

Account of montane and insular speciation in some Korean megadriles (Annelida: Oligochaeta)

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Surveys of easily accessible or moderately remote South Korean mountains has revealed several common exotic and early species-complexes [*Amyntas corticis* (Kinberg, 1867) with *A. diffringens* (Baird, 1869), *A. gracilis* (Kinberg, 1867) and *Metaphire californica* (Kinberg, 1867)], plus an unexpected number of new native taxa. Megascolecid *Metaphire muuido* sp. nov. and lumbricid *Eisenia muuido* sp. nov. are newly described from Muuido Island, Incheon. Montane taxa are parthenogenetic *Amyntas tokioensis oculo* subsp. nov. that lacks male pores but is yet comparable to both *Amyntas tokioensis* (Beddard, 1892) and *Metaphire soulensis* (Kobayashi, 1938) with its possible new synonym *A. chiakensis* Hong & James, 2013. Apparently unique sympatric taxa are *Amyntas bangtaesan bangtaesan* and *A. b. confinius* sup-spp. nov., *Amyntas centurio* sp. nov., *Amyntas punicans* sp. nov., *Amyntas seoraksan* and *A. seoraksan iti* sub-spp. nov. These are newly described and their DNA COI gene barcodes, where obtainable, are presented in a phylogram with outgroup Acanthodrilidae *Microscolex dubius* (Fletcher, 1887) from Lake Biwa Japan being a new exotic record for Asia.

Keywords: biodiversity, exotic species-complex, genetics, mountain fauna, soil biology

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INTRODUCTION

In the spirit of Kobayashi (1936; 1937; 1938; 1941) and Easton (1981), the current work contributes to the first author's current Japanese and Korean studies, e.g. Blakemore (2003; 2008; 2012a-f; 2013a; 2013b; 2014), and attempts to use genetic barcodes of primary types or neotypes for definitive species identity (Hebert *et al.*, 2003; Blakemore, 2013c). Current specimens are from mountains such as Seoraksan (alt. 1,708 m) – the highest mountain in the 500 km Taebaek Range that edges the east coast as far down as Busan and the third highest after Hallasan and Jirisan in the south. Further collection was at nearby Bangtaesan (alt. 1,444 m) and Jeombongsan (alt. 1,424 m). Islands were also sampled, and the briefest of surveys on the isle of Muuido near Incheon unearthed two new species: a megascolecid *Amyntas muuido* sp. nov. and a lumbricid *Eisenia muuido* sp. nov., the latter comparable to endemic *Eisenia koreana* (Zicsi, 1972) that was surprisingly overlooked in Hong's (2000) incomplete review of Korean Lumbricidae (compare his nine or ten spp. to the twenty listed in Blake-

more, 2014). The current paper complements an update of moniligastrid *Drawida* spp. in Blakemore *et al.* (2014).

MATERIALS AND METHODS

Taxonomic determinations follow the classifications in Sims and Easton (1972) and Blakemore (2000; 2002; 2012f). Specimens now in 80% EtOH lodged in the NIBR facility (prefixed IV0000-) had small tissue samples taken for mtDNA COI barcode analysis (courtesy of Seunghan Lee at Hanyang University) using methods similar to Blakemore *et al.* (2010) with data in an Appendix. Genetic analyses and phylogram via defaults from 'MEGA 6' (www.megasoftware.net) and BLAST programs (www.blast.ncbi.nlm.nih.gov/BLAST.cgi) are compared to Genbank and ENA (www.ebi.ac.uk/ena) entries or the author's iBOL (www.boldsystems.com) 'Japanese Earthworm Types' project data (e.g. Blakemore, 2012e) as well as to ongoing Korean studies.

Taxa are arranged chronologically, compared to Fig. 1, and then alphabetically. Discussion is confined to remarks after each species' description.

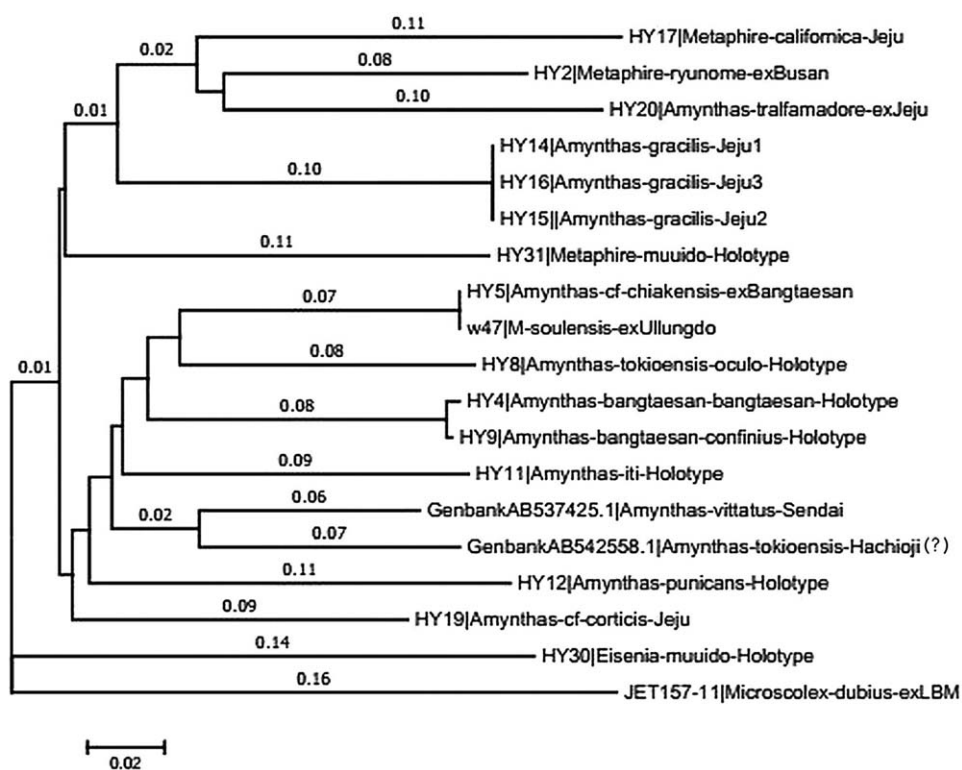


Fig. 1. MEGA6 Neighbour-Joining phylogram of DNA barcode results for evolutionary analyses using program defaults [see Tamura K., Stecher G., Peterson D., Filipski A., and Kumar S. (2013). MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Molecular Biology and Evolution* 30: 2725-2729].

Abbreviations are: GMs – genital markings, lhs – left hand side; rhs – right hand side; TP – tubercula pubertates (for lumbricids); DPs – dorsal pores; neph. – nephridium; “?” indicates some taxonomic uncertainty. Scale bars in all figures are 1 mm.

GENETIC / TAXONOMIC RESULTS AND DISCUSSION

Annelida Lamarck, 1802

Oligochaeta Grube, 1850

Megadrilacea Benham, 1890

[Note: Some Korean websites and papers by Hong & James incorrectly state “*Phylum Annelida Linnaeus, 1758*” and “*Class Clitellata Linnaeus, 1740*” while this grouping is actually Michaelsen, 1919 cf. defunct Class Vermes Linnaeus, 1758, also they have “*Order Haplotaxida Grube, 1850*” while this grouping is actually Michaelsen, 1900].

MEGASCOLECIDAE Rosa, 1891 (sensu Michalesen, 1900; Blakemore, 2000)

Amyntas Kinberg, 1867 and *Metaphire* Sims & Easton, 1972 (this latter genus more for ‘convenience’ rather than phylogenetic merit, as clearly stated by its authors).

Preliminary DNA data for taxon identification and phylogenetic relationships (Fig. 1).

1. *Metaphire californica* (Kinberg, 1867) (Fig. 2A).

Pheretima californica (part) Kinberg, 1867: 102 [part. excl. *Megascolex indicus* Horst, 1883 (= *A. corticis* - see Easton, 1981: 49)]. [Type locality Sausalita Bay, California. Types from San Francisco in the Stockholm Museum: 160. Often misdated “1866”].

Material. IV0000261354 (DNA HY17) mature, dissected, collected from Yeomiji Botanical Gardens, Seogwipo, Jeju by RJB 5th Sept., 2013 along with several *Amyntas gracilis* (Kinberg, 1867) specimens and an *Amyntas cf. corticis* (HY19 below).

Distribution. Widespread cosmopolitan, origin unknown; first record from Korea, also Jeju, by Blakemore (2012 *et al.* IV0000246440 beside Temple at Mt Sanbangan, providing DNA sample WM15); see also Blakemore (2013a) (Saeseum Island sample providing DNA WO58).

Description. Full details and distribution provided by Blakemore (2012f) “*Cosmopolitan Earthworms*”, including specimens collected by the author from Tokyo and Nagasaki, Japan.

Remarks. Blast results for DNA sample HY17 gave

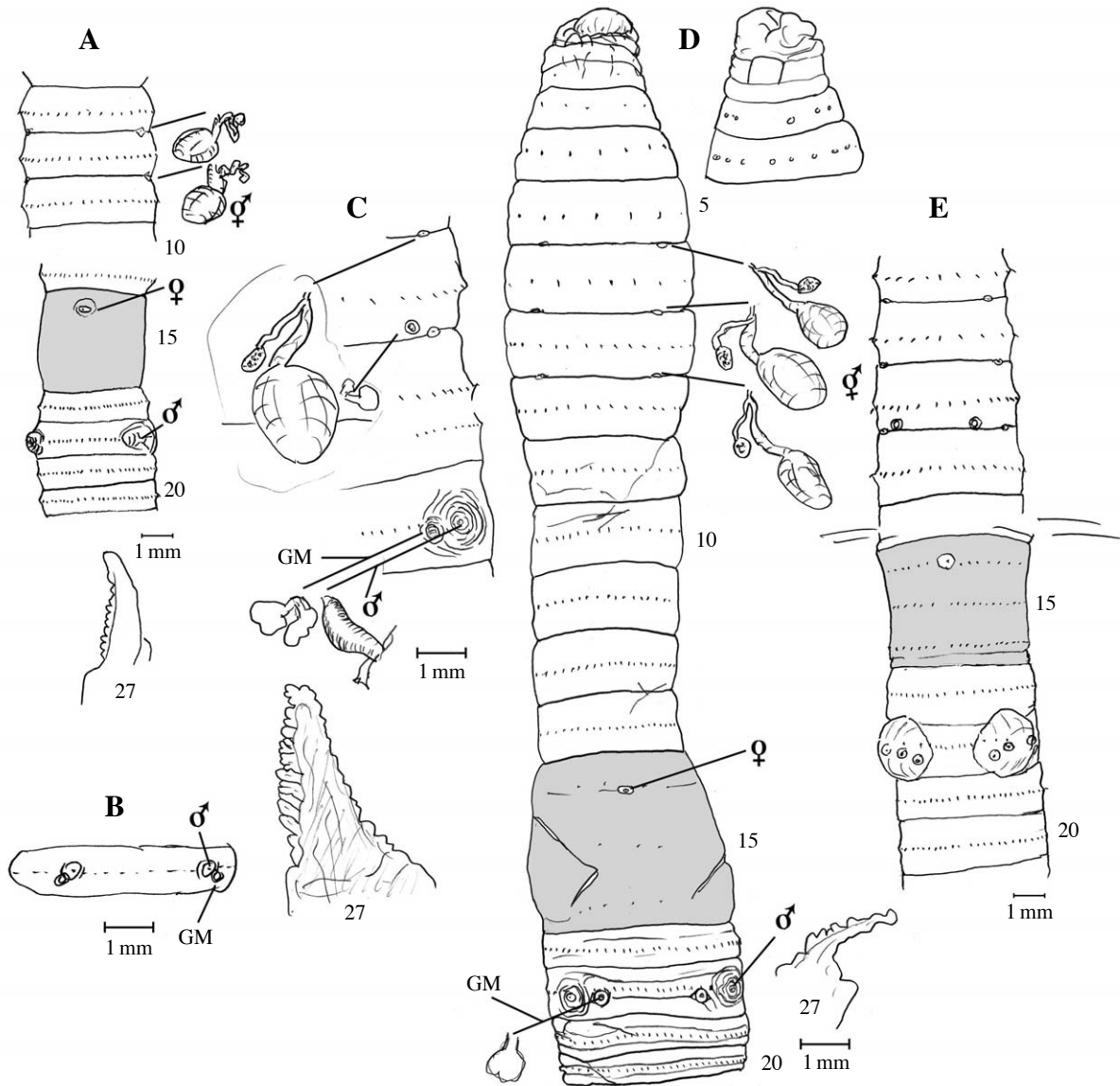


Fig. 2. 2A *Metaphire californica* (Kinberg, 1867) providing DNA HY17; 2B *Amynthes* cf. *corticis* (Kinberg, 1867) with GMs complying rather with *A. diffringens* (Baird, 1869) providing DNA HY19; 2C-E *Amynthes gracilis* (Kinberg, 1867) providing DNA tissue samples HY14-16, respectively.

100% *Metaphire californica* (AY960810.1 from Taiwan) or 98% “*Metaphire schmardae*” [EF032610 – probable misidentification from China (as in Latin America!) of *M. californica* rather than actual *Duplodicrodillus schmardae* (Horst, 1883) from Japan], whereas HY17 vs. LK172-3 (*M. californica* from Lake Biwa, Japan)=616/616 (100%); plus HY17 vs. WM15 from Jeju=617/617 (100%) and HY17 vs. W34 (redo of WO58 from Saeseum Island, Jeju) also agrees 100%. Thus my *M. californica* from Japan is confirmed the same as from Jeju, Korea.

2. *Amynthes corticis* species-complex *sensu* Blakemore, 2003: 14

[Consisting of *A. corticis*, the representative taxon, with progressive priority synonyms provided in Blakemore, 2012f].

Amynthes cf. *corticis* (Kinberg, 1867) (Fig. 2B).

Perichaeta corticis Kinberg, 1867: 102. [Type locality Oahu, the main Hawaii Island. Types in the Stockholm Museum: 1947, possibly immature] (part.?).

