Jeju-do earthworms (Oligochaeta: Megadrilacea)-Quelpart Island revisited

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Surveys on Jeju-do (Quelpart Isl.) unearthed about 40 earthworm species or sub-species. Several considered new to science are described. Only a dozen were previously known and these are taxonomically reviewed. The two most commonly recorded in surveys by S. Kobayashi in the 1930s were *Drawida anchingiana* Chen, 1933 and *Metaphire quelparta* (Kobayashi, 1937), neither recently relocated. Morphologically similar taxa, supported with DNA barcodes, for Moniligastridae, are *Drawida anchingiana seogwipo*, *D. anchingiana halla* and *D. iucn* spp. or sub-spp. nov. For Megascolecidae, new taxa and synonyms are: *Amyntas arx* and *A. aucklandis* spp. nov. that have seminal grooves rather than the eversible male pores of *Metaphire* plus *Amyntas simplex* is another new species. *Amyntas sangumburi* Hong & Kim, 2002 is recognized as a probable new synonym within the *A. corticis* (Kinberg, 1867) species-group while *Amyntas corticis saeseum* sub-sp. nov. is described. *Amyntas gracilis* (Kinberg, 1867) is a new record from Jeju and Korea (with *A. bouchei*, *A. omodeoi* and *A. edwardsi* all by Zhao & Qiu, 2009 possible synonyms of this species group from China) with a Jejuan sub-species, *A. gracilis insularum*, sub-sp. nov. Presence on Jeju of *Amyntas carnosus* (Goto & Hatai, 1899) is confirmed (its further new synonyms are Chinese *A. fuscus* Qiu & Sun, 2012 and *A. taiwumontis* Shen *et al.*, 2013), as is *A. micronarius* (Goto & Hatai, 1898) (with new synonym *A. montanus* Qiu & Sun, 2012 also an invalid secondary homonym). *Amyntas phaselus maculosus* (Hatai, 1930) is in new combination with *A. kamitai* (Kobayashi, 1934) and *A. minjae* Hong, 2001 syns. nov. Two newly described *Metaphire quelparta* sub-spp are *M. q. seogwipo* and *M. q. valhalla* these being supported with DNA barcodes despite the nominal taxon not yet being confirmed.

Keywords: Annelida, Asian, island biodiversity, native and invasive species, taxonomy

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INTRODUCTION

Jeju-do (제주도 also spelt Cheju-do or Chejoo-do and formerly known to Europeans as Quelpart Isl. or to the Japanese as Saishu-to was historically called Doi amongst other Korean names) is a special autonomous province of 1,849 km² located 80 km South of the South Korean mainland. Volcanic origin commenced approximately 2 Ma (BP) and it was last connected to the Korean Peninsula approximately 10,000 years ago. Its highest mountain Hallasan or Mt Halla, amongst several previous names being known to Europeans as Mt Auckland or to the Japanese as Mt Kanra, is a National Park that supports 1,565 vascular plants and approximately 1,000 identified insects. It is a shield volcano at 1,950 m in the centre of the island; thus the island's basaltic soils are derived chiefly from lava. Climate is subtropical oceanic and tem-

perate supporting a varied flora and fauna that is listed as a UNESCO World Heritage Site for its Volcanos and Larval Tubes (Wikipedia).

The first systematic earthworm survey by Kobayashi (1937) recorded five species, and another five were added by Kobayashi (1938; 1941), the types now lost. Thirty years later, Song & Paik (1970) found six known, three previously unrecorded and one new species. Their total of eleven species then raised the island count to 14 species of earthworms.

