THE FIRST RECORD OF *Metaphire birmanica* (Rosa, 1888)
IN VIETNAM, WITH NOTES ON SEVERAL EARTHWORM SPECIES

Dang Hai Lam¹*, Anh Duc Nguyen², Tung Thanh Nguyen³

INTRODUCTION

Almost all earthworms of Vietnam belong to the Pheretimoid group in the family Megascolecidae (207 species) (Nguyen et al., 2016a, 2016b, 2017, 2018, 2019; Nguyen & Lam, 2017; Lam et al., 2018). Prior to Nguyen et al. (2016), all Pheretimoid species were classified to only one genus *Pheretima* Kinberg, 1867 (Thai & Tran, 1986; Do, 1994; Nguyen, 1994; Le, 1995; Pham, 1995; Huynh, 1996; Thai, 2000). Although Blakemore (2007) tried to re-classify the Vietnamese earthworms in accordance with the system of Sims & Easton (1972), he seemed to have very superficial work because of lacking descriptive information and examining specimens. Nguyen et al (2016) provided the comprehensive checklist of the Vietnamese earthworms, all Pheretimoid species were listed in 6 genera including two argumentative genera, *Amynthas* (112 species) and *Metaphire* (54 species). In this list, several species were still placed in the same genera following the suggestions of Blakemore (2007). After checking specimens housed in the Can Tho University, we found that the generic positions of several species were wrong, and those species need to be confirmed with new information. Therefore, this work aimed to clarify the generic position of several species and additionally contributes a new record to the earthworm fauna of Vietnam.

Abstract. The Amynthas and Metaphire species recorded in Vietnam have been rechecked based on original descriptions and preserved specimens. As a result, *Metaphire birmanica* (Rosa, 1888) is recorded in Vietnam for the first time. The species is recognized by having three pairs of spermathecal pores in 5/6/7/8, male pores in xviii, presence of copulatory pouches, no genial markings, and manicate intestinal caeca. In addition, three species have been rechecked and re-assigned to different genera, namely *Amynthas tripidoporophoratus* (Thai & Nguyen, 1993) comb. nov., *Metaphire dranfocana* (Do & Huynh, 1993) comb. nov., *Metaphire anhumalatana* (Thai & Huynh, 1993) comb. nov.

Keywords: *Amynthas*, biodiversity, Megascolecidae, Metaphire, Pheretima, taxonomy, Vietnam

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MATERIALS AND METHODS

All species of two genera Amynthas and Metaphire listed in Blakemore (2007) and Nguyen et al. (2016) were rechecked using the original descriptions and preserved specimens including holotypes and paratypes. Samples observed in this study are being kept in the Laboratory of Zoology, Department of Biology, School of Education, Can Tho University. Earthworms were externally observed, dissected, and photographed under a microscope (Motic DM143-FBGG-C). For those species without preserved specimens, we used their original paper and confirmed it with species’ authors. Colour images of specimens and original drawings were provided for the better illustrative comparison.

Abbreviations: A = Aclitellate specimen; C = Clitellate specimen; CTU = Can Tho University, Can Tho, Vietnam; SORC = Soil Organism Research Center, Hanoi, Vietnam; ag = accessory gland; amp = ampulla; dv = diverticulum; gm = genital markings; mp = male pore; pn = penis; sg = seminal groove; sp = spermathecal pore.

RESULTS AND DISCUSSION

Taxonomic Part

Family: Megascolecidae (Rosa, 1891)
Genus: Metaphire (Sims & Easton, 1972)
Metaphire birmanica (Rosa, 1888)
(Figure 1, Table 1)
Perichaeta birmanica Rosa, 1888: 164.

Figure 1. Metaphire birmanica (Rosa, 1888)(A. Male region, ventral view; B. The copulatory pouch, transverse body section; C. Spermathecal region, ventral view; E. Prostate gland, left side; F. Intestinal caecum)
Type locality: Myanmar (Bhamof) (Rosa, 1888).
Type materials: Genoa Museum, Italy.
Examined material: 3C (CTU-EW.165.01), Thong Thu commune, Que Phong district, Nghe An province, 21/7/1987, coll. unknown.
History of materials: No record


Re-description


Three pairs of spermathecal pores in ventrolateral intersegment 5/6/7/8. Male pores located inside copulatory pouches which opened in the setal ring xviii; ventral distance between two openings of copulatory pouches about 0.35 body circumference. Genital markings absent in both spermathecal and male regions.


Spermatheca paired in vi–viii. Ampulla oval-shaped, ducts about 1/2 ampulla length. Diverticula shorter than ampulla, strongly waved and directly attached to the base of ampulla duct; seminal chamber small, oval-shaped. No accessory glands.


Distribution: Pakistan, Myanmar, China, Laos, Vietnam (Sarwar et al., 2006; Blakemore, 2006, 2007)

Vietnamese name: Giun miến điện

Remarks

Rosa (1888) described the species *Perichaeta birmanica* from poorly preserved samples from Burma (currently known as Myanmar). Those samples lack several important organs, and thus, intestinal caeca, prostomium, the ventral distance between male pores were missing in the original description. Gates (1972) re-described the species from newly collected samples in Myanmar. He provided the details of epilobous prostomium, manicate caeca, the ventral distance of male pores about 0.35 body circumference, and copulatory pouches. Recently, this species was also re-described from samples collected in Thailand (Bantaowong et al., 2011), but with the ventral distance between spermathecal pores, and between male pores of about 0.42 body circumference.

