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A New Record Earthworm *Amynthas masatakae* (Beddard) (Megascolecidae: Oligochaeta) from Taiwan

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ABSTRACT

This paper reports one new record of a megascolecid earthworm from Taiwan: *Amynthas masatakae* (Beddard, 1892), which was collected from Dong-Yan Mt. Previously, *A. masatakae* was only known from Japan. To now in Taiwan, this species has only been recorded in a small area of Dong-Yan Mt. in northern Taiwan, so little is known about its ecological data here. The external and internal characters of *A. masatakea* are described in this paper.

Key words: new record earthworm, Taiwan, *Amynthas*

INTRODUCTION

Taiwan is located in both tropical and subtropical regions of the western edge of the Pacific Ocean. The topography of Taiwan is complex, including mountains, hills, and plains. Due to the complex topography and geomorphology, terrestrial animals, such as earthworms, present great diversity.

The earthworm fauna of Taiwan has not been extensively studied. Before the 1970s (Tsai, 1964; Shin *et al*., 1999), only 24 species of earthworms were reported here. During the 1970s to the 1990s, there was a cessation of earthworm research in Taiwan. Some related studies on the earthworm fauna of Taiwan were again initiated after 1990. To the present, 44 nominal species of earthworms in Taiwan have been reported. All of them are megadrile earthworms (Oligochaeta: Annelida) (Kobayashi, 1938; Gates, 1959; Tsai, 1964; Chen and Shin, 1996; Shih *et al*., 1999; Tsai *et al*., 1999; Shen and Tsai, 2002; Shen *et al*. 2002; Tsai *et al*., 2000a, b, c, 2002; Tsai *et al*., 2000).

The family Megascolecidae is dominant and consists of 38 species in Taiwan. Among them, the genera *Amynthas* and *Metaphire* are dominant and consist of 33 species. The genus *Amynthas* is divided from the genus *Pheretima* (Pheretimoid-group). Before 1972, the genus *Pheretima* in the Megascolecidae was the largest genus in the animal kingdom, with more than 700 nominal species (Sims and Easton, 1972). This genus is also the largest and the most important group in Taiwan. In 1972, Sims and Easton divided the genus *Pheretima* into eight

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new genera (Sims and Easton, 1972; Easton, 1979), because *Pheretima* was too large to be effectively studied. *Amynthas* is one of these eight genera. Its morphology is similar to that of the genus *Metaphire*, but *Amynthas* species lack copulatory pouches. This paper describes a new record of *Amynthas* from Taiwan, *Amynthas masatakae*.

Amynthas masatakae was first described by Beddard (1892), and was only recorded from Japan. This is the first report of *A. masatakae* outside of Japan (Beddard, 1892; Kaminhira, 1973). It has never been reported from Taiwan in the past (Goto and Hatai, 1898; Kobayashi, 1938; Tsai, 1964). In this paper, the external and internal characters of *A. masatakae* are described, and we also compare these characters with the original material.

MATERIALS AND METHODS

The collected earthworms were anesthetized in a 10% ethyl-alcohol solution, fixed in a 10% formalin water solution, and preserved in a 70% ethyl-alcohol solution. Specimens were collected on 2 December 2001 and 16 November 2002 at an elevation of around 1000 m at Dong-Yan Mt., northern Taiwan (25°53'N, 121°21'E). Their habitat consists of bushes and fallen leaves. The soil characteristics is humic with much organic materials.

RESULTS

Amynthas masatakae (Beddard) 1892

Amynthas masatakae (Beddard) Zool. Jb. Syst. (1892) 6: 755-766. The following description was based on 12 preserved mature specimens with well-developed clitella and reproductive organs.

Total length 105-138 mm, clitellum width 4.0-7.5 mm, segment number 96-138. Protomium epilobous. setae 34-41 in VII, 41-49 in XX, 13-15 between male pores. First dorsal pore in XI/XII. Clitellum XIV-XVI, length 3-4.5 mm, smooth, setae and dorsal pore absent.

Spermathecal pores 2 pairs in VII/VIII-VIII/IX, ventro-lateral. Distance between pores 0.31-0.38 of body circumference apart. Pores visible, each in a depressed furrow with a tiny projection. Genital papillae in VII-VIII, 1 located immediately anteriorly to spermathecal pore and the other posteriorly to spermathecal pore. Some of the papillae are partially embedded in the pore. Each papilla is circular and flat with a slightly concave center.