Subsequently, Hong & James (2001a) claimed *Amyntas youngtai* from Mt Halla, but this is a synonym of *A. carnosus* (Goto & Hatai, 1899) (see Blakemore, 2012a; 2012f). Also, *Amyntas yongshilensis* Hong & James, 2001b: 80 - a probable junior synonym of *A. tokioensis* (Beddard, 1892) - was collected from Mt Halla (=Yongshil?) and was sympatric on Jeju and compared only to their *Amyntas alveolatus* Hong & James, 2001b: 81

from Sangumburi Crater, Jeju that is exactly the same, i.e., synonymous, with *A. kanrazanus incretus* (Kobayashi, 1937) which is comparable to *A. kanrazanus kanrazanus* (Kobayashi, 1937: 340, figs. 3, 4) itself also similar to *A. tokioensis*. *Amyntas sangumburi* Hong & Kim, 2002 also from Sangumburi Crater near Mt Halla resembles both *A. toriii* (Ohfuchi, 1941: 244) from a cave in Oita-ken and *A. subrotunda* (Ishizuka, 2000) both currently in synonymy of *A. corticis*. Therefore, *A. sangumburi* possibly also belongs to the synonymy of either or joins both of these in *A. corticis*, at least its validity depends upon deeper research.

Most recently, several exotics and a translocated endemic, *Amyntas tralfamadore* Blakemore, 2012, were newly reported in Blakemore *et al.* (2012) and by Blakemore (2012d).

Previous results are compared and consolidated in this taxonomic report following collecting trips by the current author in 2012 to give a current total of more than 40 taxa.

MATERIALS AND METHODS

Surveys were under the auspices of NIBR with funding from Hanyang University. Taxonomic determinations follow the methodology and classifications in Sims & Easton (1972) and Blakemore (2010b; 2012a). Abbreviations are: C - circumference, GMs - genital markings, lhs - left hand side and rhs - right hand side. A “?” indicates some uncertainty.

Small tissue samples were taken for mtDNA COI gene barcoding by various Korean Companies with preliminary nucleotide analysis via ‘MEGA 5’ (www.megasoftware.net) and BLAST programs (www.blast.ncbi.nlm.nih.gov/BLAST.cgi) provided in an Appendix. Those barcode results that are confidently proven will eventually be uploaded to GenBank (www.blast.ncbi.nlm.nih.gov/genbank) and Bold Systems (www.boldsystems.org) or the International Barcode-of-Life project (iBOL www.barcodeoflife.org) with published names.

TAXONOMIC RESULTS

Results (arranged by family) are summarized in Table 1.

Enchytraeidae

Several small, pale, semi-terrestrial “pot-worms” were noted, but not kept, during the surveys and, since they are ecologically ineffectual when compared to megadriles (usually being grouped with the aquatic microdriles) nor

are they taxonomically diverse (just 650 named spp from sodden soils worldwide), thus they do not warrant further consideration.

Moniligastridae

Drawida anchingiana anchingiana Chen, 1933

Material examined. None. Types not known.

Remarks. *Drawida gisti anchingiana* Chen, 1933: 202 was elevated to specific rank (in part?) by Gates (1935: 3) and Kobayashi (1937: 333, fig. 1). It is comparable to *Drawida gisti* Michaelsen, 1931 as redescribed by Gates (1936: 406-407) that differed from Chen’s (1933) version. Both Gates (1935: 2) and Kobayashi (1937: 336; 1938: 35, fig. 2) noted that Chen’s description of *D. gisti* f. *typica* also differed in some important characters from Michaelsen’s original and from his types as later redescribed by Gates (1937). Gates (1935: 3) had earlier noted:

“*D. gisti* var. *anchingiana* Chen, 1933, is not adequately described but differs from the [*gisti*] types as follows: limitation of the penis pouches (?) to the body wall, small size and smooth surface of the prostates, and the presence of the spermathecal atria in vii rather than viii. These differences are important enough to distinguish the worms specifically from *D. gisti*. The specimens may not be sexually mature - *vide* absence of granulations on the prostates, the empty ovisacs, and the small size of the spermathecal ampullae, as well as the indistinctness of the clitellum.”