Although Blakemore (2006) listed the presence of this species in Vietnam, he has never checked specimens or explained the absence of this species in previous reports. Both the comprehensive checklists of Thai (2000) and Nguyen et al. (2016) did not list the species *Metaphire birmanica*, in Vietnam. There-
Therefore, we believe that the species has never officially reported from Vietnam. After checking the samples deposited in the Can Tho University, we found that these samples belong to the species, *Metaphire birmanica*. Our samples almost agree with the original description, with Gates (1972), and Bantaowong et al. (2011) except for several minor differences. The Vietnamese specimens slightly differ from the descriptions of Rosa (1888) and Gates (1972) in the first dorsal pore (11/12 vs. 12/13), more segments (141-168 vs. 112), and the longest part of caeca (first vs second). Our samples are also different from Thailand ones (Bantaowong et al., 2011) in the distance of spermatheca pores (0.3X vs. 0.4X); the shape of diverticula (zigzag vs. coiled) and the presence of lymph glands (absent vs. present). The detailed comparison is presented (Table 1).

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Length (mm)</td>
<td>92-98</td>
<td>130</td>
<td>100-160</td>
<td>85-210</td>
</tr>
<tr>
<td>Diameter (mm)</td>
<td>4.4-4.6</td>
<td>6</td>
<td>4-7</td>
<td>5.8-6.7</td>
</tr>
<tr>
<td>Segments</td>
<td>141-168</td>
<td>112</td>
<td>112</td>
<td>105-111</td>
</tr>
<tr>
<td>Spermathecal pores</td>
<td>5/6/7/8</td>
<td>5/6/7/8</td>
<td>5/6/7/8</td>
<td>5/6/7/8</td>
</tr>
<tr>
<td>Ventral distance between spermathecal pores</td>
<td>0.35X</td>
<td>0.42X</td>
<td>0.35X</td>
<td>0.45X</td>
</tr>
<tr>
<td>Prostomium</td>
<td>Epilobous</td>
<td>n/a</td>
<td>Epilobous</td>
<td>Epilobous</td>
</tr>
<tr>
<td>First dorsal pore</td>
<td>11/12</td>
<td>12/13</td>
<td>12/13</td>
<td>12/13</td>
</tr>
<tr>
<td>Pre-clitellum setae</td>
<td>109-117</td>
<td>70</td>
<td>70?</td>
<td>65-70</td>
</tr>
<tr>
<td>Post-clitellum setae</td>
<td>89-94</td>
<td>70</td>
<td>70?</td>
<td>63-69</td>
</tr>
<tr>
<td>Male pores</td>
<td>xviii, on conical penial body in small copulatory pouch</td>
<td>xviii, on slightly bulging pale areolas</td>
<td>xviii, on conical penial body in small copulatory pouch</td>
<td>xviii, onto the tumescent lips</td>
</tr>
<tr>
<td>Ventral distance between male pores</td>
<td>0.35X</td>
<td>0.42X</td>
<td>?</td>
<td>0.3X</td>
</tr>
<tr>
<td>Genital markings</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Ampulla</td>
<td>Oval</td>
<td>Oval</td>
<td>?</td>
<td>Large sac</td>
</tr>
<tr>
<td>Shape of diverticulum</td>
<td>Zigzag</td>
<td>Convoluted tube</td>
<td>Looped, zigzag</td>
<td>Coiled</td>
</tr>
<tr>
<td>Caeca (parts)</td>
<td>Manicate (4-6 parts)</td>
<td>?</td>
<td>Manicate (3-6 parts)</td>
<td>Manicate (3-6 parts)</td>
</tr>
<tr>
<td>Longest parts of caeca</td>
<td>First</td>
<td>?</td>
<td>Second</td>
<td>Second</td>
</tr>
<tr>
<td>Male organ system</td>
<td>Holandric</td>
<td>Holandric</td>
<td>Holandric</td>
<td>Holandric</td>
</tr>
<tr>
<td>Testis sacs</td>
<td>Separated</td>
<td>?</td>
<td>Unpaired</td>
<td>Paired</td>
</tr>
<tr>
<td>Last heart</td>
<td>xiii</td>
<td>?</td>
<td>xiii</td>
<td>xiii</td>
</tr>
<tr>
<td>Origin of intestine</td>
<td>xv</td>
<td>?</td>
<td>xv</td>
<td>xv</td>
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<tr>
<td>Typhlosole</td>
<td>Lameliform</td>
<td>?</td>
<td>Lameliform</td>
<td>Present</td>
</tr>
<tr>
<td>Prostate glands</td>
<td>Deeply lobuled in xvi-xxii</td>
<td>Deeply lobuled in 3 segments</td>
<td>Deeply lobuled in xvi-xx</td>
<td>Deeply lobuled in xvii-xxi</td>
</tr>
<tr>
<td>Prostatic duct</td>
<td>U-shaped</td>
<td>Curved</td>
<td>U-shaped loop</td>
<td>U-shaped</td>
</tr>
<tr>
<td>Lymph glands</td>
<td>Absent</td>
<td>?</td>
<td>Post caecal segment</td>
<td></td>
</tr>
</tbody>
</table>
**Metaphire anhumalatana** (Thai & Huynh, 1993) comb. nov. (Figure 2-A)