?*Megascolex* (*Perichaeta*) *diffringens* Baird, 1869: 40, figs. 1-3. [From Y Plas Machynlleth, Wales, UK. Type in British Museum: BMNH 1869:1:2:1 inspected by

author (Blakemore, 2013d: fig. 9)].

Material. IV0000261360 (DNA HY19), a mature specimen from Yeomiji Botanical Gardens, Seogwipo, Jeju collected by RJB 5th Sept., 2013. Unfortunately, IV 0000261287, a mature specimen collected 25th April, 2013 from Dongnae Botanic Gardens, Busan with DNA tissue sample HY3 as described by Blakemore (2013: 132) failed to yield results on second attempt and cannot be characterized further.

Distribution. Widespread cosmopolitan, origin unknown, recorded from mainland Korea, e.g., Blakemore (2013: 103, figs. 4-7), also from Jeju, e.g., by Blakemore (2012a: 26, fig. 7) [many specimens but please note: six specimens in sample IV0000251209 were mislabelled in Blakemore (2012: 26) as “IV0000251208”].

Description. Full details and distribution provided by Blakemore (2012f) “*Cosmopolitan Earthworms*”, compared to *A. corticis saeseum* Blakemore, 2012a: 26, fig. 7 and to *A. diffringens* (Baird, 1869) by Blakemore (2013d).

Remarks. The current specimen’s sample HY19 appears to conform to *A. corticis* group-1 in the phylogram of Blakemore (2013: 101, fig. 1), e.g., 100% agreement with WM7 (*A. corticis* from Arataki Honey, N.Z.), “*Amyntas corticis*” (DQ224190.1 from Taiwan) and 100% “*Amyntas diffringens*” (EF077548.1, EF077550.1 from China), also with w59 (*A. corticis* from Incheon)=639/639 (100%) but differs slightly from w25 (“*A. diffringens*?” from Jeju)=635/639 (99%). The current dissected sample agrees superficially with *A. diffringens* type as figured by Blakemore (2013d: fig. 9) and thus may be taken as representative of this taxon.

Moreover, HY19 differs substantially from *A. corticis* group-2 taxa such as WM9 (*A. corticis* from Korea)=597/640 (93%) and w33 (*A. c. saeseum* from Jeju)=597/639 (93%) also with JET020 and JET055 both from Japan=597/639 (93%) needing further clarification.

3. *Amyntas gracilis gracilis* (Kinberg, 1867)

(Fig. 2C-E).

Nitocris gracilis Kinberg, 1867: 102. [Type locality Rio de Janeiro. Types in Stockholm Museum, immatures (Sims & Easton, 1972: 214)]; synonymy in Blakemore (2012f).

Material. IV0000261351 (DNA HY14), mature, dissected; from Seonimgyo Bridge over Cheonjeyeon Waterfalls near Botanic Gardens, Seogwipo collected by RJB 5th Sept. 2013 found stranded on footpath at dusk; 261352 (DNA HY15) mature, ditto location but in drainage channel for rice paddy aqueduct beside footpath over the bridge; 261353 (DNA HY16), mature dissected, from Yeomiji Botanical gardens with other matures (261355-358).

Distribution. Widespread cosmopolitan, origin unknown, tentatively reported from Jeju by Blakemore (2012a: 26, fig. 8A) (IV0000251208 beside Cheonji-yeon Falls providing DNA sample w63); see also *A. gracilis insularum* Blakemore, 2012a: 28, fig. 8B from same Jeju locality (providing DNA samples WO55, resampled as w31 and cf. w63 that both comply with “*A. gracilis*” from Ogasawara Islands, Japan – see Appendix).

Description. Full details and distribution provided by Blakemore (2012f) “*Cosmopolitan Earthworms*”, compared to *A. gracilis insularum* Blakemore 2012a: 28, fig. 8.

Remarks. Blast results for all three samples HY14-16 agree 100% with *Amyntas gracilis* (Genbank AB542489.1 – mistakenly cited previously as AB542589.1 – from Kagoshima on Kyushu and AB542491.1 from Yona, Okinawa; also JX177860 from Rio Grande do Sul, Brazil), whereas HY14 vs. w31 and/or W63 (Appendix) have only 98% similarity. This taxon can reasonably be accepted as the proper confirmation of *A. gracilis gracilis* from Jeju and Korea and conforms to a basal *A. gracilis* group shown in phylogram of Blakemore (2013a: 101, fig. 1).

4. *Metaphire hilgendorfi* / *Amyntas tokioensis* species-complex s. Blakemore, 2003

Amyntas tokioensis (Beddard, 1892) confirmed from the type by Blakemore (2010: fig. 2) with full synonymy provided in Blakemore (2012f).

Perichaeta tokioensis Beddard, 1892b: 762. [Published December, 1892 according to Michaelsen, 1900: 272]. [From Japan (probably Tokyo as in “tokioensis”). Holotype in British Museum: BMNH: 1904.10.5.166 inspected by Sims & Easton, 1972: 181, 191 and re-inspected and refigured by RJB when on loan to YNU in October, 2004 and again in NHM, London in June, 2013; the specimen was 65 mm long with 67 segments but looks like a posterior amputee as the last segment has setae and is blunt rather than tapering. It is brown-grey in preservative and the clitellum is darker. The specimen had been dissected by Beddard and was slightly damaged: spermathecae in 8 were removed, only one remained in the jar that I put in a calcium vial along with a detached diverticulum, also the glands from 7 rhs seemed to have been removed, as was 18 lhs prostate].

Distribution. Japan and Korea; also reported from North America [by Gates (1954: 231) and as *Metaphire levis* (Goto & Hatai, 1899) by Easton (1981: 53), sometimes incorrectly as “*Metaphire levis* (Horst, 1893)”, and possibly as *Amyntas vittatus* (Goto & Hatai, 1898)].

Remarks. Full description in Blakemore (2003; 2010; 2012f).

5. *Metaphire soulensis* (Kobayashi, 1938)

(Fig. 3A, 3B).

Pheretima soulensis Kobayashi, 1938: 131, fig. 8. [From Keiki-dō, Keijo (now=Seoul, Kyonggi-do), South Korea. Ten specimens. Types unknown].

Pheretima shinkeiensis Kobayashi, 1938: 134, fig. 9. [A specimen from Kokai-do now in SW North Korea].

Pheretima soulensis: Kobayashi, 1941a: 51, 53; 1941b: 260 (widespread in Japan).

Metaphire soulensis: Sims & Easton, 1972: 238 (*Metaphire glandularis*-group); Blakemore, 2003a: 43 (syns. *Pheretima shinkeiensis* Kobayashi, 1938, *Pheretima aokii* Ishizuka, 1999; held as *species incertae sedis*); 2003: 43, addenda; 2005; 2007; 2010; 2012b; 2013; 2014) (syns. *shinkeiensis*, *aokii*, *dageletensis*).

Pheretima aokii Ishizuka, 1999b: 36, figs. 9-18; Ishizuka et al., 2000b: 180. [From around Tokyo, including the Imperial Palace and incredibly/magically without any explanation or justification whatsoever, from Korea! Types in Tokyo].

Amyntas dageletensis Hong & Kim 2005: 129. [From Korea].

Amyntas chiakensis Hong & James, 2013: 76. [From Korea]. **Syn. nov.?** (see below).

Material. NMST-An421 two mature specimens (one sketched and dissected providing DNA sample JET028, partial result, redone as JET168 Appendix); *Metaphire soulensis* from Shirota-koen, Mishima-shi, Shizuoka-ken, Japan collected by RJB and Y. Hiramoto, 7th June, 2010. Specimens also at Kuzuharagaoka Shrine, Kamakura, Japan (several specimens collected 13.vi.2004 by RJB, Amanda Reid and Yuko Hiramoto in YNU collection) that agree superficially although they lack male pores and markings, but have an extra pair of spermathecae in 5/6 (cf. the smaller *A. kamakurensis*). NIBR-IV0000261235 *M. soulensis* Korea labelled “21-61” and “70”, mature sketched and dissected providing DNA sample WO62 nil result, redone as w38 (contamination, Appendix) collected 18th July, 2012 by Dr H-Y Seo.

Distribution. Korea and Japan and ?China [possibly for erstwhile *yamadai* synonym that was restored by Blakemore (2012b) after Easton (1981: 60) states “*Japan, China, Korea*”, but China is probably just from Kobayashi (1939) who claimed *yamadai* in Japan and China]. Kobayashi (1941) had described *M. soulensis* as widely distributed in Japan as well as in Korea.

Diagnosis. Parthenogenetically degraded morphs 50-125 mm long described with adiverticulate spermathecae in 6/7/8 (sometimes lacking?), and (always?) lacking prostate glands and male pores but with genital markings as clusters of two or more papillae on 18 that have corresponding glands internally in the usual position of the male pores. These papillae, when fully formed, are at

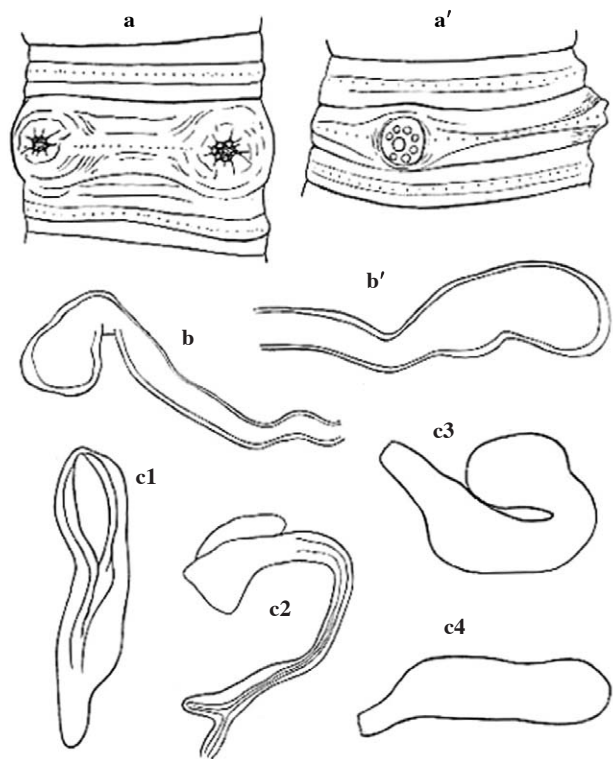


Fig. 8. *Pheretima soulensis*, n. sp. a & a', ventral or ventrolateral view of XVII-XIX. \times ca. 12.6 (a, Keijo-specimen, and a', Koryo-specimen). b & b', terminal ends of sperm-ducts. \times ca. 48.5 c1-c4, spermathecae all vestigial in size. \times ca. 12.6 (3-4 not cleared).

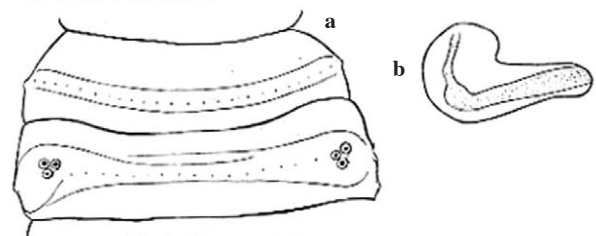


Fig. 9. *Pheretima shinkeiensis*, n. sp. a, ventral view of XVII & XVIII. \times ca. 12.6 b, spermatheca without both ampulla and diverticulum. \times ca. 28

Fig. 3A. *Metaphire soulensis* (Kobayashi, 1938) after Kobayashi (1938, figs. 8, 9) showing his *Pheretima soulensis* and its synonym *P. shinkeiensis*. Note that the top-right figure appears exactly the same as that of possible synonym *A. chiakensis* Hong & James, 2013 (cf. Fig. 4A below).

least partly retractable into the body (hence possibly qualifying for inclusion in *Metaphire* see Kobayashi's original figure reproduced here). Intestinal caeca manicate in 27.