Kobayashi (1937: 337) concluded that the penial apertures were situated “*nearer to b*” in *D. gisti* Michaelsen, 1931, but “*much nearer to c*” in *D. anchiangiana* and that the spermathecal duct “*opens into the broad distal end of a large long sac-like spermathecal atrium*” in *D. gisti*, but “*enters into posterior ectal third of the atrium*” in *D. anchingiana*. Kobayashi had as its characteristic feature the spermathecal atrium in segment 7 that was “*often*” accompanied by an accessory gland (Kobayashi, 1937: 337, fig. 1B). However, it is not clear that what Kobayashi claimed from Jeju was the same as the Chinese taxon due partly to uncertainty of Chen’s taxon obtained from “*Anching, Anhwei and Pukow, Kiangsu*”, and due partly to Kobayashi’s specimens that, as well as being mostly immature, also tending to vary and perhaps representing a species-complex. Types unknown, this taxon has not been confirmed in China nor Korea - and neither has its sibling species *Drawida gisti nanchingiana* Chen, 1933: 200. Kobayashi obtained specimens from Jeju town, from Mt Halla and from Seogwipo, some of which probably come close to the following sub-species newly found on Jeju that themselves vary somewhat but which provide objective DNA data for comparison.

Table 1. Summary of Jeju earthworms survey results

No.	Kobayashi (1937; 1938; 1941)	Song & Paik (1970)	Recent studies
1			? <i>Enchytraeus</i> spp.
2	<i>Drawida anchingiana</i>		<i>Drawida a. anchingiana</i>
3			<i>Drawida a. halla</i>
4			<i>Drawida a. seogwipo</i>
5			<i>Drawida iucn</i>
6	<i>Drawida japonica</i>		<i>Drawida japonica</i>
7			<i>Drawida</i> spp?
8			<i>Ocnerodrilus occidentalis</i>
9			<i>Amyntas arx</i>
10			<i>Amyntas aucklandis</i>
11	<i>Pheretima carnosus</i>	<i>Pheretima carnosus</i>	<i>Amyntas carnosus</i>
12		<i>Pheretima heteropoda</i>	<i>Amyntas corticis corticis</i>
13			<i>Amyntas c. saeseum</i>
14			? <i>Amyntas gracilis gracilis</i>
15			<i>Amyntas g. insularum</i>
16	<i>Pheretima hupeiensis</i>	<i>Pheretima hupeiensis</i>	<i>Amyntas hupeiensis</i>
17	<i>Pheretima kanrazana kanrazana</i>	<i>Pheretima kanrazana</i>	<i>Amyntas kanrazanus kanrazanus</i>
18	<i>Pheretima kanrazana increta</i>	<i>Pheretima kanrazana</i>	<i>Amyntas k. incretus</i> (inc. <i>alveolatus</i>)
19	<i>Pheretima masatakae</i>	<i>Pheretima masatakae</i>	<i>Amyntas masatakae</i>
20			<i>Amyntas micronarius</i>
21		<i>Pheretima phaselus</i> var. <i>kamitai</i>	<i>Amyntas phaselus maculosus</i> (incl. <i>kamitai</i> and <i>minjae</i>)
22			? <i>Amyntas p. phaselus</i>
23			? <i>Amyntas sangumburi</i>
24		<i>Pheretima seungpanensis</i>	<i>Amyntas seungpanensis</i>
25			<i>Amyntas simplex</i>
26			<i>Amyntas tokioensis</i> (incl. <i>yongshilensis</i>)
27			<i>Amyntas tralfamadore</i>
28		<i>Pheretima agrestis</i>	<i>Metaphire agrestis</i>
29			<i>Metaphire californica</i>
30			<i>Metaphire haenyeo</i>
31			? <i>Metaphire hilgendorfi</i>
32	<i>Pheretima quelparta</i>	<i>Pheretima quelparta</i>	<i>Metaphire quelparta quelparta</i>
33			<i>Metaphire q. seogwipo</i>
34			<i>Metaphire q. valhalla</i>
35		<i>Pheretima soulensis</i>	<i>Metaphire soulensis</i>
36			<i>Pontodrilus litoralis</i>
37			<i>Aporrectodea caliginosa/tuberculata</i>
38	<i>Allolobophora caliginosa trapezoides?</i>	<i>Allolobophora cal. trapezoides</i>	<i>Aporrectodea trapezoides</i>
39			<i>Bimastos parvus</i>
40			? <i>Dendrobaena</i> sp
41			? <i>Eisenia andrei</i>
42			<i>Eisenia fetida</i>
43	<i>Allolobophora japonica typica</i>		<i>Eisenia japonica</i>
Total	10	12	43