*A. anhumalatanus* -- Nguyen et al., 2016: 14


**Type locality:** Vietnam (Dak Lak: Yok Don province) (Thai et al., 1993).

**Type materials:** lost.

**Examined material:** no

**History of materials:** SORC, Vietnam. (Nguyen et al., 2016)


**Distribution:** Only known from Vietnam.

**Vietnamese name:** Giun cận nhumalat (Nguyen et al., 2016).

**Remarks:** Blakemore (2007) put the species into the genus *Amynthas*, but still with a question mark: *Amynthas? anhumalatanus*. Nguyen et al. (2016) confirmed this placement. However, it was a mistake because Thai et al. (1993) already mentioned male pores located inside copulatory pouches "Lỗ đực trong buồng giao phối" (Figure 2-A). They also remarked that paratypes had variations in the number of spermathecal pores. One individual has 3 pairs of spermathecal pores in 5/6/7/8 while another has 4 pairs in 5/6/7 and 8/9/10.

*Metaphire dranfocana* (Do & Huynh, 1993) comb. nov. (Figure 2-B).

*Pheretima dranfocana* Do & Huynh, 1993 (in Thai et al. 1993): 12, fig. 1A; Thai, 2000: 308.

*A. dranfocana* -- Nguyen et al., 2016: 25.


**Type locality:** Vietnam (Dak Lak: Yok Don province) (Thai et al., 1993).

**Type materials:** CTU, Vietnam.

**Examined material:** 1C holotype (CTU-EW.134.h01) and 1C paratype (the tail was lost) (CTU-EW.134.p02) natural forest, Drang Phok village, Krong Na commune, Buon Don district, Dak Lak province, 01/10/1989, coll. Huynh Thi Kim Hoi.

**History of materials:** 2C (SORC-HPV .040) same data as for holotype and paratype (Nguyen et al., 2016).


**Distribution:** Only known from Vietnam.

**Vietnamese name:** Giun đrăng phốk.

**Remarks:** Blakemore (2007) put the species into the genus *Amynthas*, but still with a question mark: *Amynthas? dranfocanus*. Nguyen et al. (2016) confirmed this placement. However, it is a mistake because Thai et al. (1993) already mentioned male pores located deep inside copulatory pouches ("Lỗ đực ở đáy buồng giao phối sâu") and prostatic ducts enlarged basally and ending in a coelomic copulatory chamber ("gốc cuống nối rỗ buồng giao phối") (Thai et al., 1993).

**Genus:** *Amynthas* Kinberg, 1867

*Amynthas tripidoporophoratus* (Thai & Nguyen, 1993) comb. nov. (Figure 2-C).

*Pheretima tripidopororhatora* Thai & Nguy-

*Metaphire tripidoporophoratus* (sic!) -- Nguyen et al., 2016: 68.


**Type locality:** Vietnam (Thua Thien Hue: Hue city) (Nguyen, 1993).

**Type material:** CTU, Vietnam.

**Examined material:** 6C (CTU-EW.141.01) An Le, Huong Dien, Hue, 15/5/1985, coll. Nguyen Van Thuan.

**History of materials:** 6C and 1A (SORC-V095.04) same data as for (CTU-EW.141.01) (Nguyen et al., 2016).


**Distribution:** Only known from Vietnam.

**Vietnamese name:** Giun nhú đực 3 cánh (Nguyen et al., 2016).

**Remarks:** The species was described as *Pheretima tripidoporophorata*, then transferred to the genus *Amynthas* by Blakemore (2007) with the question mark "*Amynthas? tripidoporophoratus*". Nguyen et al. (2016) transferred this species to the genus *Metaphire* but in the misspelled name "*Metaphire tripidoporophoratus*". After rechecking specimens, we found that the species lacks copulatory pouches. Therefore, the species should be in the genus *Amynthas*.

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Figure 2. Male pores region of **A. Metaphire anhum-alatana** (Thai & Huynh, 1993), **B. Metaphire dranfocana** (Do & Huynh, 1993) and **C. Amynthas tripidoporophoratus** (Thai & Nguyen, 1993) (A1, B1. after Thai et al., 1993; C1. after Nguyen, 1993; B2, C2. from samples; C3. The copulatory pouch, transverse body section from sample)
With the re-confirmation of the generic position of three species and the discoveries of *Metaphire birmanica*, the number of earthworm species increases to 220 in Vietnam, of which the genus *Amynthas* has 111 species, *Metaphire* has 56 species. However, the earthworm fauna of Vietnam is far from fully understanding, more intensive studies will reveal more new discoveries.

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