Remarks. Easton's (1981: 60) synonymy of *M. soulensis* (Kobayashi, 1938) in *M. yamadai* (Hatai, 1930), misspelt “yamardai”, is not accepted here due to differences in markings around the male pores and other characters, as described on a neotype by Blakemore (2012b). Full descriptions in Blakemore (2012f). The current Korean specimen not designated a neotype because exact location

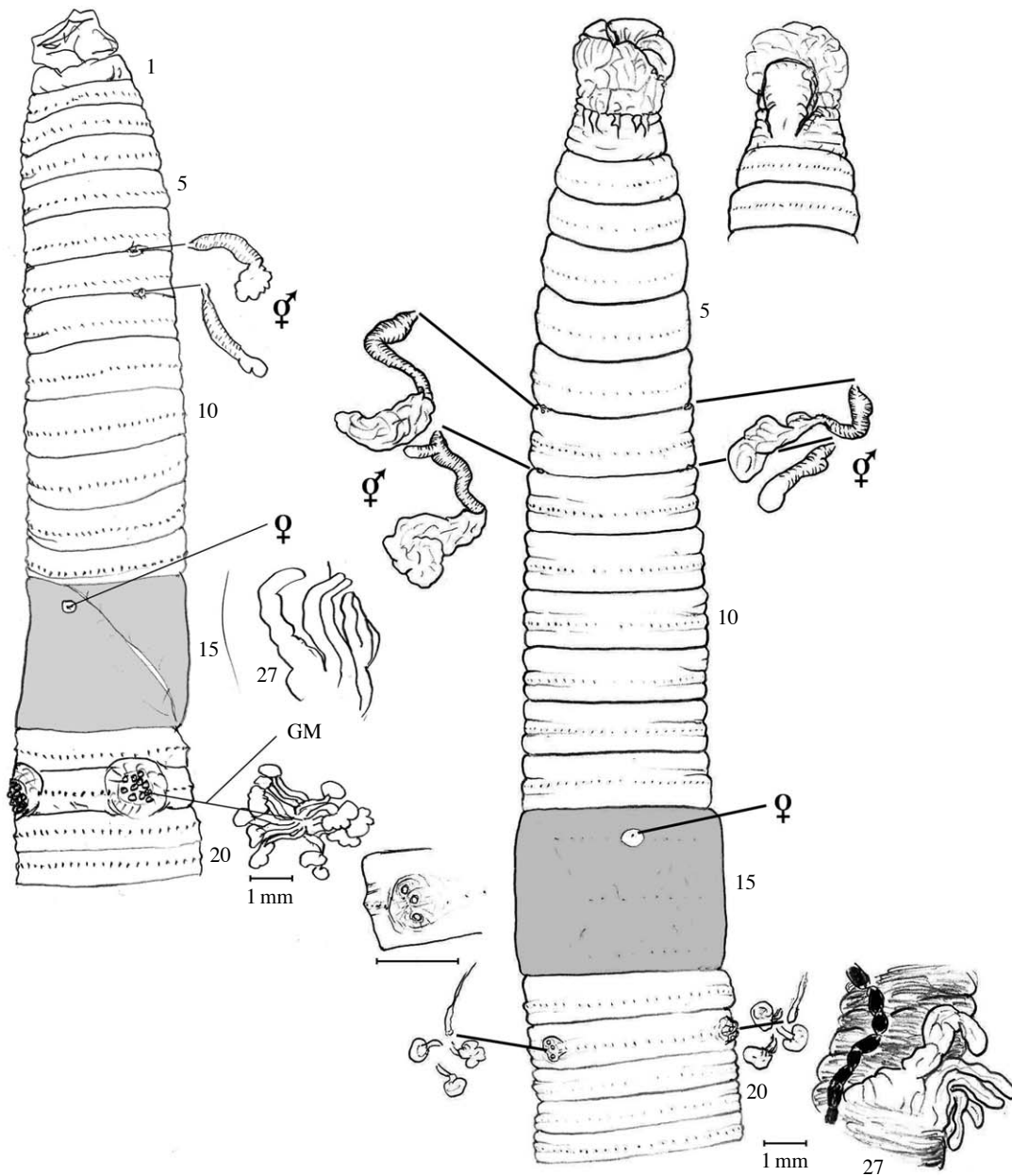


Fig. 3B. *Metaphire soulensis* (Kobayashi, 1938) lhs specimen is NMST An-421 from Mishima, Japan; on rhs is NIBR specimen from Korea with enlargement of its 18 lhs male field.

not known and the DNA data was unforthcoming after two attempts.

6. *Amyntas tralfadore* Blakemore, 2012

Material. IV0000261361 (DNA HY20) a pale mature from Jeju Town, Jeju Island by RJB 7th Sept. 2013, found with IV0000261362 two dark matures identified as “*A. masatakae/tralfadore*”.

Distribution. Jeju Island and introduced to NIBR facility in Incheon (type-locality).

Description. Pale specimen with extra pair GMs in 9/10 otherwise complies with descriptions in Blakemore (2012d: 143, figs. 1, 7; 2013a: 35, fig. 9B-C).

Remarks. Blast result for HY20 gave 95% “*Amyntas robustus*” (Genbank AB542534 – a likely misidentification from Japan), whereas HY20 vs WO2 (*A. tralfadore* Holotype) Id=619/621 (99%), i.e., tolerably the same taxon. Also HY20 vs w29 (*A. tralfadore* smaller specimen from Jeju, redo of WO53) Id=618/621 (99%) and HY20 vs w30 (*A. tralfadore* pale specimen from Jeju)=619/621 (99%). Thus species confirmed from

northern Jeju too.

7. *Metaphire ryunome* Blakemore, 2012

Material. IV0000261294 (DNA HY2) from Jungang Park, Busan by RJB 26th April, 2013.

Distribution. Japan (Lake Biwa, Shiga-ken), Busan, Korea and “China” where it seems misidentified as “*Amyntas incongruous*”. Thus possibly widespread of unknown origin.

Description. Provided by Blakemore (2012: 145, fig. 10; 2013: 311, fig. 4B).

Remarks. Blast results gave 99% “*Amyntas incongruous*” (Genbank EF077551 – a misidentification from China). Comparing HY2 vs. *M. ryunome* Holotype from Hikone, Japan (Tokyo An-457, JET108) results: Id.= 653/653 (100%), i.e., same taxon. Its wide distribution allows concession to yield to an as yet unknown species originating from Asia. Note: These latter data were not shown in Blakemore (2013b: 129, fig. 1 phylogtree).

8. *Amyntas* cf. *chiakensis* Hong & James, 2013: 76, fig. 1A, B (Fig. 4A).

Material. IV0000261301 (DNA sample HY5) a sub-adult from Bangtaesan Mt. (37° 55'25.30"N 128° 25'48.42"E), Inje, Gangwon-do, eastern South Korea, collected by Dr H.-Y. Seo, 11th July, 2013. Found with a mature *Metaphire hilgendorfi* (Michaelson, 1892) (IV0000261302), and one other specimen (IV000261300) described separately below.

Description. Length 70-82, current 60 mm. Brown. Perichaetine. Spermathecae in 6/7/8, no genital markings nearby. Male pores superficial surrounded fore and aft by two to four papillae (three in current specimen) per side within elongate, lateral disc. Caeca manicate in 27. GM glands internally (Hong & James, 2013: 76 note GM glands are lacking around the spermathecal pores, but this is unsurprising when there are no GMs).

Remarks. This specimen lacking anterior GMs is superficially complicit with *Amyntas chiakensis* (from Mt Chiak) defined by these authors as related to *A. sanchongensis* Hong & James, 2001: 90 fig. 5P-T (from Mt Jiri) that has clusters of small genital markings anterior and posterior to each spermathecal pore. It was said also similar only to *A. sonjaesiki* Hong & James, 2009 (from Mt Songni) that differs in having small GMs close to the spermathecal pores in 7 and 8.

However, Blakemore (2003: 43, 2006; 2008; 2012f; 2014) suggested that *A. sanchongensis* is a synonym of *A. tappensis* (Ohfuchi, 1935) along with several other Japanese and Korean species that are overlooked by Hong & James (2001; 2009; 2013). Moreover, *A. sonjaesiki* Hong & James, 2009 is similarly thought a junior

synonym of prior *A. tokioensis* (Beddard, 1892) with yet other species taking priority as per Blakemore (2003b: 43, 2006; 2008; 2010; 2012f). These issues are entirely avoided by Hong & James (2013: 76) who merely say “*Resolving the taxonomic issues associated with extensive parthenogenetic modification of sexual characters is a difficult problem in this group of earthworms, among others (cf. Blakemore 2006), and will require extensive resampling for molecular data.*” They yet fail to resample nor provide any molecular data to support their work, whereas in the current study COI barcodes (e.g., sample HY5 in Appendix, Fig. 1) are provided for support and comparison whenever possible.

Interestingly, the nearest BLAST match on HY5 is 621/623 (99%) with “*Metaphire soulensis*” (accessions AB5426642-7 from Japan: Aomori-ken, Kanagawa-ken, Sendai City in Miyagi-ken, Hachioji near Tokyo, Kobe City and Hiroshima) and 577/579 (99%) with >JET-168 *Amyntas soulensis* from Japan (Appendix) also 622/623 (99%) with DNA sample >w47 of *Metaphire soulensis* from Ullungdo as described by Blakemore (2013: 62, fig. 7). Current synonyms of *Metaphire soulensis* (Kobayashi, 1938) are *Pheretima shinkeiensis* Kobayashi, 1938; *Pheretima aokii* Ishizuka, 1999 – as per Blakemore (2003b: 43; 2012b) – plus *A. dageletensis* Hong & Kim, 2005 as per Blakemore (2006; 2008; 2010; 2012b; 2013; 2014).

The question now of whether *A. chiakensis* Hong & James, 2013 also belongs in synonymy of parthenogenetic *M. soulensis* (Kobashi, 1938) is left to its authors to determine.

9. *Amyntas tokioensis oculo* Blakemore sub-sp. nov. (Fig. 4B).

Material. IV0000261311 (DNA sample HY8) mature from Jeombongsan Mt. (38° 01'16.39"N 128° 25'6.36"E), boundaries of Inje and Yangyang in eastern South Korea, collected by Dr H.-Y. Seo, 25th July, 2013. Found with four other specimens, two other *Amyntas* sp. described below and a *Drawida jeombongsan* Blakemore, 2014, plus IV0000261310 an *M. hilgendorfi* specimen. IV0000261308 (P) is a superficially similar mature with same details collected 11th July, 2013 along with *Drawida* sp. (IV0000261309).

Etymology. Latin *oculo* (m noun) for “black eye” referring to the look of the spermathecal pores.

Distribution. Widespread in Japan and Korea, *A. tokioensis* is an introduction to USA (also as synonym *M. levis*) but, in view of many misidentifications “*Amyntas tokioensis* species-group from central Thailand” is considered doubtful.

Description (current specimens). Length 60 (P) to 85 mm with 90 segments (H). Reddish-brown dorsum. Peri-

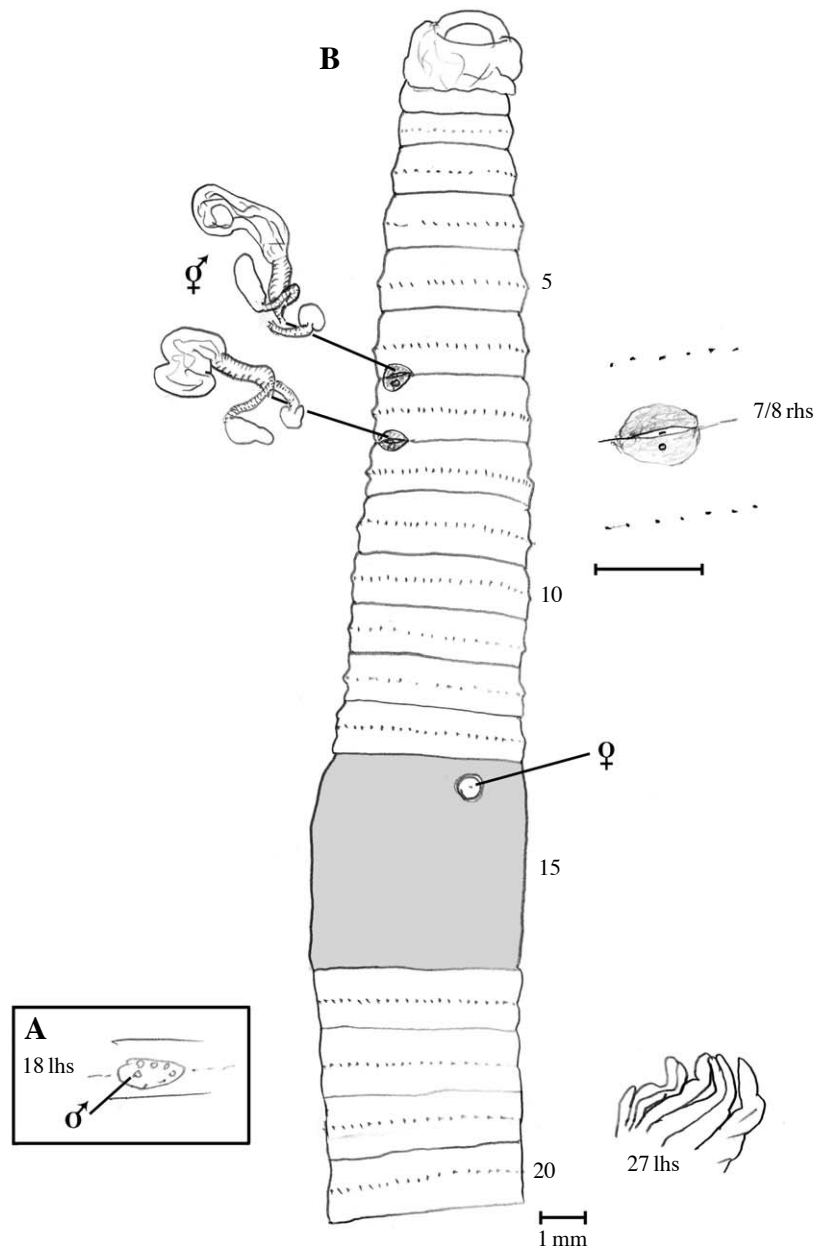


Fig. 4. 4A. *Aynnthas* cf. *chiakensis* Hong & James, 2013. Boxed sketch of male pore region (spermathecae and anterior GMs lacking). 4B. *Aynnthas tokioensis oculo* sub-sp. nov. Holotype with enlargement of spermathecal pore 7/8 rhs (male pores and posterior GMs lacking).

chaetine with 40-50 setae. Clitellum 14-16. Spermathecae eye-like in 6/7/8 in lateral dark patches also enclosing a single GM papilla below each pore. Female pore single, central on clitellum. Male pores absent. Spermathecal ampullae deflated with clavate diverticulum on muscular duct. GM glands correspond internally to the spermathecal papillae. Seminal vesicles in 11 and 12. Last hearts in 13. Caeca manicate in 27.

Remarks. These clearly parthenogenetic specimens resemble part of the *Aynnthas tokioensis* (Beddard, 1892)

species-complex as described by Blakemore (2003; 2010; 2012f). In the latest revision by Blakemore (2014) *Aynnthas tokioensis* (Beddard, 1892) has the following synonyms: *?schizopora*, *?irregularis*, *levis*, *?parvicystis*; *?verticosa* all by Goto & Hatai, 1898/1899; *?gucheonensis* Song & Paik, 1970; *jiriensis* Song & Paik, 1971; *surcata* and *verticosa* Ishizuka, 1999; *?paiki* Hong in Hong, Lee & Kim, 2001; *?yongshilensis*, *?eastoni* and *?boletiformis* by Hong & James, 2001; *A. sonjaesiki* Hong & James, 2009 (these last nine synonyms as per

Blakemore, 2003b: 43; 2006; 2008; 2010; 2012f; 2012g); plus *Amyntas conferticurtus* Hong & James, 2009: 1241 *species inquirendum* and possible syn. nov.?