Drawida anchingiana halla* sp. nov.*[Fig. 1]**

Material examined. IV0000251105 Holotype, figured and dissected with tissue samples taken for DNA analysis [WO46 (cf. WO45), w24, w43]. Collected 12th June 2012 by RJB from Hyonyungsa Temple, Mt Halla (33° 21'42"N 126° 31'45"E); preservation in 80% EtOH.

Note. Superficially similar specimens from Mt Halla looked possibly conspecific but also resemble *D. koreana* Kobayashi, 1938 are noted as “*Drawida* sp.2” below.

Etymology. From location, noun in apposition.

Description. Length 60 mm. Segments 128. Body stout, flattened posteriorly. Colour dark brownish in anterior and bluish in posterior. Prolobous, ventrally cleft. No dorsal pores. Clitellum not developed. Nephropores in cd lines. Spermathecal pores in 7/8 median of c lines. Male pores on penes protruding slightly from wide slits centred median of c lines in 10/11. Female pores in b lines in 11/12. Genital markings are widely paired presettally median of c lines in 8 and 10 (circular ‘GM glands’ correspond internally, DNA sample from 8lhs that appeared

Fig. 1. *Drawida anchingiana halla* sp. nov. holotype showing ventral aspect, prostomium; gizzards and reproductive organs with [boxed] enlargement of male pore.

to contain mucus and a nematode - w43).

Internally, septa 5/6-8/9 thick; others thin and displaced; 10/11 supports large testis sac with coiled vas deferens to prostate near exit. Dorsal blood vessel single and hearts in 6-9. Spermathecae atria present anteriorly from 7/8 with long coiled duct to ampulla attached to 7/8 pos-

teriorly in 8. Ovisacs small (empty) from septum 12/13; 11/12 doubled to form an ovarian chamber. Nephridial bladders elongate. Gizzards in 12-14.

Remarks. *Drawida gisti* Michaelsen, 1931 that occurs on the mainland (Kobayashi, 1938: 35) has male pores nearer to b lines and gizzards in 12-14, whereas *D. anchingi-*

ana has male pores nearer to c lines and gizzards described by Kobayashi (1937: 335) as three in “XII–XVI or XI–XVII” with markings variable in some of 8, 10 and 11 and either presetal or postsetal; plus a distinctive accessory atrial gland in segment 7. *Drawida a. halla* sub-sp. nov. has male pores near c lines, gizzards in 12–14 plus widely paired and presetal genital markings in 8 and 10 that, in combination with DNA data in Appendix identify this species.

***Drawida anchingiana seogwipo* subsp. nov.**
[Fig. 2]

Material examined. IV0000261226 Holotype (H) figured and dissected with small tissue samples taken for DNA analysis (WO69, w44); IV0000261228 Paratype (P) providing DNA sample (WO71). Collected 9th Sept. 2012 by RJB during short walk from Botanic Gardens to IUCN meeting at Seogwipo (33° 15'10"N 126° 33'40"E); preservation in 80% EtOH.

Note. Three complete specimens and two fragments, with the same collection data but none dissected, are possibly the same taxon (see “*Drawida* sp.1” below).

Etymology. After the type-locality, noun in apposition.

