azama,

### Description

**Measurement and color:** Body Length 165–260 mm, width 9.9–11.5 mm in segment 13. Number of segments 75–144. Live specimens bluish-green or greenish-brown dorsally and clitellum, light greenish-gray ventrally. Preserved specimens brown dorsally, light-gray ventrally, dark-brown clitellum.

**External characters:** Three pairs of spermathecal pores situated in furrows 6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings absent, but external markings (genital glands absent) paired, swelled serrated lip-liked pad, closely and surrounded each spermathecal pores in pre-clitellar. First dorsal pore beginning in furrow 12/13. Clitellum occupying segments 14–16. Female pore single, mid-ventrally on segment 14. Male pores paired, in segment 18, transverse slit on top of elliptical protuberance



**Fig. 2.** *Amynthus glaucus* sp. nov. Holotype (RUMF-ZO-00018). 1: Ventral view of body. 2: External markings on segments 5–9 (a: ventral view, b: lateral view). 3, 4: Spermathecae. 5: Male pores and external markings on segments 17–21 (a: ventral view, b: lateral view). 6: Prostate glands with a duct. 7: Intestinal caecum at right side (a: ventral view, b: dorsal view).

**Table 1.** A comparison of characters among *Amynthas glaucus* sp. nov. and *A. sexpectatus* Tsai, Shen & Tsai, 1999 of Taiwan.

Character	<i>Amynthas glaucus</i> sp. nov.	<i>Amynthas sexpectatus</i>
Body length (mm)	166-260	193-258
Body width (mm)	10-11.5	—
Number of segments	75-144	102-140
Number of setae VII	76-90	56-72
XX	93-112	66-94
MP <sup>1)</sup>	12-17	17-24
Spermathecal pore	6/7/8/9	6/7/8/9
External markings (genital glands absent)	swelled serrated lip-liked pads surround each spermathecal pore	large oval disk-liked pads present on VI-VIII
Spermathecae	diverticulum, short duct, simple sausage-shaped pouch	diverticulum, short duct, granular sausage-shaped pouch

MP<sup>1)</sup> number of setae between Male pore

which elongated from post-setal on segment 17 to pre-setal on segment 19, separated by a distance of ca. 1/3 body circumference. Ventral body wall between each male pores, depressed strongly. Setal number 76–90 in segment 7, 91–112 in segment 20, 12–17 between male pores.

**Internal characters:** Three pairs of spermathecae in segments 7–9, ampulla consisting of an oval-shaped pouch and a short stout duct; diverticulum consisting of an oval or sausage-shaped pouch and short slender duct. Septa absent in 8/9/10, thickened in 5/6/–7/8 and greatly thickened in 10/11–12/13. Genital glands absent. Seminal vesicle small, extending in segments 11–12. Intestine begins in segment 15. Prostate large and diverges four longitudinal lobes, extending through segments 16–22, short ducts associated with the male pores. Simple intestinal caeca paired, originating in segment 27, extending to anteriorly for 5-8 segments.

**Etymology:** The specific epithet “*glaucus*” in Latin word means “bluish grey or light bluish green”. This name refers to greenish body color of this species.

#### Remarks

The new species has three spermathecal pores in furrows 6/7/8/9 and simple intestinal caeca, and is characterized by thick-short figure and greenish body color. The new species resembles *Amynthas sexpectatus* (Tsai *et al.*, 1999) of Taiwan, but is distinguished by 1) male pores transverse slit on the top of elliptical protuberance (male pores at the top of corn-shaped porophore in *Amynthas sexpectatus*), 2) spermathecal diverticulum consisting of short duct and smoothed sausage-shaped

pouch (consisting of short duct and granulated sausage-shaped pouch in *Amynthas sexpectatus*), 3) external markings (genital glands absent) which swelled serrated lip-liked pads surround each spermathecal pores (oval-shaped disk-liked genital pads on posterior end of segments 6–8 in *Amynthas sexpectatus*). The comparison of characters between the new species and *Amynthas sexpectatus* are summarized in Table 1. (Chang *et al.*, 2009; Chen, 1931; 1933, 1935, 1936, 1938, 1946; Chen *et al.*, 1975; Gates, 1935, 1972; Ishizuka 2001, 2015; Ishizuka and Minagoshi, 2014; Nakamura 1999),

#### *Amynthas cucurbitae* sp. nov.

[Japanese name: hyoutan-mimizu]

(Fig.3)

#### Diagnosis

Four pairs of spermathecal pores in furrows 5/6/7/8/9. Male pores simple, superficial on segment 18. Gourd-shaped colored patch types external markings (genital glands absent), close to male pores, on segments 17–19. Simple intestinal caeca, originating in segment 27.