Amyntas conferticurtus types (IV0000120468 H & 479 P) are not traceable in NIBR (pers. obs.) but it appears to be misdescribed in several key characters: e.g., the spermathecal pores are said to be on 7 and 8 (thus allegedly qualifying for an *A. pomellus* species group) however, they are shown in their fig. 7 to be in 6/7/8! Moreover the supposed genital markings on 7 and 8 are not shown in their fig. 7 (?). Its description appears indistinguishable from their subsequent *A. sonjaesiki* Hong & James, 2009 that was placed in synonymy of *A. tokioensis* by Blakemore (2010). Seemingly the *A. conferticurtus* name also belongs there. According to the description, it also appears to be similar to *A. paiki* Hong, 2001 or to *A. fasciformis* Hong & James, 2001 and both are probably in an *A. tokioensis* species-group, if not also synonyms. The types of the other synonym, *A. sonjaesiki* Hong & James, 2009: 1243 (types IV0000120469 H & 480 P) are also not traceable in NIBR (pers. obs.) but its markings resemble those claimed for *A. conferticurtus*. These authors need to fix these issues before they erect any further “new” names.

Regarding the current specimens, it is surprising that the nearest BLAST similarity is only 88% for *Metaphire vesiculata* (AB542689 from Tokyo, Okutama) or 88% for the *M. soulensis* matches noted above. Fig. 1 shows separation from taxa under consideration here. It may seem precipitous to put a new name to these specimens despite the lack of a genetic match, however it will hopefully provide an unambiguous starting point for conscientious resolution of all the earliest taxa noted above progressively by any concerned workers.

Repeated searches by the senior author of the Tokyo environs for new topotypic material of *Amyntas tokioensis* have thus far been unsuccessful, although a record from nearby Hachioji is claimed in Genbank (accession AB542558 by Minamiya *et al.*, 2010, unpublished). If their identification is correct, this may provide the closest match to a toptype’s DNA. However, the current specimen HY8 vs. AB542558 of Hachioji=523/614 (85%) which is far removed and questions the close identity of either or both with “*Amyntas tokioensis*” proper (see Fig. 1).

10. *Metaphire muuido* Blakemore sp. nov. (Fig. 5).

Material. IV0000261298 (DNA sample HY31) from Incheon, Muuido Island (ca. 37° 23'31"N 26° 24'56"E), Hanagae beach, from treeline above northern shore, collected by RJB, 15th Sept., 2013.

Etymology. After type-locality, noun in apposition.

Description. Length 100 mm. Segments 116. Brown

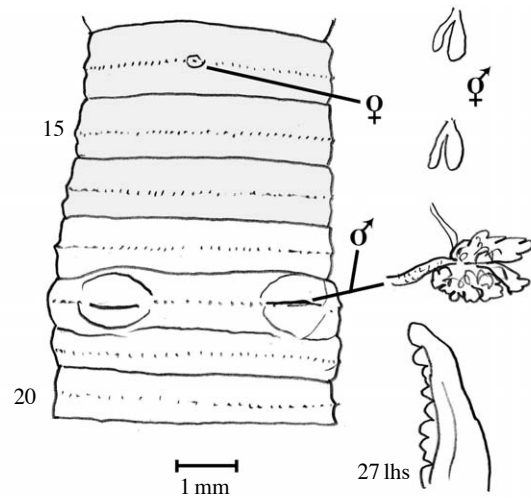


Fig. 5. *Metaphire muuido* sp. nov. Holotype.

dorsum, with weak clitellum 14-16. Open epilobous. First dorsal pore in 12/13. Setae ca. 74 on 12 and 15 or ca. 68 on 20. Spermathecal pores 6/7/8. Female pore mid-ventral on 14. Male pores on 18 within large transverse slits in round porophores filling 18 longitudinally with ca. 12 setae intervening. No trace of GMs.

Internally, large ganglia seen in segment 2. Septa 8/9/10 aborted around gizzard. Spermathecae with small, poorly developed but single clavate diverticulum and no nephridia on duct. Meroic. Seminal vesicles vestigial. Last hearts and small ovaries in 13. Prostates racemose on muscular duct but copulatory pouch not pronounced. Intestinal caeca ventrally incised from 27.

Remarks. In the rather outdated key of Sims & Easton (1972) the non-superficial male pores of the current species keys it to the *Metaphire planata*-group at that time composed of six species, now doubled. The only one nearby being *M. parvula* (Ohfuchi, 56: 152) [non *parvula* Goto & Hatai, 1898 see Blakemore, 2003] from the Ryukus that is smaller at 50-65 mm, with setae on 3-8,9 long and widely spaced plus a simple rather than incised caecum; it is perhaps similar to *M. decipiens* (Beddard, 1912) from the Philippines that is usually (incorrectly?) placed in *Pheretima darnleiensis* (Fletcher, 1886). Chinese taxa added to the group are *M. jianfengensis* (Quan, 1985) that is somewhat larger at 160-250 mm and *M. nanlingmontis* plus and *M. dadingmontis* both from Guangdong by Zhang *et al.*, 2006 having accessory glands in the spermathecal and/or prostate regions. Most other members of the group also have GMs, for example, *M. planata* (Gates, 1926) found in Southeast Asia has them in 7 and 8 just median to the spermathecal pores (that are actually in these segments). If the male pores were taken as superficial but in seminal grooves (unlikely as these are rarely lateral), it would qualify under Sims & Easton

ton's scheme as part of an *Amyntas tokioensis* spp.-group, this also highly outdated, especially since manicate caeca were confirmed from the type by Blakemore (2010: fig. 2) whereas the present species has simple incised caeca.

The only similar cosmopolitan species (keys from Blakemore, 2012f) is perhaps *Metaphire sandvicensis* (Beddard, 1896) sp. *incert. sedis.* from Hawaii that was initially misdescribed regarding spermathecal pores in 6/7/8, later corrected to 7/8/9 as in *M. californica*.

Despite its sub-adult condition, the present taxon is clearly distinguished from all other *Metaphire* species in Japan and Korea with spermathecae in 6/7/8 that have manicate caeca rather than simple, incised as here. Neither are the local "*Amyntas*" spp. with spermathecae in 6/7/8 similar, as discussed under the account of *Amyntas mujuensis* Hong & Kim, 2002: 195.

Blast analysis of the DNA data in the Appendix failed to make a match closer than 87% similarity and the barcode profile now helps define this species.

11. *Amyntas bangtaesan bangtaesan* Blakemore sub-sp. nov. (Fig. 6A).

Material. IV0000261300 (DNA sample HY4) mature, rather poorly preserved, sketched and dissected from Bangtaesan Mt. (37° 55' 25.30"N 128° 23' 48.42"E), collected by Dr H.-Y. Seo, 11th July, 2013. Found with two specimens noted under *Amyntas* cf. *chiakensis* above.

Etymology. Named after type locality (noun in apposition).

Description. Dorsum distinctly puce but slightly translucent, ventrum paler. Length 63 mm with 83 segments tapering to tail. Reddish-brown dorsum. Epilobous. First dorsal pore 13/14 (i.e., at start of clitellum). Perichaetine with ca. 50-60 setae. Clitellum 14-16. Spermathecae in 6/7/8 laterally with row of six or seven GM papilla below and median to each pore. Female not found (minute). Male pores small, simple and superficial with ca. 16 setae intervening; above and below and moving ventrally from each porophore are rows of papillae, there being one row above with six or seven papillae and two below with eight to ten total. Spermathecal ampullae saccular with clavate diverticulum on thick muscular duct. Prostates racemose on straight muscular duct. GM glands correspond internally to the GM papillae. Seminal vesicles large in 11 and 12. Caeca manicate in 27.

Remarks. The nearest match for HY9 on Genbank is "*Megascolecidae* sp." (sic) (AB607052.1) 86%. From the current study, HY4 vs. HY9=610/613 (99%) which is particularly close. It is similar yet differs from *Amyntas gucheonensis* (Song & Paik, 1970) in its markings which are closer to the spermathecae and only above the male pores in the latter. The type-locality for that species

was Gucheon Valley on Geojedo Island and also from Mt Sopaik (or Sobaeksan?) on the mainland. The current taxon, more so than Song & Paik's, is similar to what may reasonably be expected for a sexual form of *Amyntas vittatus* (Goto & Hatai, 1898) although they compared their taxon to *A. tappensis* (Ohfuchi, 1935).

12. *Amyntas bangtaesan confinius* Blakemore sp. nov. (Fig. 6B).

Material. IV0000261312 (DNA sample HY9) mature, sketched and dissected from Jeombongsan Mt. (37° 01' 16.39"N 128° 25' 6.36"E), collected by Dr H.-Y. Seo, 25th July, 2013; IV0000261313, superficially similar mature, same details.

Etymology. Latin '*confinius*' (adj. m) implying "adjoining, contiguous or allied" for its location from neighboring Jeombongsan and similarity to nominal species.

Description. Length 62-80 mm with 89 segments tapering to tail. Reddish-brown dorsum. Epilobous. First dorsal pore 12/13. Perichaetine with 50-60 setae. Clitellum 14-16. Spermathecae in 6/7/8 in lateral dark patches with transverse row of six or seven GM papilla below and median to each pore. Female pore single, central on clitellum. Male pores in dark round patches that taper medially and are ringed with papillae; above each porophore is another patch of GMs each with about a dozen papillae in two rows. Spermathecal ampullae deflated with clavate diverticulum on muscular duct. Prostates racemose on U-shaped muscular duct. GM glands correspond internally to the GM papillae. Seminal vesicles large in 11 and 12. Caeca manicate in 27. Gut contains organic matter.

Remarks. The nearest match for HY9 on Genbank is only 88% for *Metaphire communissima* (AB542620.1 from Japan). Morphologically distinct from the previous sub-species with regards to its dorsal pore commencement, the distribution of the GMs and possibly on the form of the prostate duct (U-shaped vs. straight), the molecular difference of HY4 vs. HY9 is slight 610/613 (~99%) suggesting only sub-specific or ecotypic status. There may be other differences in behavior or morphology that would require further field-collection and study.

13. *Amyntas seoraksan seoraksan* Blakemore sub-sp. nov. (Fig. 7A).

Material. IV0000261306 (Holotype DNA sample HY7 – nil results) mature, sketched and dissected from Seoraksan Mt. (38° 06' 21.34"N 128° 24' 37.52"E), collected by Dr H.-Y. Seo, 26th July, 2013. Sample also contained an immature *Amyntas* sp. and an immature blue *Dra-wida* sp. (both in IN0000261307).

Etymology. After the type locality (noun in apposition).

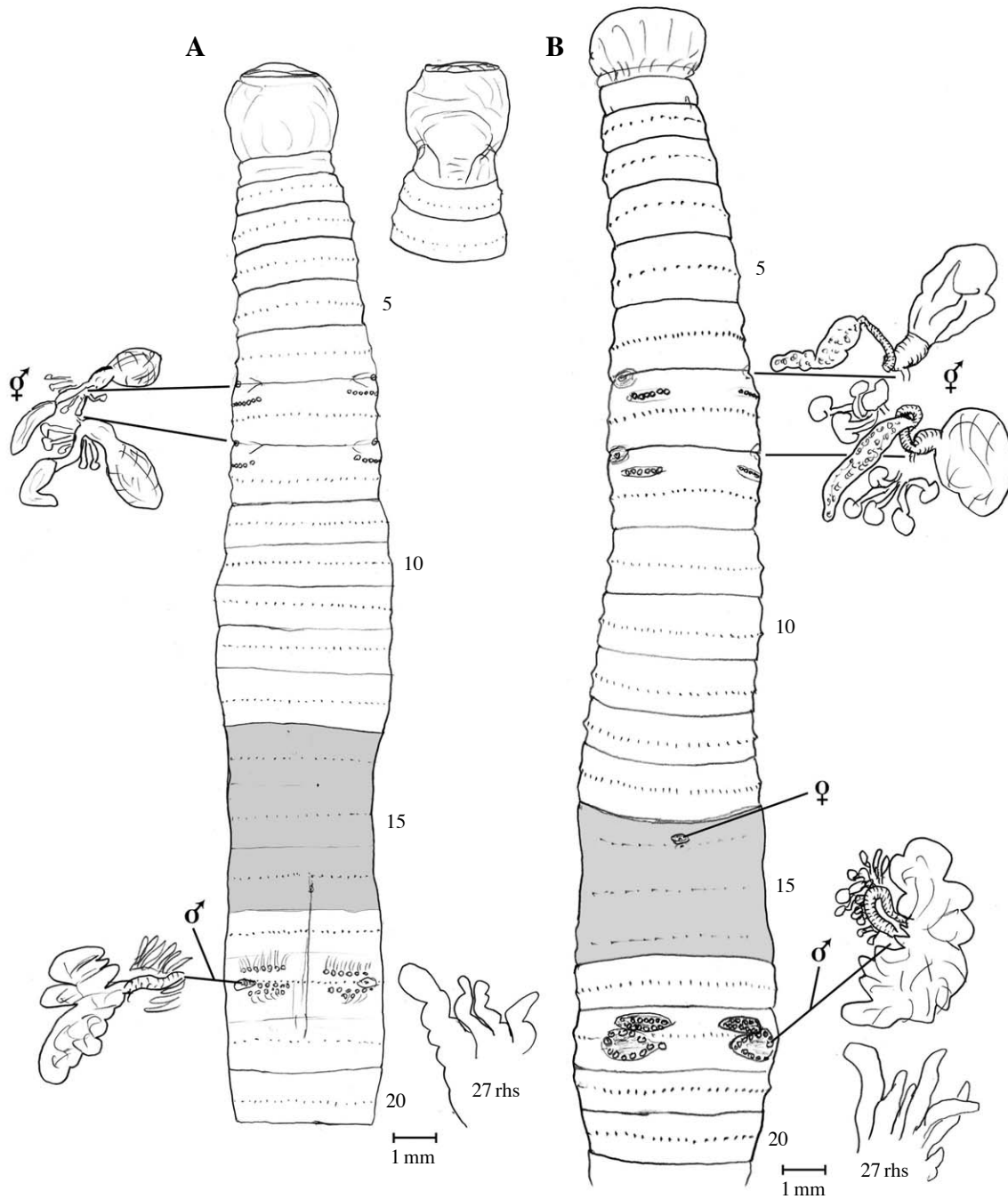


Fig. 6. 6A. *Amynthas bangtaesan bangtaesan* sub-sp. nov. Holotype providing DNA HY4 (female pore not found). 6B. *Amynthas bangtaesan confinius* sub-sp. nov. Holotype providing DNA HY9 (see Fig. 1).