Description. Length 55–58 mm (H missing tip of tail, P complete). Colour bluish in posterior of body, with faintly dark mid-dorsal line. Prolobous, ventrally cleft. No dorsal pores. Clitellum not developed. Nephropores clearly in setal d lines or above in anterior. Spermathecal pores in 7/8 in cd lines. Male pores on penes protruding slightly from wide slits centred on c lines in 10/11. Female pores in b lines in 11/12. Genital markings paired in 8 offset medially, and lhs analogues in 9, 10 and 11 in H; P1 has them on 10 & 11 only (circular ‘GM glands’ correspond internally – on the off-chance they are parasitic artefacts those from 8rhs and 10lhs from H sampled for DNA – w44, results in Appendix).

Internally, septa 5/6–8/9 thick; 9/10 and 10/11 are conjoined and displaced to mid-10 supporting yellow testis sac with coiled vas deferens to prostate that attaches to male organ. Dorsal blood vessel single and hearts in 6–9. Spermathecae atria present anteriorly from 7/8 with long coiled duct to ampulla attached to 7/8 posteriorly in 8. Ovisacs (empty) present from septum 12/13 that along with 11/12 forms an ovarian chamber ventrally. Nephridial bladders elongate. Gizzards muscular in 13–15.

Remarks. Differences in the current type of *D. a. seogwipo* from the nominal taxon are gizzards in 13–15 and lack of an atrial gland which may be its distinguishing characters, here complemented with the DNA barcode data including that of the paratype (WO71) that was not so extensively studied but differs only slightly. Morphological similarity of *D. anchingiana seogwipo* to *D. a. halla* sub-sp. nov. described above, extends to atrium in

7 and lack of accessory glands there, but is contraindicated by gizzards in 13–15 rather than 12–14. Slight DNA barcode indications support its separation (w24 vs. WO69 in Appendix). However, should *D. a. anchingiana* proper be confirmed from China (or Jeju!) then morphological and genetic comparison may allow clarification of the full species relationship.

Both new sub-species may indicate a variable species complex, possibly with parts similar to what Kobayashi found. Mutual inclusion or separation depends on re-locating fully mature material on Jeju that correspond to Kobayashi’s description, plus further studies of types of the whole species-complex in China.

***Drawida iucn* sp. nov.**
[Fig. 3]

Material examined. IV0000261225 Holotype, figured (Fig. 3) and dissected with small tissue sample taken for DNA analysis (WO68). Collected 9th Sept. 2012 by RJB from under rock on short walk from Botanic Gardens to IUCN meeting at Seogwipo (33° 15'10"N 126° 33'40"E); preservation was in 80% EtOH.

Etymology. From acronym for International Union of Conservation Networks who hosted the World Conservation Congress at Jeju and are concerned with promotion of species diversity. This does not imply support nor funding for the survey and its results from IUCN. Pronunciation is “eye-you-see-en”, a non-arbitrary combination of letters used as a word formed from an acronyms as permitted under ICZN recommendations (cf. *Eisenia anzac* Blakemore, 2011 from Japan).

Description. Length 73 mm. Segments 127, possibly the last 12 regenerated. Colour pale grey unpigmented with dark mid-dorsal line from 11. Prolobous. No dorsal pores. Clitellum not developed. Nephropores in c lines or above. Spermathecal pores in 7/8 in c lines. Male pores on blunt penes protruding slightly from wide slits centred median of cd lines in 10/11. Female pores in b lines in 11/12. Genital markings single, mid-ventrally offset in 8 and 11.

Internally, septa 5/6–8/9 thick; 9/10 and 10/11 are conjoined and displaced to mid-10 supporting yellow testis sac with coiled vas deferens to prostate that attaches to male organ. Dorsal blood vessel single and hearts in 6–9. Spermathecae atria present anteriorly from 7/8 with long coiled duct to ampulla attached to 7/8 posteriorly in 8. Ovisacs (empty) present from septum 12/13 that along with 11/12 forms an ovarian chamber ventrally. Nephridial bladders elongate. Gizzards in 12–15 with muscular modification in 12 reduced.