#### Material examined

Holotype (RUMF-ZO-00021): collected from humus soil under the natural forest dominated by *C. sieboldii*, nearby Mt. Nishime-dake, Kunigami Village, Okinawa-jima Island, 26°48' 12" N, 128°16' 22" E, 340 m a.s.l., 18-XII-1998, by Y. Azama and K. Ishizuka. Five paratypes (RUMF-ZO-00022-26): same data as the holotype.

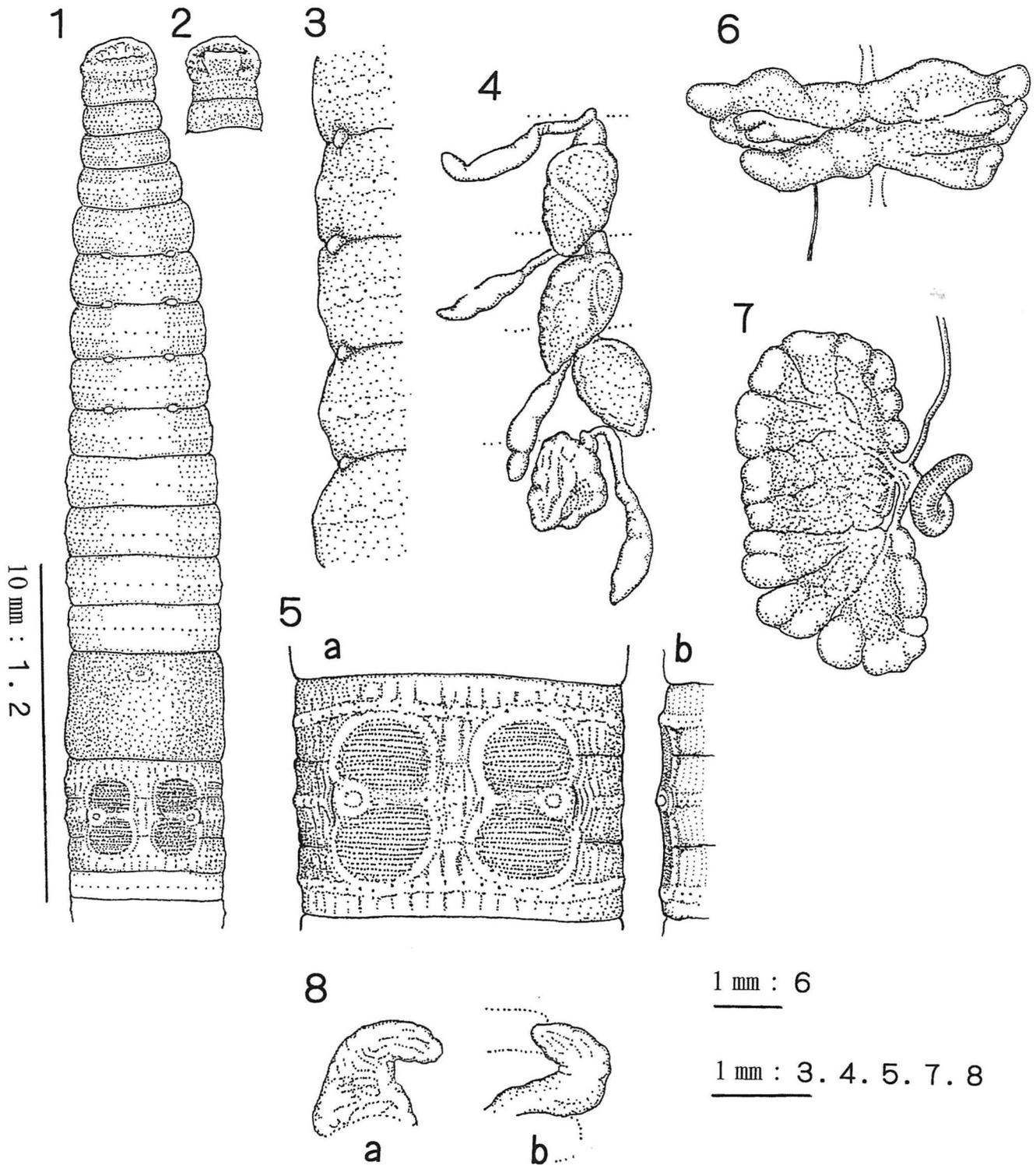


Fig. 3. *Amynthes cucurbitae* sp. nov. Holotype (RUMF-ZO-00021). 1: Ventral view of anterior body. 2: Dorsal view of prostomium. 3: External markings in contacts with each spermathecal pores on segments 5–9. 4: Spermathecae. 5: Male pore and external markings on segments 17–19 (a: ventral view, b: lateral view). 6: Dorsal view of testes and seminal vesicles. 7: Prostate glands with a duct. 8: Intestinal caecum at right side (a: ventral view, b: dorsal view).