Description. Length 80 mm with 86 segments. Bright red dorsum and pale ventrum, body somewhat transparent and tapers to tail. Epilobous. First dorsal pore 12/13. Perichaetine with ca. 40-50 setae. Clitellum 14-16. Spermathecae in 6/7/8 in lateral dark patches with one or two GM papilla below and median to each pore. Female pore minute not found on clitellum. Male pores in setal

arc within dark elongate patches containing two rows of six papillae above one or two below just medial and above each porophore; about twenty-one setae intervene between the male pores. Spermathecal ampullae saccular with clavate diverticulum on bulbous duct with GM glands nearby. Prostates racemose on bent muscular duct with glands correspond internally to the GMs. Seminal

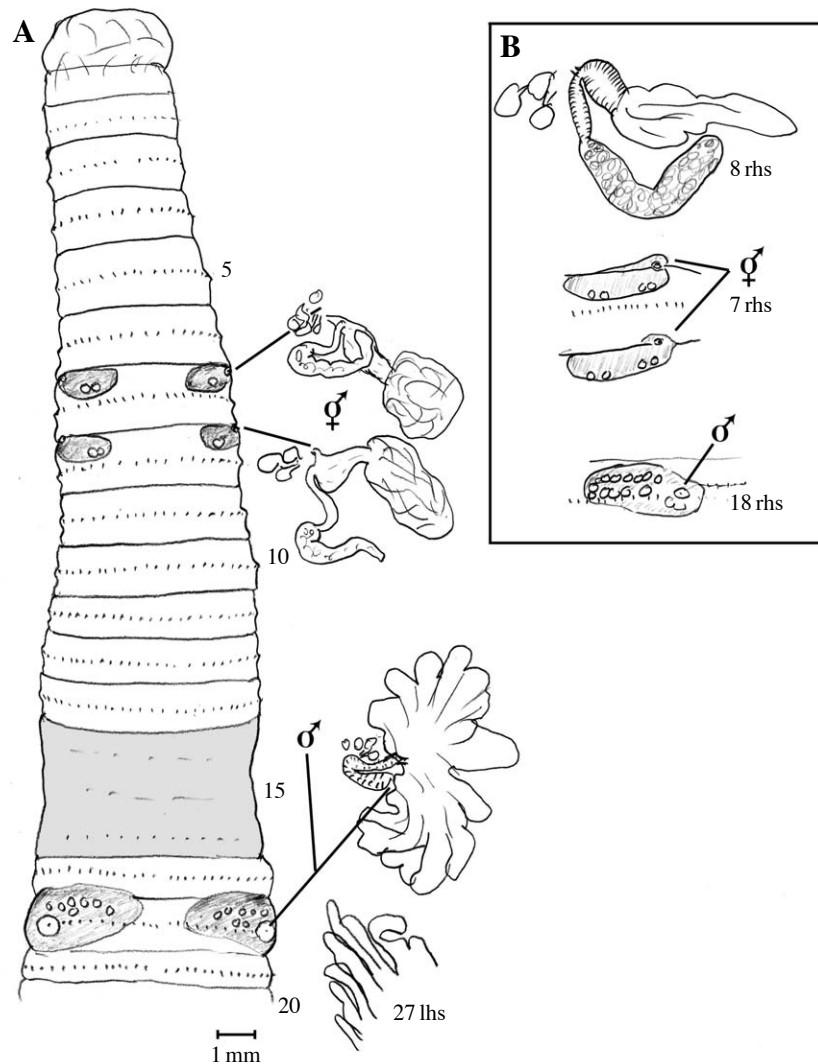


Fig. 7. 7A. *Amynthus seoraksan seoraksan* sub-sp. nov. Holotype. 7B. *Amynthus seoraksan iti* sub-sp. nov. Holotype (DNA HY11 in Fig. 1).

vesicles large in 11 and 12. Caeca manicate in 27.

Remarks. As with *A. bangtaesan* described above, the current species is somewhat similar to *Amynthus gucheonensis* Song & Paik, 1970 from Gu-cheon Valley on Geoje Island (type locality) and Mt Sopaik on the mainland, relatively distant locations possibly accounting for supposed variability actually due to the combination of different taxa. Their species was described as similar to *A. tappensis* – both having GMs in spermathecal and male fields but differing in body length and spermathecal shape. Nevertheless, type descriptions differ in many small factors, mostly noticeably by lacking the bulbous spermathecal diverticula which also differentiates from *A. s. iti*. Unfortunately two attempts to extract and sequence DNA failed to yield genetic results, thus fresh material is required.

14. *Amynthus seoraksan iti* Blakemore sub-sp. nov.
(Fig. 7B).

Material. IV0000261316 (Holotype DNA sample HY11) mature, sketched and dissected from Jeombongsan Mt, (37° 01'16.39"N 128° 25'6.36"E), collected by Dr H.-Y. Seo, 25th July, 2013; IV0000261317 (Paratype), superficially similar mature, same details; plus sample contained a mature *M. hilgendorfi* specimen IV0000261315 with everted male pores (confirming its correct allocation to genus *Metaphire*). Other sample batch with same details contains three specimens (IV0000261318-20) that agree superficially except they may have three instead of two papillae in 7 and 8, the longest is 120 mm; two other samples are IV0000261321 and sympatric specimen described successively below.

Etymology. Derived from Morse code for its spermath-

ecal markings: “.. - ..”=ITI.

Description. Length 111 mm (both H & P). Reddish iridescent dorsum body tapers to tail. Epilobous. First dorsal pore 12/13. Perichaetine with 50-60 setae. Clitellum 14-16. Spermathecae in 6/7/8 just above intersegment in lateral dark patches with transverse row of two sets of two GM papilla below and median to each pore (sets of two and three in some specimens). Female pore single, central on clitellum. Male pores just behind setal line in dark elongate patches two rows of about six papillae above and medial to each porophore. Spermathecal ampullae deflated with clavate diverticulum on muscular duct and GM glands nearby. Prostates racemose on muscular duct. GM glands correspond internally to the male GM papillae. Seminal vesicles large in 11 and 12. Caeca manicate in 27.

Remarks. The nearest Blast result for HY11 is also just 87% for *Metaphire communissima* (Genbank AB542623.1 from Hyogo-ken, Japan), and HY11 vs. HY9=568/653 (87%).

Distinctive characters of *A. iti* are the markings that also resemble nesting birds (see figure) and the slightly off-line position of the spermathecal and male pores. DNA data helps confirm this identity amongst taxa tested.

15. *Amyntas punicans* Blakemore sp. nov. (Fig. 8).

Material. IV0000261322 (Holotype DNA sample HY12) mature, sketched and dissected from Jeombongsan Mt, (37° 01' 16.39"N 128° 25' 6.36"E), collected by Dr H.-Y. Seo, 25th July, 2013. Five other samples noted above (IV0000216318-21).

Etymology. Latin *punicans* (adj.) meaning “blushing” or “reddish” referring to the colour.

Description. Length 69 mm with 100 segments (H). Brightest red iridescent dorsum, body tapers. Epilobous open. First dorsal pore 12/13. Perichaetine with ca. 50 setae. Clitellum weak 14-16. Spermathecae in 5/6/7 lateral. Female pore single on 14. Male pores on small hemi-circular porophores equatorially with about a dozen setae intervening and medial to each porophore a small GM disc.

Septa 8/9/10 are aborted. Spermathecal ampullae smallish sacs on muscular duct with long zig-zagging, inseminated spermathecal diverticula. Testis 10 & 11; seminal vesicles large in 11 & 12. Ovaries small and not determined. Last heart in 13. Prostates racemose on circular muscular duct. GM glands not noted. Oesophagus dilated in 12-13 with intestine in 15. Caeca single with indented trailing edge in 27. Gut contains organic soil.

Remarks. The nearest Blast result for HY12 is just 87% for *Amyntas tappensis* (AB542548.1 from Osaka, Japan). Distinctive characters of *A. punitans* are the spermathe-

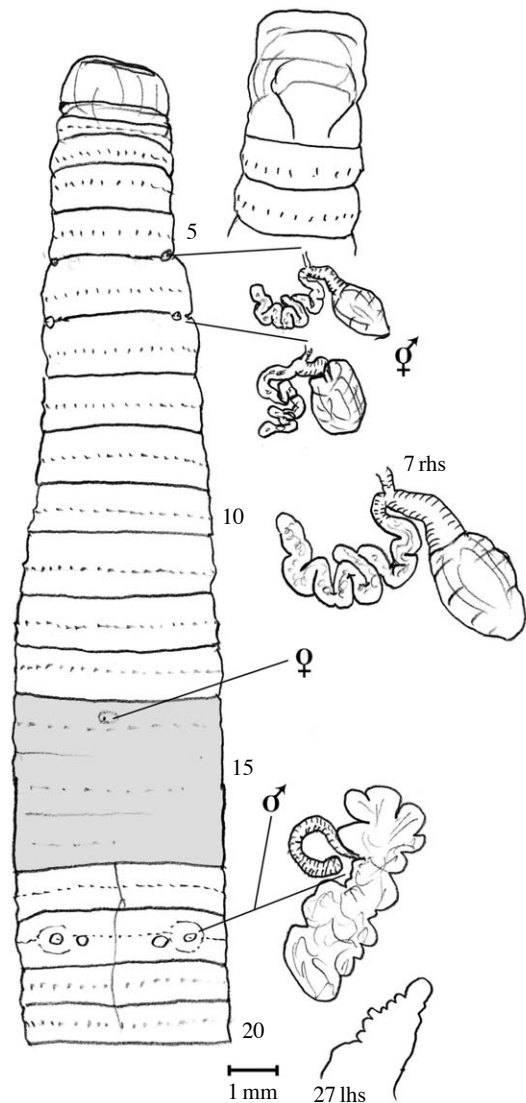


Fig. 8. *Amyntas punicans* sp. nov. Holotype with X2 enlargement of 7 rhs spermatheca.

ecal pores in 5/6/7, a character shared with *A. fibulus* Kobayashi (1936) and *A. kobayashii* Kobayashi (1938). The first is similar in its serrated caecum but it lacks GMs in 18 and the spermathecae are small and straight as with *A. geojeinsulae* Song & Paik (1970); the second has very different male pores and a smooth caecum and can be compared and *A. gyeryongensis* Hong & Kim, 2002 that also has short spermathecal diverticula. Other known species in Korea with spermathecae in or near 5/6/7 all have male pores in seminal grooves and small diverticula. The DNA data again helps this identity.

16. *Amyntas centurio* Blakemore sp. nov. (Fig. 9).

Material. IV0000261303 (Holotype DNA sample HY6

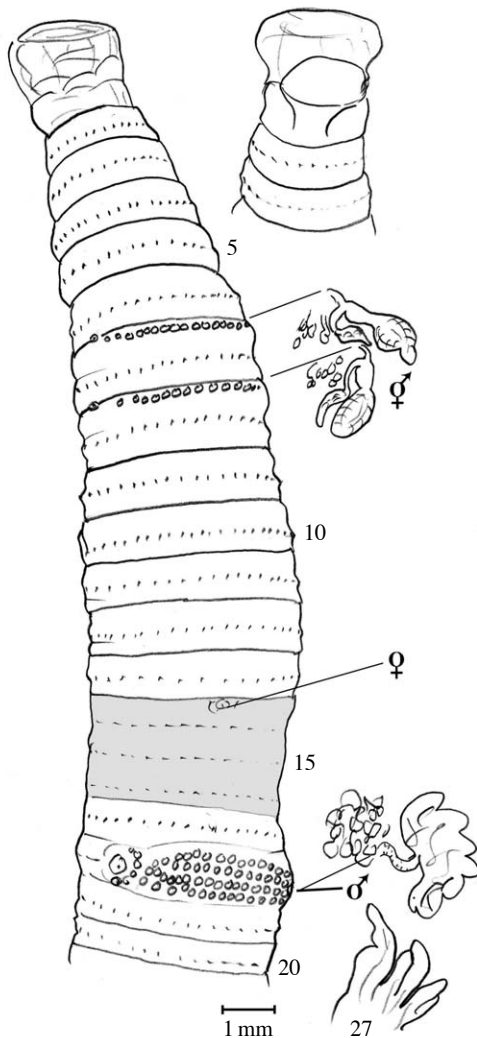


Fig. 9. *Amynthus centurio* sp. nov. Holotype providing DNA HY6.

– nil results) mature, sketched and dissected from Bangtaesan Mt, (37° 55'25.30"N 128° 25'48.42"E), collected by Dr H.-Y. Seo, 11th July, 2013. Sample also contained seven specimens (IV000261304) of three mature *M. hilgendorfi* and three blue *Drawida* sp. matures plus an immature. A second container had many specimens but was overcrowded so preservation was poor, all allocated IV000261305.

Etymology. Latin *centurio* (m noun) for “one hundred” loosely referring to the markings.

Description. Length 65 mm with 92 segments. Reddish dorsum and pale ventrum, body somewhat transparent. Open epilobous. First dorsal pore 12/13. Perichaetine with ca. 40 setae. Clitellum 14-16 slightly darker. Spermathecae in 6/7/8 laterally ca. 0.5 circumference apart with ca. 18 GM papilla in a row just below intersegmental furrow between each pore. Female pore central on 14. Male pores in setal line on small circular porophore

on 18 with a semi-circle of papillae median to each pore and four rows of numerous GM papillae numbering more than sixty. Spermathecal ampullae saccular and slight on short duct with small clavate diverticulum; glands match GMs. Prostates racemose on S-bent muscular duct with glands internally to the GMs. Seminal vesicles large in 11 & 12. Caeca manicate in 27.