Remarks. *Drawida iucn* agrees morphologically with *D. anchingiana seogwipo* on almost all points, except for lack of blue colour, GM details and extension of gizzards into 12. Moreover, the DNA barcode data in Appendix

Fig. 2. *Drawida anchingiana seogwipo* sub-sp. nov. holotype showing ventral aspect; gizzards and reproductive organs.

(WO68 vs. WO69) shows that there is some difference (3%) that is here considered sufficient to indicate speciation. *D. iucn* barcode also differs (4%) from *D. a. halla* (WO68 vs. w24), supporting their mutual separation.

***Drawida japonica japonica* (Michaelsen, 1892)**

Material Examined. Hamburg Museum and Berlin syn-

types were inspected by the author as reported in Blakemore & Kupriyanova (2010: 8) wherein two synonyms were listed: *Drawida grahami* Gates, 1935 and *Drawida propatula* Gates, 1935.

Remarks. Reported from Japan, Korea, China, Taiwan, Southeast Asia and India. Not confirmed on Jeju since Kobayashi (1938: 95) (cf. “*Drawida* sp 2” below); it is fully redescribed on types in Blakemore & Kupriyanova

Fig. 3. *Drawida iucn* sp. nov. holotype showing ventral aspect, prostomium and pygidium; gizzards and reproductive organs with [boxed] enlargement of spermathecal and male pore.

(2010).

***Drawida* sp. 1 (cf. *D. a. seogwipo*)**

Material examined. IV0000261227 posterior amputee specimen providing DNA (WO70), collected 9th Sept. 2012 by RJB during a short walk from Botanic Gardens to IUCN meeting at Seogwipo, plus IV0000261229 of two complete and two fragments, with the same collec-

tion data. None yet dissected.

Remarks. Sympatric and probably closest to *D. a. seogwipo* (see Appendix and Fig. 4).

***Drawida* sp. 2 (cf. *D. koreana*)**

Material examined. IV0000249942 mature specimen undissected, from under bridge on Rt. 516, Mt Halla, 12th June, 2012 collected by RJB and NIBR team, providing

DNA sample (WO44 that was mixed in the lab, resampled as w17). IV0000249943, two similar semi-matures undissected, possibly the same taxon, from the same location.

Remarks. Specimens a blue colour considered to be *Drawida* cf. *koreana* are unidentified at this time and await thorough analysis of *D. koreana* from the mainland. Summary of its DNA data thus far are provided in the Appendix.

Jeju results for all *Drawida* spp. are summarized in Table 2 and Fig. 4 (a Maximum Likelihood Tree automatically generated by MEGA 5 program).

Ocnerodrilidae

Ocnerodrilus occidentalis occidentalis Eisen, 1878

Material examined. IV0000245077 collected from Jeju Island by the author (15.II.2012) as reported in Blake-more *et al.* (2012, fig. 1) providing DNA sample (WM17 in Appendix).

Remarks. Pan-tropical distribution by introduction; the original home is thought to be in Central/South America; it is fully described by Blakemore (2010b). Part of a species-complex (Gates, 1972), previously noted without details from North Korea by Kobayashi (1941: 263, tab. 1)

a record that appears to have been overlooked subsequently due to the old-style kanji used.

Megascolecidae

Amyntas arx sp. nov.

[Fig. 5]

Material examined. IV0000246444 holotype (H) sub-mature specimen, sketched and dissected providing DNA sample (WM11 resampled as w4), collected from side of Haenyeos' beach at base of Seongsan Ilchulbong or "Sunrise Peak", Jeju 15th Feb., 2012 by RJB.

Etymology. Latin noun 'arx' for 'citadel or fortress' after the location's colloquial name of 'The Floating Fortress'.