Female pore single, medio-ventral in XIV. Male pore paired in XVIII, ventro-lateral, distance between the pores 0.3-0.33 of body circumference (Fig. 1a). Each male pore with 2 papillae forming a flat triangle: male pore latero-medial, one papillae ventro-anterior to setae, the other papillae ventro-posterior to setae, and all of them surrounded by 2 or 3 circular flods (Fig. 1b).

Color of preserved specimens in 70% ethyl alcohol, dark brown on dorsum and around clitellum, yellowish on ventrum.

Septa V/VI-VI/VII thickened, VIII/IX and IX/X absent. X/XI-XIII/XIV greatly thickened. Gizzard in IX-X, peach-shaped; yellowish white. Intestine enlarged from XV. Caeca paired in XXVII, extending 4 segments anteriorly to XXIII, simple, light brown, wrinkled, with saw-shaped borders (Fig. 1c).

Spermathecae 2 pairs in VII-VIII, ampulla oval-shaped, about 1.5 mm long, 1.5 mm wide, stout stalk not easily visible. Diverticulum with a long white strip of seminal chamber about 2.5 mm long and slender stalk about 2.5 mm long (Fig. 1d).

Sperm sac 2 pairs in X and XI, medio-ventral, small, yellowish, oval shaped, 2 vas deferentia on each side joining in segment XII. Seminal vesicles 2 pairs in XI and XII, large, yellowish white, with wrinkled surface (Fig. 1e). Prostate glands absent or very small, only appear prostatic duct in XVIII (Fig. 1f).

Table 1. Characters of these collections from Taiwan compared to the original paper of *Amynthas masatakae*(1892)

	A. masatakae (1892)	*A. masatakae* in Taiwan
Body length (mm)	134	105-138
No. of segments	90	96-138
First dorsal pore	-	XI/XII
Prostomium	epilobous	epilobous
Setae in VII	-	34-41
X	-	41-49
XVIII	-	13-15
Spermathecal pore	2 pairs (VII/VIII, VIII/IX)	2 pairs (VII/VIII, VIII/IX)
No. of spermathecae	2 pairs (VIII, IX)	2 pairs (VIII, IX)
Sperm sac	-	X, XI
Seminal vesicle	XI, XII	XI, XII
Prostate	absent, only duct	absent, only duct
Intestine origin	XV	XV
Genital papillae		
Preclitellar	VIII, IX	VII, VIII
Postclitellar	-	XVIII
Caeca paired	XXVI	XXVII- XXIII

Remarks

By comparing the characters of these collections in Taiwan to the original paper on *Amynthas masatakae*, such as the number and location of spermathecal pores, sperm sacs, seminal vesicles, and prostate glands as listed in Table 1, we confirm that the collections at Dong-Yan Mt. are *A. masatakae*. In particular, the number and location of spermathecal pores are very important to earthworm taxonomy, because they are related to copulation and reproduction. In addition, in most species of earthworms, the prostate gland is large, but it is absent from *A. masatakae*. This is a key character for identifying *A. masatakae*. The male pore is another key character for recognizing the species: each male pore has along with two papillae which form a flat triangle. Exclusive of those two papillae, no other papilla exists around the male pore. This morphology has not been described for other earthworm species.

DISCUSSION

The original paper (Beddard, 1892) does not illustrate *A. masatakae*. We confirmed that the collections are *A. masatakae* based on a review paper published by Kaminhira (1973), in which *A. masatakae* showed four taxonomic characters including male pores, prostate glands, caeca, and spermathecae. *Amynthas masatakae* has never