Remarks. The most distinctive characteristic of the current species from cohorts is the arrangement of GMs numbering about one hundred small papillae in 7/8, 8/9 and especially between the male pores on 18. The shape of the spermathecae and manicate caeca are also indicative. DNA sequencing was unforthcoming but morphology alone defines this species.

LUMBRICIDAE Rafinesque-Schmaltz, 1815

17. *Eisenia muuido* Blakemore sp. nov. (Fig. 10).

Material. IV0000261296 (DNA HY30) H, holotype, a mature specimen from Muuido (same details as IV000261298) collected 15th Sept. 2013 by RJB; IV0000261297 P, paratype, a subadult lacking tail; plus an immature specimen (S).

Etymology. After island locality (noun in apposition).

Description. Pale body, pinkish in life with distinct yellow anterior and posterior tips (coelomocytes as in *E. japonica*) found in all life stages (H, P, S). Length 100 mm (H) or 55+ mm (P) with 120 segments. Open epilobous. First dorsal pore 4/5. Clitellum weak saddle in ca. 27-32,33. TP elongate bands lateral of b setae on 28-32. Setae ab on 28-32 tumid. Spermathecal pores minute in 9/10/11 dorsally as rounded sacs (one heart-shaped). Female pores in 14 just lateal of b setae. Male pores on barely marked porophores also just lateral of b setae. Nephropores not found. Holandric: testis in seminal vesicles in 9-10 medium sized and larger in 11-12. Hearts in 7-11. Calciferous glands annular in 11 & 12. Ovaries in 12 as flattened tongues with many eggs. Intestine from 1/2 15. Crop in 16. Gizzard in 17-18. Typhlosole not noted. Nephridial bladders sausage-shaped. Much mucous produced when handled.

Remarks. From Michaelsen (1900), the closest agreement is with *Eisenia tigrina* (Rosa, 1896) from Europe, however it has first dorsal pore in 3/4 and much larger male pores (14/15-15/16). Of the twenty Korean lumbricids listed in Blakemore (2014), the geographically closest are *Eisenia japonica* (Michaelsen, 1892) and its subspecies (as described by Blakemore & Grygier, 2011; Blakemore, 2012c; 2013) that have clitella around 24-31 and TP restricted to 27 & 29 or *E. koreana* (Zicsi, 1972), *E. gaga* Blakemore, 2012, and *E. sindo* Blakemore, 2012 all three of which differ, however, by having clitella near 25-32 and TP around 27-29. Several of these taxa

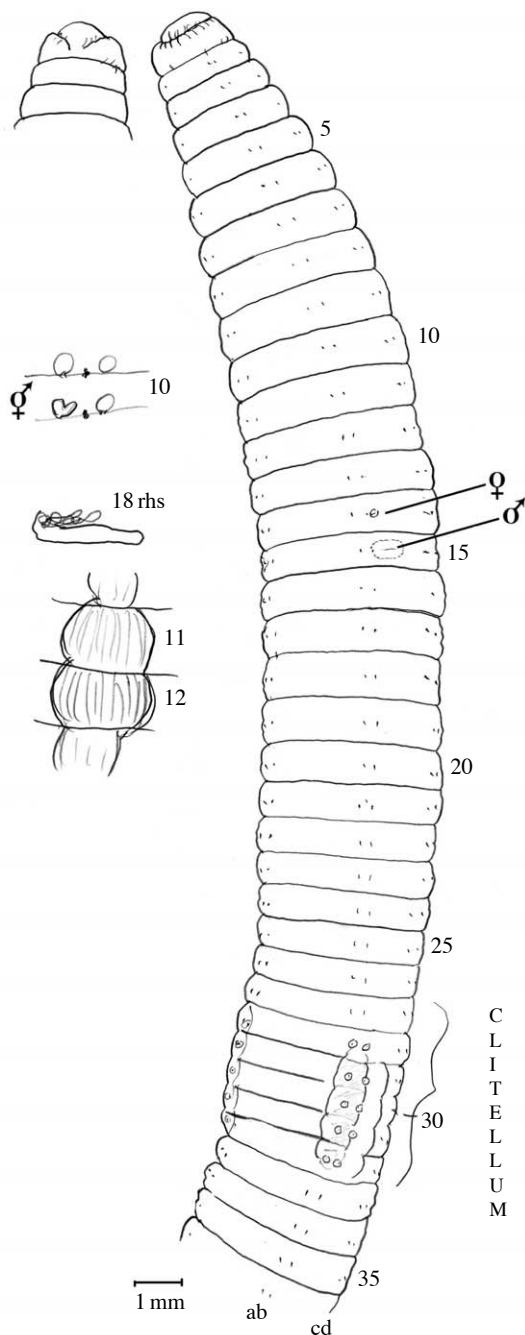


Fig. 10. *Eisenia muuido* sp. nov. Holotype showing spermathecae, nephridium 18rhs and calciferous glands in 11 & 12.

are genetically tested in Appendix and show matches no closer than 79-84% thus helping to define the uniqueness of the current worm.

DNA barcode Blast results show match no closer than 85-86% for *Eisenia nordenskioldi* aff. *nordenskioldi* (Eisen, 1879) (Genbank JX531498.1 from a Russian study) and its sub-species as redescribed by Blakemore (2013c: tab. 1) that have clitella in the region of 26,27-

32,33 and TP 29-31, thus closest to the current taxon. In Korean *Allolobophora* species reviewed by Blakemore (2013c: tab. 2), viz. *Allolobophora hataii*, *A. harbinensis* and *A. dairenensis* all by Kobayashi (1940), their clitella are in region of 23,24,25-32,33 and TP in 29-31 only, thus they too differ morphologically.

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Appendix – mtDNA COI barcode gene results with analysis via BLAST and MEGA-6

[JETxx samples are the author's iBOL (www.boldsystems.com) project on Japanese Earthworms at Guelph Uni., Canada; WOyy samples were attempted by a student at Ewha Womens' Uni. but were mixed in their lab (as lamented in Blakemore, 2013a) requiring resampling with prefix "w" at Seoul National Uni.; Hzz and HYzz are Hanyang Uni. data of current material. Arranged chronologically, some provisional/superseded taxa names are retained for reason of cross-reference, other names – of primary types – are definitive (cf. Fig. 1). Most Japan specimens were collected by RJB some with help of TJ Tansy (TJT)].

>LK172-173 W8 *Metaphire californica* Lake Biwa sample collected by RJB (2010/11).

atattggaaccttATATTTTATTCTAGGAATCTGAGCAGGGATAATCGGAGCAGGGATAAGATTACTTATTCGCATCGAACTAAGAC
AGCCTGGATCATTCCCTTGGAAAGAGACCAACTATATAATAACAATTGTGACAGCACACGCATTTCTAATAATTTTCTTTCTGGTG
ATACCAGTATTTATTGGGGGATTGGAAACTGACTTCTCCACTAATGTTAGGAACCCCTGACATAGCGTTCCTCGACTAA
ATAACATAAGATTCTGACTACTGCCACCTCATTAAATTCTACTAGTTAGATCCGCGGCAGTAGAAAAGGGGAGCAGGTACAG
GATGAACAGTGTACCCTCCACTAGCTAGAAACATAGCACACGCAGGTCCATCAGTAGATCTTGCAATTTTCTCACTACATTT
AGCAGGTGCCTCATCAATTTTGGGGGCCATCAATTTTCACTGATCAACATGCGATGATCAGGCCTACGCGCTAGAG
CGAATCCCACATTTCGTATGAGCCGTAGTAATCACTGTAGTACTCTTCTACTATCATTCTCTGTGCTAGCGGGGAGCAATTAC
TATATTATTAACGGATCGAAACCTAAATACCTCATTCTTCGACCCTGCAGGTGGGGGAGACCCAATTCTGTATCAACACC

>JET168-111An-4211*Amyntas-soulensis*|COI-5P

AACACTATATTTTATTTAGGAATTTGAGCTGGAATAATTGGAGCAGGATTAAGACTACTTATTCGAATTGAACTAAGACAG
CCTGGCTATTTCTCGTGGAAAGAGATCAACTTTATAATAACAATCGTAACCTGCCATGCATTTCTAATAATTTTTTCTCGTAAT
ACCTGTATTTATTGGGGGATTGGAAATTTGATTATTACCTCTTATACTAGGTGCACCCGATATAGCTTTCCCGACTTAATA
ATATAAGATTCTGGTTGCTCCCTCCTTCCCTTATTTTATTAGTATCCTCAGCAGCCGTAGAAAAGGGTGTGGAACAGGATG
AACAGTATACCCGCCACTTGCAAGGAATATTGCTCATGCTGGGCCCTCAGTAGACCTGGCAATTTTCCCTCCATTTAGCTG
GTGCATCATCAATTTTAGGAGCAATTAACCTTTATTACCACAGTAATTAATATACGATGGTCTGGGCTACGCTTAGAACGAAT
TCCCCTATTTGTATGAGCCGTTGTAATTAAGTGTAGTTCTCCTGCTCCTATCCTTACCTGTCTAGCCGGTGTATTACAATACT
ACTAACAGATCGAAACCTAAATACATCATTCTTCG

Blast *Metaphire soulensis* from Sendai, Japan (Genbank AB542663) 592/595 (99%).

JET028 (partial) vs. JET168=205/222 (92%) – possible contamination?

HY5 vs. JET168=577/579 (99%).

>WM15 Jeju1 #8 Sanbansan Temple *M. californica*

AGGTGTTGATACAGAATTGGGTCTCCCCACCTGCAGGGTCAAGAATGAGGTATTTAGGTTTCGATCCGTTAATAATATAG
TAATTGCTCCCGTAGCACAGGAAGTGATAGTAGAAGGAGTACTACAGTGATTACTACGGCTCATAACGAATAGTGGGATTC
GCTCTAGGCGTAGGCCTGATCATCGCATGTTGATCACAGTGGTAATGAAATTGATGGCCCCAAAATTTGATGAGGCACCTGC
TAAATGTAGTGAGAAAATTGCAAGATCTACTGATGGACCTCGGTGTGCTATGTTTCTAGCTAGTGGAGGGTACACTGTTTCAT
CCTGTACCTGCTCCCTTTTCTACTGCCGCGGATCTAACTAGTAGAATTAATGAGGGTGGCAGTAGTCAGAATCTTATGTTATT
TAGTCGAGGGAACGCTATGTCAGGGGTTCCCTAACATTAGTGGGAGAAGTCAGTTTCCAAATCCCCCAATAAAATCTGGTATC
ACCAGAAAAGAAATTTAGAAATGCGTGTGCTGCTACCAATTTGATTAATAGTTGGTCTTTCCAAGGAATGATCCAGGCT
GTCTTAGTTTCGATGCGAATAAGTAATCTTATCCCTGCTCCGATTATCCCTGCTCAGATTCTCAGAATAAAAAT
BLAST 100% *M. cal* or 98% *M. schmardae* from China.

>WO55 – *Amyntas* sp. Cheyonji – nil result. Redone as w31.

>WO62 – *M. soulensis* Korea, nil result, redone as w38.

>w38 *M. soulensis* (redo of WO62). NICEM samples results from BLAST 99% *Ischnura asiatica* (contamination of a dragonfly from Japan)! Same as w10 and w12 and w15 and w16 and w18 and w19 and w22 and w23 and w26 and w28 and w35.

>w31 *A. gracilis insularum* (redo of WO55).

AACCCTATATTTTATTCTAGGAATTTGAGCCGGAATAATTGGAGCTGGAATAAGGCTACTTATTCGAATTGAACTCAGACAG
CCGGGATCGTTTCTGGGAAGAGATCAACTATATAATAACAATTGTAACAGCTCATGCATTTGTAATAATTTTCTTTCTGGTAAT
ACCAGTATTCATTGGTGGATTGGAAACTGACTACTACCTCTAATGCTGGGTACACCAGACATAGCATTTCGCGACTTAAT
AATATAAGATTTGACTACTCCCCCGTCACTTATCTACTAGTAAGATCCGCGCCGTTGAAAAGGGGGCGGGAAGTGGAT
GAACAGTATATCCCCCGCTGGCAAGAAATATTGCACATGCTGGTCCATCAGTAGATCTAGCAATCTTCTCACTACACTTGGC
AGGAGCATCATCTATTTGGGGCCATTAACCTTTTACAACCTGTAATTAATATACGATGATCTGGATTACGGCTAGAACGA
ATCCCCTATTTGTATGGGCGGTAGTAATTAAGTGTAGTACTTCTACTATTATCTCTACCTGTACTAGCCGGAGCTATTACTAT
ATTATTAACAGATCGAAACCTTAACACATCATTCTTTGATCCCGCTGGAGGTGGAGACCCTATTCTATATCAACACCTATTT
BLAST 100% "*Amyntas gracilis*" GenBank vouchers (AB542484.1 & 542485.1) specimens were both from Ogasawara Islands, on Chichijima and Hahajima; whereas Identities=623/637 (98%) for two specimens of *Amyntas gracilis* (AB542489.1 & 542491.1) from Kyushu and Okinawa. The conclusion was a new sub-species cf. *A. gracilis*.

>w63 *Amyntas gracilis insularum* Cheonji 12 June 2012.