## Description

**Measurement and color:** Body Length 53–74mm, width 2.6–3.1 mm in segment 13. Number of segments 79–102. Purplish-brown dorsally, light yellowish-grey ventrally, dark-brown clitellum.

**External characters:** Four pairs of spermathecal pores situated in furrows 5/6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/4 body circumference. Genital markings absent, but two types external markings (genital glands absent) paired, one is granular and it contacts each spermathecal pores in pre-clitellar; another one is large gourd-shape colored patch types, close to male pores, extend from post-setal on segment 17 to pre-setal on segment 19 in post-clitellar. First dorsal pore beginning in furrow 12/13. Clitellum occupying segments 14–16. Female pore single, mid-ventrally on segment 14. Male pores paired, superficial on segment 18, separated by a distance of ca. 1/4 body circumference. Setal number 24–28 in segment 7, 28–34 in segment 20, 3–4 between male pores.

**Internal characters:** Spermathecae four pairs in segments 6–9; ampulla consisting of a shovel-shaped pouch and a short duct; diverticulum consisting of a sausage-shaped pouch and a duct. Genital glands absent. Septa absent in 8/9/10, thickened in 5/6/7/8 and 10/11. Seminal vesicles small, extending in segments 11–12. Intestine begins in segment 15. Prostate extending through segments 16–21, twisted duct associated with the male pores. Simple intestinal caeca paired, originating in segment 27, extending to anteriorly for 2–3 segments.

**Etymology:** The specific epithet "*cucurbitae*" in Latin word means "gourd". This name refers to the morphological characteristics of this species which has gourd-shaped external markings closed to male pore.

## Remarks

The new species is distinguishable from the other congeneric species which shared morphological characteristics such as four pairs of spermathecal pores in furrows 5/6/7/8/9 and simple intestinal caeca, by large gourd-shaped colored patch type external markings (genital glands absent) close to male pores and extend from post-setal on segment 17 to pre-setal on segment 19 in post-clitellar (Chang *et al.*, 2009; Chen, 1931, 1933, 1935, 1936, 1938, 1946; Chen *et al.*, 1975; Gates, 1935, 1972; Ishizuka, 2001, 2015; Ishizuka and Minagoshi, 2014).

## Acknowledgments

The authors thank to Norimasa Shimabukuro, reside in Nago city, for his support of collecting earthworms and

Takeshi Sasaki, University Museum (Fujyukan) University of the Ryukyus, for kindness support and variable advice.

## 摘要

安座間安史<sup>1</sup>・石塚小太郎<sup>2</sup> ( <sup>1</sup>〒905-0019 沖縄県名護市大北3-12-55・<sup>2</sup>〒203-0003 東京都東久留米市金山町2-7-15) : 沖縄島北部山地帯から採集された *Amyntas* 属 (フトミミズ科) の3新種。

沖縄島の北部山地帯のイタジイの優先する森林からフトミミズ科の3新種を命名記載した。 *Amyntas surculatus* sp. nov. (和名: ムネマルミミズ) は第7・8体節 (稀に6・7・8体節) の腹面正中線上の剛毛線後方に吸盤状の性徴を有するのが特徴である。学名および和名は性徴の形状および位置にちなんだ。 *A. glaucus* sp. nov. (和名: ミドリフトミミズ) は太く短い体型と緑色がかかる体色が特徴である。学名および和名は体型と体色にちなんだ。 *A. cucurbitae* sp. nov. (和名: ヒョウタンミミズ) は第17~19体節に雄性孔を挟むように褐色の“ヒョウタン形”の外部標徴を有するのが特徴である。3新種は受精囊孔対数, 性徴, 外部標徴, 受精囊, 生殖線, 体色・体形などにより同属の既知種と区別できる。

キーワード: *Amyntas* 属, フトミミズ科, 沖縄島, 新種

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