Description. Length 92 mm, segments 102. Colour in life a deep red-brown, more a chocolate-like colour in alcohol with a paler ventrum and darker mid-dorsal line. Prostomium epilobous. First dorsal pore in 12/13. Setae ca. 60-70 per segment. Clitellum slightly darker in 14-16. Spermathecal pores lateral in 6/7/8/9lhs and 5/6/7/8/9rhs. Female pore obscure. Male pores widely paired superficial on raised white pads but within curved, longitudinal slits on 18 in shape of deeply incised "(and)" braces, with 35 much crowded small penial setae intervening, most concentrated nearer to the slits. Genital markings

Table 2. Contingencies of Jeju *Drawida* spp compared to *D. koreana* Kobayashi, 1938*

Taxon	Male pores	Gizzards	GMs	Atrium (gland)
<i>D. a. anchingiana</i>	Nearer c	Three (in 11,12-16?)	(8, 10, 11?)	7 (Y)
<i>D. a. halla</i>	Nearer c	Three (12-14)	8 and 10 wide	7 (N)
<i>D. a. seogwipo</i>	Nearer c	Three (13-15)	8-11 variable	7 (N)
<i>D. iucn</i>	Nearer c	Four (1 ¹ / ₂ 12-15)	8 and 11 mid	7 (N)
<i>D. j. japonica</i>	Near b	Two/three (12-13,14)	7-13 or absent	8 (N)
<i>D. koreana</i> *	Near b	Two/three (12-13,14)	7-13 variable-	8 (N)

**D. koreana* is a deep blue colour, which helps to distinguish it from pink/grey *D. japonica*.

Fig. 4. Phylogram of DNA barcodes for Jeju *Drawida* spp. compared to megascolecs.

Fig. 5. *Amynthus arx* sp. nov. holotype showing ventral aspect; prostomium and pygidium, spermathecae, prostate and caecum *in situ* with [boxed] enlargement of spermatheca in 9 and of male pore 18lhs].

not found although glands present internally in 9rhs and 9lhs.

Internally, the pharyngeal mass fills segment 4. Septa 5/6/7/8 weak, 8/9/10 absent around muscular gizzard, 10/11-13/14 slightly thicker. Dorsal blood vessel single,

hearts in 10-13. Spermathecae in 6-9lhs & 7-9rhs, small with thick muscular duct and roundish ampulla with curved diverticulum (non iridescent). Glands occur near spermathecae in 9. Holandric but testis small and non iridescent; seminal vesicles anteriorly in 11 & 12. Prostates

racemose, heavily parasitized in 18. Ovaries flat in 13 with no ovisacs seen in 14. Oesophagus dilated in 11-13, intestinal origin in 15. Intestinal caeca from 27, hemi-pinnate ventrally. Low but wide typhlosole from ca. 25. Gut contains soil and grits. Gregarine parasites around prostates as noted but no other parasites found.

Remarks. Specimen distinct with its red colouration, but possibly not fully mature. Its C-shaped seminal grooves, crowded setae and incised caeca appear unique. The male pores are construed as superficial rather than eversible as in *Metaphire* spp. and, assuming spermathecae in 5/6/7/8/9, the species would comply with an *Amyntas corticis* species-group of Sims & Easton (1972). Possibly a 'species-in-transition', losing its anterior spermathecae and approaching *Metaphire* with quasi-non-superficial male pores. By extension, in *Metaphire* it would comply with an *M. ignobilis* species-group and the taxon it would resembles most on Jeju probably being *Metaphire quelparta* (Kobayashi, 1937) from which it differs principally in the visibility of primary male pores, the incipient retention of spermatheca in 6lhs, colouration plus other lesser characters. The penial setae, uniquely characteristic, possibly provide traction during copulation and compensate for lack of genital markings. DNA data (w4 in Appendix) confirm its identity and shows closest match with *A. aucklandis* (w21). However, such DNA data cannot be used to determine whether it is correctly placed in *Amyntas*, the default genus for pheretimoids (see Blakemore, 2012e).