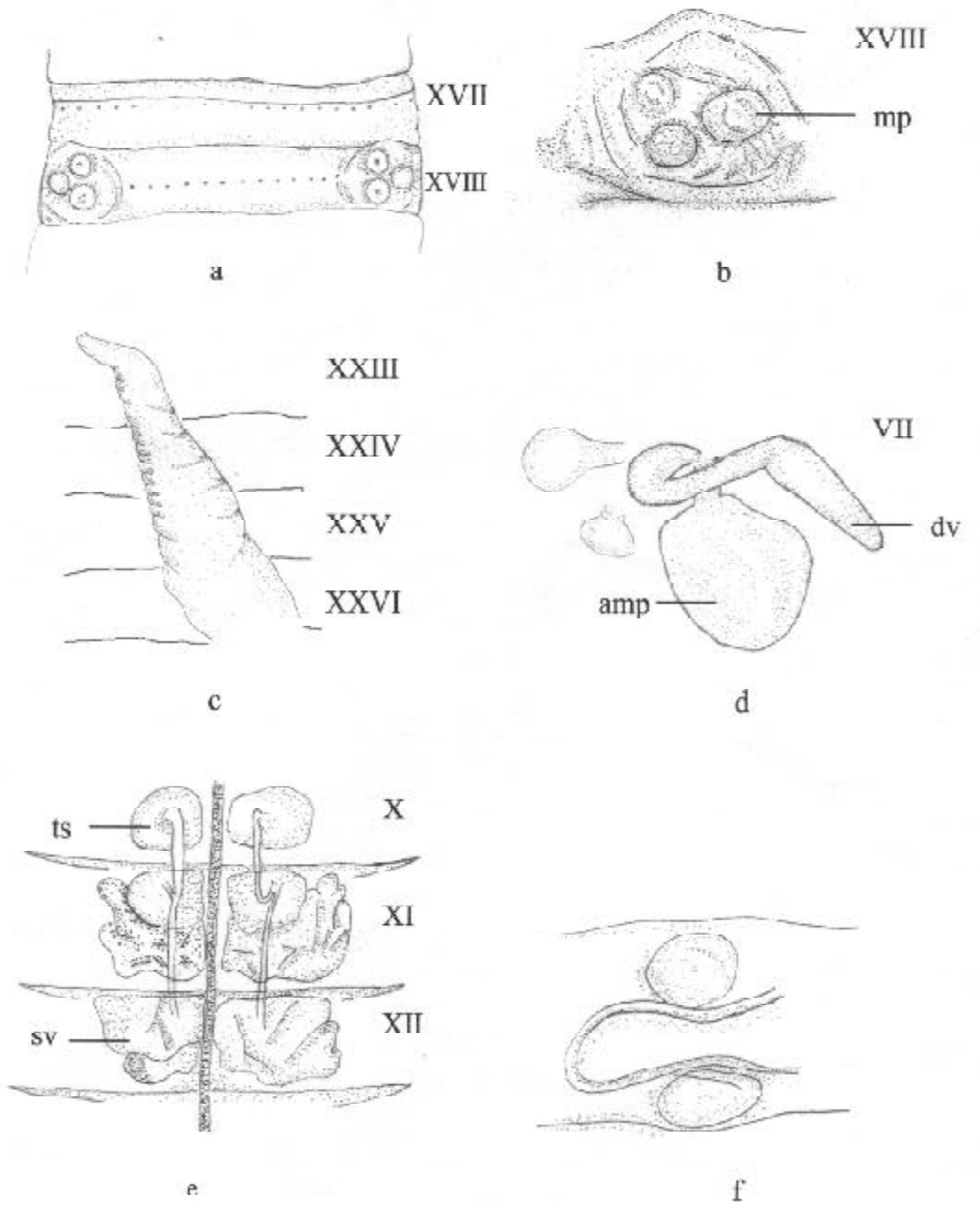

Figure 1. *Amynthas masatakae*: (a-b) male pore region (mp, male opening) (c) right caecae (d) left spermathecae (dv, diverticulum; amp, ampulla) (e) vetral view of sperm sacs (ts) and seminal vesicles (sv) (f) right prostate gland.

been reported from Taiwan before (Goto and Hatai, 1898; Kobayashi, 1938; Tsai, 1964). This is the first record.

We thought that they were exotic earthworms, not species native to Taiwan. The reason was very simple. Because this collection was restricted to the area of Dong-Yan Mt. at an elevation of about 1000 m, an important agricultural site for temperate fruits such as peaches since the 1980s in northern Taiwan, it is reasonable to suspect that the earthworms might have been transported into the area with those temperate fruits at some time in the past 20 years. This is one possible reason we only found them around agricultural farms. So far, we know little about its ecological data from Taiwan. Because exotic earthworms may compete with native species, we need to pay greater attention to these exotic species in the future.

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台灣新紀錄種蚯蚓三星遠盲蚓 *Amynthas masatakae*

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摘 要

本文描述一巨蚓科(family Megascolecidae) 台灣新紀錄種蚯蚓*Amynthas masatakae* (Beddard, 1892)，採集地點位於東眼山的北橫公路邊。此種蚯蚓原本只報告產於日本，在台灣目前只出現在台北桃園交界的東眼山，因此對其生態資料所知尚少。針對其外部形態及內部特徵作詳細描述。

關鍵字: 新紀錄種, 蚯蚓, 台灣, 遠盲蚓