TATATTTTATTCTAGGAATTTGAGCCGGAATAATTGGAGCTGGAATAAGGCTACTTATTCGAATTGAACTCAGACAGCCGGG
ATCGTTTCTGGGAAGAGATCAACTATATAATAACAATTGTAACAGCTCATGCATTTGTAATAATTTTCTTTCTGGTAATACCAG

TATTCATTGGTGGATTTGGAACTGACTACTACCTCTAATGCTGGGTACACCAGACATAGCATTTCGCGACTTAATAATAT
 AAGATTTTGACTACTCCCCCGTCACTTATCTTACTAGTAAGATCCGCGGCCGTTGAAAAGGGGGCGGAACTGGATGAACA
 GTATATCCCCCGTGGCAAGAAATATTGCACATGCTGGTCCATCAGTAGATAGCAATCTTCTCACTACACTTGGCAGGAG
 CATCATCTATTCTTGGGGCCATTAACCTTATTACCAACTGTAATTAATATACGATGATCTGGATTACGGCTAGAACGAATCCCC
 CTATTTGTATGGGCCGTAGTAATTACTGTAGTACTTCTACTATTATCTTACTCTGACTAGCCGGAGCTATTACTATATTATTA
 ACAGATCGAAACCTTAACACATCATTCTTTGATCCCGTGGAGGTGGAGACCCTATTCTATATCAACACCTA

megaBLAST result *Amyntas gracilis* (AB542485.1); 100% from Japan.

BLAST w63 vs. WO54 Identities=650/650 (100%), i.e., WO54 was mixed.

BLAST w63 vs. w31 Identities=650/650 (100%) – QED thus questioning identification of *A. gracilis gracilis* as was recognized by Blakemore (2012a: 27).

> HY2 *M. ryunome* Blakemore, 2012; small (116 mm), prostatic Busan specimen (RJB)

TATACCTTATTTTAGGAATTTGAGCCGGAATAATCGGAGCTGGGATAAGCCTACTTATCCGCATTGAACTAAGTCAACCGGG
 GTCTTTCCTTGGAAAGAGACAGGATATATAATACGATTGTAACAGCACATGCATTCTCATAATTTTCTTCTTAGTAATACCAG
 TATTTATTGGGGGCTGCGAACTGGTTGCTACCTAATACTAGGAACACCAGATATAGCATATAGCATATAGCATATAGCATATAGCAT
 AAGATTTTGACTACTCCCCCTTCCCTAATTTCTCCTAGTGAGACTGAGCTGCCGTAGAAAAAGGAGCAGGTACAGGTTGAACA
 GTATACCCACCCCTAGCAAGAAATATAGCACATGCGGGCCCCCTCAGTAGATCTTGCAATCTTCTCACTACATTTAGCAGGTG
 CCTCGTCAATTTAGGAGCTATTAATTTTATTACCACAGTGATCAATATACGATGGTCAGGACTACGACTAGAACGAATTCC
 ATTATTTGTTTGGAGCAGTAATAATTACTGTAGTACTACTATTATCACTCCCTGTACTAGCCGGTGAATTACTATACTAC
 TAACAGACCGAACTTAACACATCCTTCTTTGATCCAGCTGGTGGTGGAGACCAATTCTATACCAACACTTATTC

megaBlast result: *Amyntas incongruus* (EF077551 from China), Id. (99% – misidentified).

BLASTn result: HY2 *Metaphire ryunome* Busan vs. *M. ryunome* H from Hikone (Tokyo An-457); results: Id. 653/653 (100%), i.e. same taxon – its wide distribution now allows concession of possibility to yield to prior records of some as yet unknown species from Asia.

HY2 *M. ryunome* vs. H3 *Amyntas masatacae* Busan specimen (180 mm) no prostates; results: Id. 553/652 (85%), i.e., different taxa as 15% dissimilar COI gene.

> HY3|*Amyntas-cf-corticis*|Dongnae-Gardens-Busan – nil result.

> HY4|*Amyntas-bangtaesan*

AGCAGGAATGAGACTCCTTATTCGAATCGAGCTAAGACAACCAGGATCTTTCCTAGGTAGTGATCAGCTATATAATACAATT
 GTTACAGCACATGCATTCTAATAATTTTTTTCTTGTAAATGCCCGTATTTATTGGGGGATTTGGAACTGACTTCTACCTCTA
 ATATTAGGTGCTCCTGATATAGCTTTTCCCGCTTAAATAACATAAGATTTTGATTACTTCCACCTTCACTAATTTTATTAGTG
 TCCTCGCGCTGTAGAAAAAGGTGACAGGTACTGGATGAAACAGTATACCCGCCACTTGCAAGAAATATTGCTCATGCGGGA
 CCCTCAGTAGACCTAGCAATTTTTTCCCTGCATTAGCTGGGGCGTCTCAATTCTAGGTGCAATTAACTTTATTACAACAGT
 AATTAATATACGATGATCTGGATTACGTCTAGAGCGAATTTCCCTATTTGTATGAGCAGTTGTAATTACCGTAGTTCTTCTAC
 TACTATCTTACCCGATTGGCTGGCGCCATCAATACTACTAACAGATCGAAATTTAAATACATCATTTTTTCGATCCGGCA
 GGAGGTGGAGACCAATTCTATATCAACACCTA

Blast result: *Megascolecidae* sp. (AB607052.1), 86%

HY4 vs. HY9=610/613 (99%).

> HY5|*Amyntas-cf-chiakensis* Mt Bangtaesan (= *M. soulensis*?)

AGTAATTGGAGCAGGAATAAGACTACTTATTCGAATTGAACTAAGACAGCCGGGCTCTTTCCTGGGAAGAGATCAACTTTAT
 AATACAATCGTAACTGCCATGCATTTCTAATAATTTTTTTCTCGTAATACCTGTATTTATTGGGGGATTCGGAAATTTGATT
 ATTACCTTATACTAGGTGCACCCGATATAGCTTTCCCGACTTAAATAATAAGATTCTGGTTGCTCCCTCCCTCCCTTAT
 TTTATTAGTATCCTCAGCAGCCGTAGAAAAAGGTGCTGGAACAGGATGAACAGTATACCCGCCACTTGCAAGAAATATTGCTCATGCGGGA
 TCATGCTGGGCCCTCAGTAGACCTGGCAATTTTTTCCCTCCATTTAGCTGGTGCATCATCAATTTTAGGAGCAATTAACTTTA
 TTACCACAGTAATTAATATACGATGGTCTGGGCTACGCTTAGAACGAATTTCCCTATTTGTATGAGCCGTTGTAATTACTGTA
 GTTCTCCTGCTCCTATCCTTACCTGTCTAGCCGGTGTATTACAATACTACTAACAGATCGAAACCTAAATACATCATTTCTT
 CGACCCAGCAGGGGGTGGGGACCCTATTTTATATCAACATTTATTTTG

Blast result: *Metaphire soulensis* (AB542665.1) 621/623 (99%).

HY5 vs. > w47 of *Metaphire soulensis* from Ullungdo as described by Blakemore (2013: 62, fig. 7)=99%.

HY5 vs. JET168=577/579 (99%), i.e. tolerably the same species.

> HY6|*Amyntas* sp. Bantaesan – nil result

> HY7|*Amyntas-seoraksan* – nil result.

> HY8|*Amyntas-Jeombangsan*1

CTATATTTTCATTTTAGGATTTGAGCTGGAATGGTTGGGGCAGGAATAAGACTACTTATTCGAGTTGAACTAAGACAACCGG
 GCTCTTTCCTAGGAAGAGATCAACTATATAATACAATTTGTAACAGCCCATGCATTCCTAATAATTTTTTTCTTGTAAATACCC
 GTATTTATTGGGGGATTTGGAAATTTGATTACTGCCACTAATGTTGGGTGCACCAGATATAGCTTTCCACGACTTAAATAATAT
 AAGATTTGATTGCTACCACCTTCACTCATTTTACTAGTATCTTCGGCAGCCGTAGAAAAGGGTGCCGGAACAGGATGAACA
 GTATACCCCTCAGCAAGAAATATTGCACATGCGGGCCCATCAGTAGATCTAGCAATCTTTTCTTCACTTAGCTGGAG
 CTTCTCAATTTTAGGAGCAATTAACCTTATCACCACAGTAATTAATATACGGTGTCTGGGTTACGTTTGAACGAATTTCCA
 CTATTTGTATGGGCAGTTGTAATTACTGTAGTACTCCTTCTACTATCTTTACCAGTTTTAGCCGGTGTCTATTACAATGTTACTA
 ACAGATCGAAACCTAAATACATCATTTTTTGACCCGGCTGGTGGTGGAGA

Blast result: *Metaphire vesiculata* (AB542689.1), 88%.
 HY8 vs. AB542558 of “*A. tokioensis*” from Hachioji, Japan=523/614 (85%).

> HY9|*Amyntas-jeombongsan2*

CTATACTTCATTTTAGGTATCTGAGCAGGGATAATTGGAGCAGGAATGAGACTCCTTATTTCGAATCGAGCTAAGACAACCAG
 GATCTTTCCTAGGAAGTGATCAGCTATATAATACAATTGTTACAGCACATGCATTTCTAATAATTTTTTTTCTTGTAATGCC
 GTATTTATTGGGGGATTGGAACTGACTTCTACCTCTAATATTAGGTGCTCCTGATATAGCTTTTCCCGTCTTAATAACAT
 AAGATTTGATTACTTCCACCTTCACTAATTTTATTAGTGTCTCGGCGGTGTAGAAAAAGGTGCGAGGTACTGGATGAACA
 GTATACCCACCATTGCAAGAAATATTGCTCATCGGGACCTCAGTAGACCTAGCAATTTTTTCCCTACTAGGCTGGGG
 CGTCCCTCAATTCTAGGTGCAATTAACCTTTATTACAACAGTAATTAATATACGATGATCTGGATTACGCTTAGAGCGAATCCC
 CTATTTGTATGAGCAGTTGTAATTACCGTAGTCTTCTACTACTATCTCTACCCGATTGGCTGGCGCCATACAATACTACT
 AACAGATCGAAATTTAAATACATCATTTTTTCGATCCGGCAGGAGGTGGAGACCCAATTCTATATCAACACCTATTT

Blast result: *Metaphire communissima* (AB542620.1 from Hyogo-ken, Japan), 88%.

> HY11|*Amyntas-jeombongsan3*

TATATTTTATTTTAGGCATTTGAGCTGGGATGGTGGGAGCTGGAATAAGGCTCCTTATTTCGAATTGAGCTAAGACAACCAGG
 GTCTTTCCTAGGAAGTGACCAGCTCTATAATACAATTGTAACAGCTCATGCGTTTCTAATAATTTTTTTTCTTGTAATGCCCG
 TATTTATTGGGGGATTGGGAATTGGCTTCTACCTTAAATACTGGGAGCGCCGGATATAGCCTTTCCTCGACTAAATAATATA
 AGATTTTGATTACTACCTCCCTCACTTATTTACTAGTATCTCCGCGCCGTTGAAAAAGGTGCGCGGTACAGGGTGAACAG
 TATATCCACCACCTTGGCAAGAAATATTGCACATGCGGGACCTCCGTAGACTAGCAATTTTTTCCCTTCAATTTAGCTGGTGG
 TCATCAATCTGGGGCAATCAACTTTATTACAACAGTAATTAACATACGATGATCTGGAAATGCGCTTAGAGCGAATCCC
 TATTTGTATGGGCTGTAGTATTACTGTAGTTCTTCTACTTCTCTTTACCCGACTTGTGGTGTACTACTATACTATTAA
 CAGATCGAAATCTAAATACATCATTTTTTGATCCCGCTGGAGGTGGGGACCCATTTTTATATCAACACCTATTT

Blast result: *Metaphire communissima* (AB542623.1 from Hyogo-ken, Japan), 87%.

HY11 vs. HY9=568/653 (87%).

> HY12|*Amyntas-jeombongsan4*

CTATACTTATTTTAGGGATCTGAGCAGGAATAATTGGAGCTGGGATAAGACTTCTCATTTCGAATTGAACTAAGACAGCCTG
 GATCCTTTCCTAGGAAGTGACCAACTATACAATACAATTGTAACAGCTCATGCATTTTAAATGATTTTTTTTCTTGTTATACCA
 GTATTTATTGGGGGATTGGAACTGATTATTACCCCTCATACTCGGCGCACCTGATATGGCATTTCACGACTAAATAACA
 TAAGATTCTGATTACTACCCCTCGCTTATCCTACTAGTGTCTCAGCAGCTGTAGAGAAAGGGGCGGGAACAGGGTGAAC
 AGTATACCCCTTGGCAGGAATATTGCACATGCTGGTCCATCAGTAGACCTAGCAATTTTTCTCTTCACTTAGCGGGG
 GCATCCCTCAATTTCTGGTGAATCAACTTTATTACAACAGTAATTAATATACGCTGATCGGGCCATCGTTTAGAGCGAATCC
 CGCTATTCTGTGGGAGTTGTAATTACCGTAGTACTATTACTACTATCTCTACCAGTTCTAGCAGGTGCCATTACAATACTG
 CTTACAGATCGAAATCTAAATACATCATTCTTTGACCTGCT

Blast result: *Amyntas tappensis* (AB542548.1 from Osaka, Japan), 87%

> HY13 null result.

> HY14|*Amyntas-cf.-gracilis-gracilis-Jeju1*

GAGCAGGAATAAGACTACTTATTTCGAATTGAGCTCAGACAGCCGGGATCGTTTCTGGGAAGAGATCAATTATATAATACAA
 TTGTAACAGCTCATGCATTCGTAATAATTTTCTTCTAGTAATACCAGTATTCATTGGTGGATTGGAACTGACTACTACCT
 CTAATGCTGGGTACACCAGACATAGCATTTCGCGGCTTAATAATATAAGATTTGGCTACTCCCCCGTCACTTATCTTACT
 AGTAAGATCCGCGCGGTTGAAAAGGGGGCGGGAATGGATGGACAGTATATCCCCGCTGGCAAGAAATATTGCACATGC
 TGGTCCATCAGTAGATCTAGCAATCTTCTACTACACTAGCAGGGGCATCTATTCTTGGGGCCATTAACCTTTATTACAA
 CTGTAATTAATATGCGATGATCTGGATTACGGCTAGAGCGAATCCCCCTATTTGTATGGGCCGTAGTAATTACTGTAGTACTT
 CTACTATTATCTTACCTGTACTAGCCGAGCTATTACTATACTATTAACAGATCGAAACCTTAACACATCATTCTTTGATCC
 CGCTGGAGGTGGAGACCCTATTCTATATCAACACCTATTT

Blast result: *Amyntas gracilis* (AB542489.1 & 542491.1 from Japan), 100%.

> HY15|*Amyntas-cf.-gracilis-Jeju2*

CCCTATATTTTATTCTAGGAATTTGAGCCGGAATAATTGGAGCAGGAATAAGACTACTTATTTCGAATTGAGCTCAGACAGCC
 GGGATCGTTTCTGGGAAGAGATCAATTATATAATACAATTGTAACAGCTCATGCATTCGTAATAATTTTCTTTCTAGTAATAC
 CAGTATTCATTGGTGGATTGGAACTGACTACTACCTCTAATGCTGGGTACACCAGACATAGCATTTCGCGGCTTAATAA
 TATAAGATTTGGCTACTCCCCCGTCACTTATCTTACTAGTAAGATCCGCGGCGTTGAAAAGGGGGCGGGAACCTGGATGG
 ACAGTATATCCCCGCTGGCAAGAAATATTGCACATGCTGGTCCATCAGTAGACTAGCAATCTTCTACTACACTTAGCAG
 GGGCATCATCTATTCTTGGGGCCATTAACCTTTATTACAACCTGTAATTAATATGCGATGATCTGGATTACGGCTAGAGCGAAT
 CCCCCTATTTGTATGGGCCGTAGTAATTACTGTAGTACTTCTACTATTATCTCTACCTGTACTAGCCGAGCTATTACTATA
 TATTAACAGATCGAAACCTTAACACATCATTCTTTGATCCCGCTGGAGGTGGAGACCCTATTCTATATCAACACCTA

Blast result: *Amyntas gracilis* (AB542491.1), 100%

> HY16|*Amyntas-cf.-gracilis-Jeju3*

GGAGCAGGAATAAGACTACTTATTTCGAATTGAGCTCAGACAGCCGGGATCGTTTCTGGGAAGAGATCAATTATATAATACA
 ATTGTAACAGCTCATGCATTCGTAATAATTTTCTTTCTAGTAATACCAGTATTCATTGGTGGATTGGAACTGACTACTACC
 TCTAATGCTGGGTACACCAGACATAGCATTTCGCGGCTTAATAATATAAGATTTGGCTACTCCCCCGTCACTTATCTTAC

TAGTAAGATCCGCGGCCGTTGAAAAGGGGGCGGGAAGCTGGATGGACAGTATATCCCCGCTGGCAAGAAATATTGCACATG
CTGGTCCATCAGTAGATCTAGCAATCTTCTACTACACTTAGCAGGGGCATCATCTATTCTTGGGGCCATTAACCTTTATTACA
ACTGTAATTAATATGCGATGATCTGGATTACGGCTAGAGCGAATCCCCCTATTGTATGGGCCGTAGTAATTACTGTAGTAC
TTCTACTATTATCTCTACCTGTACTAGCCGGAGCTATTACTATACTATTAACAGATCGAAACCTTAACACATCATCTTTTGT
CCCCGCTGGAGGTGGAGACCCTATTCTATATCAACACCTAT

Blast result: *Amyntas gracilis* (AB542491.1), 100%

>HY17|*Amyntas-californica*-Jeju

ATCGGAGCAGGGATAAGATTACTTATTCGCATCGAACTAAGACAGCCTGGATCATTTCCTTGAAGAGACCAACTATATAAT
ACAATTGTGACAGCACACGCATTCTAATAATTTCTTCTGGTGATACCAGTATTTATGGGGGATTTGGAACTGACTTCT
CCCCTAATGTTAGGAACCCCTGACATAGCGTTCCTCGACTAAATAACATAAGATTCTGACTACTGCCACCCTCATTAAAT
CTACTAGTTAGATCCGCGGCAGTAGAAAAGGGAGCAGGTACAGGATGAACAGTGTACCCTCCACTAGCTAGAAACATAGCA
CACGCAGGTCCATCAGTAGATCTTGCAATTTCTACTACATTTAGCAGGTGCCTCATCAATTTGGGGGCCATCAATTTTCAT
TACCCTGTGATCAACATCGCATGATCAGGCCTACGCCTAGAGCGAATCCCCTATTTCGTATGAGCCGTAGTAATCACTGTA
GTACTCTTCTACTACTTCTCTGTGCTAGCCGGAGCAATTACTATATTATTAACGGATCGAAACCTAAATACCTCATCTT
CGACCCTGCAGGTGGGGGAGACCCAATTTCTGTATCAACACCTATTC

Blast result: *Metaphire californica* (AY960810.1), 100%; *Metaphire schmardae* (EF032610) 98%.

>HY19|*Amyntas*-cf.-*corticis*-Jeju

CTATACTTCATTTAGGAATTTGAGCCGGAATAATTGGGGCTGGAATAAGTCTTCTTATTTCGAATCGAATTAAGACAACCTG
GGTCATTCTGGGAAGTGACCACTTTATAACACAATTGTAACAGCAGCATGCATTTTAATAATTTTTTTCTAGTAATACCA
GTATTTATTGGTGGTTTTGGTAATTGACTATTACCACTTATATTGGGGACTCCAGATATAGCATTTCACGCCTAAATAATAT
AAGATTCTGACTATTACCCCTCCTCATCTTACTAGTCTTCTGCAGCAGTGGAAAAAGGTGCAGGAACAGGATGAACA
GTTTACCCACCTAGCAAGTAACATTGCGCATGCTGGACCATCAGTAGATCTGGCAATTTCTACTACACTTAGCAGGGG
CATCATCAATTTAGGTGCAATCAATTTTATTACTACAGTAATTAATATACGATGATCAGGCCTACGACTAGAACGAATTC
CCTATTTGTATGAGCAGTAGTAATACCCTAGTCTACTACTTCTATCATTACCAGTACTAGCCGGTGTATCACAATACTAT
TAACAGATCGAAACCTTAATACATCATTCTTTGATCCAGCAGGAGGGGAGACCCAATTTA

Blast result: *Amyntas corticis* (DQ224190.1), 100% or *Amyntas diffringens* (EF077548.1), 100%, this latter probably a mistake for *A. corticis* (cf. Blakemore, 2013d).

>HY20|*Amyntas-tralfamadore*-Jeju

CTATACTTTATTCTAGGAATTTGAGCAGGAATAATTGGTGCAGGAATAAGACTACTTATTTCGTATTGAGTTAAGACAACCTG
GATCCTTCTTGGTAGGGACCAGCTATATAATAACAATTGTAACAGCAGCATGCATTTTAATAATCTTCTTTCTAGTAATACCA
GTATTTATTGGTGGATTTCGAAAACCTGGTTACTACCCCTAATACTTGGAAACCCAGATATGGCGTTCCTCGATTAAATAACA
TAAGATTTGACTACTCCCGCCATCATTAAATTTATTAGTAAGATCTGCCCGGTAGAAAAGGGGGCTGGCACAGGTTGAAC
AGTTTACCCACCTTAGCAAGAAATATAGCAGATGCCGGTCTCAGTAGACCTTGCAATTTCTACTTCATCTTGCAGGTG
CCTCGTCAATTTGGAGCTATTAACCTTATCACAACAGTAATTAACATACGATGATCTGGGTTACGTCTAGAACGAATCCC
ACTATTTGTGTGAGCAGTAGTAATCACTGTAGTACTATTACTATTGTCCCTACCTGTACTGGCAGGGGCAATTACCATATTAC
TAACAGATCGAAACCTTAATACATCATTCTTTGATCCAGCAGGA

Blast result: *Amyntas robustus* (AB542534.1), 95%

HY20 vs WO2 *A. tralfamadore* Holotype=619/621 (99%), i.e., probably same taxon.

HY20 vs w29 *A. tralfamadore* smaller Jeju specimen (redo of WO53)=618/621 (99%).

HY20 vs w30 *A. tralfamadore* pale specimen from Jeju Id=619/621 (99%).

>HY21-HY29 void.

>HY30|*Eisenia-muuido*

TCTTTATTTTATCCTAGGAGTTTGGGCCGGTATAGTGGGTGCTGGAATAAGACTCCTCATTTCGAATCGAATTAAGACAGCCG
GGCGCCTTTCTAGGTAGAGATCAACTATATAATAACAATTGTCACAGCTCACGCATTTGTAATAATTTTCTTCTTAGTAATACC
CGTATTTATTGGTGGATTGGAACTGACTTCTGCCCTAATACTAGGTGCCCGGATATAGCCTTCTCCTCGTCTAAATAACA
TAAGATTCTGACTTCTACCACCCTCCCTGATTCTTGTATCCTCCGGCAGTAGAAAAAGGTGCGGGAACAGGATGAAC
CGTATACCCCTCTTTCTAGAAACCTTGCTCATGCTGGCCCTTCTGTAGATCTAGCCATTTTCTCCCTTCACTTAGCTGGAGC
CTCATCTATTCTAGGGGCAATTAACCTTTATTACAACCGTTATTAACATACGTTGAGCAGGCATACGTCTTGAACGAATCCCC
TATTCGTATGAGCTGTAATTATTACAGTAGTCTTCTCCTTCTATCTCTCCAGTACTTGCAGGTGCAATTACTATGTTACTAA
CAGACCGAAACCTTAATACTTCTATTCTTTGACCCAGCTGGAGGTGGTGATCCCATCCTATATCAACATCTGTTC

Blast result: *Eisenia nordenskioldi* aff. *nordenskioldi* (JX531498.1 Russian study), 85%.

HY30 vs. > WM1 *Eisenia gaga* Holotype (INV245509 Fig. 1)=523/644 (81%).

HY30 vs. > WO25 *Eisenia sindo* Holotype, H IV0000246435 (Fig. 3)=524/651 (80%).

HY30 vs. > JET124-11|An-466.1|*Eisenia japonica* from Japan=550/656 (84%).

> JET170-11|An-417|*Eisenia japonica* Enoshima Japan topotype=548/656 (84%).

HY30 vs. > w18b Jeju #2 *Eisenia japonica* (redo of WO45)=535/654 (82%).

HY30 vs. > WM6 NZ Arataki "*Eisenia japonica*" AMNZ86031=513/650 (79%).

HY30 vs. > w65 Mongolian *Eisenia nordenskioldi* onon Blakemore, 2012 Holotype=540/630 (86%).

>HY31|*Metaphire-muuido*

TTATATTTTCATTTTAGGTATCTGAGCCGGAATAATTGGAGCCGGAATAAGACTCCTTATTCGAATTGAATTAAGACAGCCTG
 GATCATTCTAGGCAGGGACCAATTATATAATAACAATTGTAAGTCTCATGCATTTTAAATAATTTCTTTTTAGTTATACCA
 GTATTTATTGGGGGATTGGAAATTGATTACTACCCTTATACTAGGAACCCAGACATAGCCTTTCCACGACTTAATAATA
 TAAGATTTTGATTATTACCCCTCACTTATTCTCCTAGTATCGTCCGCTGCAGTAGAAAAGGGTGCGGGAACAGGATGAAC
 AGTATATCCCCACTAGCAAGAAATATTGCACACGCTGGACCTTCAGTGGACCTTGCAATTTTTTCCCTTCATCTTGCTGGTG
 CATCCTCAATTCTAGGAGCTATTAATTTTATTACTACTGTAATTAATATAACGATGATCTGGGCTTCGCTTAGAGCGAATTCCA
 CTATTTGTATGAGCAGTAGTAATCACAGTAGTACTCCTACTGCTCTCACTTCCAGTTCTTGCTGGGGCCATTACAATATTATT
 AACAGACCGAAATCTAAATACATCATTCTTCGATCCAGCGGGAGGGGGGACCCCTATTTTATACCAACACCTATTT

Blast result: *Amyntas sp. 3* (JQ911673.1), 87%.

> AB542558.1|*Amyntas tokioensis* ex Hachioji, Japan (Minamiya *et al.*, 2010).

OUTGROUP

ACANTHODRILIDAE (*sensu* Blakemore, 2000 rather than some Gatesian concept).

> JET157-11|An-480|*Microcolex dubius*|COI-5P from Lake Biwa Japan collected by RJB.

AACACTATACTTCATTTTAGGAGTATGAGCAGGGATAATTGGAGCTGGGATAAGGCTATTAATCCGTATTGAATTAAGGCAA
 CCCGGGGCATTCTAGGTAGAGATCAACTATATAATAACAATTGTTACCGCACATGCATTTTAAATAATTTTTCTCTGGTAAT
 ACCAGTATTCATTGGAGGATTGGAAATTGGCTTCTCCTCTTATATTGGGGGCCCTGACATAGCATTCCACGACTTAATA
 ATATAAGATTTTGACTGCTACCTCCATCCTTAATTCATTAATTTTCATCAGCTGCTGTAGAAAAGGGGGCTGGGACAGGATG
 AACTGTATATCCACCCCTTGCAAGAAATATAGCTCATGCGGGACCATCTGTAGACTTAGCAATTTTCTCACTTCATCTTGAG
 GAGCCTCGTCCATTTTAGGGGCCATTAACCTTATTACTACTGTTGTTAATATAACGATCAACAGGTATACGACTAGAACGAGT
 ACCCTTATTGTATGAGCAGTAATTATTACAGTGGTCTACTACTTCTTCTTTACCCGTGTTAGCTGGGGCCATTACAATACT
 ATTAAGTATCGTAACTAAATACCTCCTTCTTTGACCCTTCAGGTGGTGGAGACCCTATCTTATATCAGCATCTATTC

BLAST 620/621 (99%) *Microcolex dubius* isolate WELG2 JN870091 from "South Africa" as above; nBLASTAn-479 vs. An-480 653/658 (99%). This Japanese specimen of Acanthodrilid *Microcolex dubius* (Fletcher, 1887) from rice-paddy drains at Lake Biwa is a new record for Far East Asia (Blakemore, 2012e).