Amyntas aucklandis sp. nov.

[Fig. 6]

Material examined. Holotype (H) IV0000251100 mature, from Mt Halla under bridge on Rt 516 12th June, 2012; sketched and dissected providing DNA samples (WO41 resampled as w21).

Etymology. From Mt Auckland (Latin genitive) the European's early name for Mt Halla.

Description. Length 120; segments 98. Colour dark brown on dorsum and anterior. Clitellum buff 14-16. Epilobous. First dorsal pore in 12/13. Setae number about 64 per segment. Spermathecae in wide slits in 6/7/8/9 about 0.3 C apart. Female pores single on 14. Male pores deep in lateral C-shaped clefts (seminal grooves), the male porophore body appears retractable as a flat pad with five or six setae above a circular disc. Genital markings, in addition to those on male pads, also as small discs lateral of spermathecal pores, plus one pair below 7/8 and another postsetal pair ventrally on 8.

Internally, nephridial forests fill 5 and 6. Septa are all thin, 8/9/10 are absent in position of muscular gizzard. Hearts in 10-13. Spermathecae have a large saccular ampulla on muscular duct with long diverticulum inseminat-

ed for most of its length. Small glands associated with each spermatheca and in place of GMs. Holandric, with large seminal vesicles in 11 & 12. No vesicles in 13. Prostates on thick duct to infolding of male pores. Ovaries free in 13, no ovisacs in 14. Oesophagus slightly dilated in 13 only, intestine from 15, caeca broad based from 27 and deeply incised ventrally. Parasites not noted.

Remarks. As with *A. arx*, the male pores are construed as within C-shaped seminal grooves rather than non-superficial and eversible as in *Metaphire*. The current species differs from *A. arx*, *M. quelparta* and other similar species described herein in the shape of its spermathecae and distinctive male field. DNA data are provided for confirmation (Appendix).

Amyntas carnosus (Goto and Hatai, 1899)

Material examined. Tokyo Museum neotype (An435) designated and described by Blakemore (2012a). IV000 0261224 from Seogwipo found during walk from Botanic Gardens, 9th Sept. 2012 collected by RJB from under rocks beside road, providing DNA sample (WO67). Specimen undissected but is superficially similar to *A. carnosus*.

Remarks. Chinese/Japanese/Korean *Amyntas carnosus* (Goto & Hatai, 1899) recently redescribed on the Tokyo museum neotype (Tokyo NSMT An435) by Blakemore (2012a; 2012f) where an annotated synonymy included: *kyamikia* Kobayashi, 1934, *monstrifera* Kobayashi, 1936, *sangyeoli*, *youngtai*, *kimhaeiensis*, *sinsiensis* and *baem-sagolensis* - all Korean names by Hong & James, 2001, and Taiwanese *monsoonus* James *et al.*, 2005. However, Chinese *A. pingi* (Stephenson, 1925) (syn. *fornicata* Gates, 1935) was maintained separately, at least for the present, until its comprehensive review, possibly extending to DNA barcode differentiation. Distribution is Japan (Goto & Hatai, 1899; Easton, 1981), Korea and Quelpart Island (Kobayashi, 1936; 1938: 161). Hong & James (2001a) claimed their *Amyntas youngtai* from Mt Halla, but this is a clear synonym of *A. carnosus* (Goto & Hatai, 1899) after Blakemore (2012a). In addition to these locations, *A. carnosus* is known from China (Jiangsu, Zhejiang, Anhui, Shandong, Hong Kong, Sichuan, Beijing) and possibly Vietnam (as *P. pingi*). Recent Chinese claims from islands of Hainan as *Amyntas fuscus* Qiu & Sun, 2012 and off from Taiwan, as *Amyntas taiwumontis* Shen *et al.*, 2013 **syn. nov.** that agree with Kobayashi (1936: fig. 1 types I or II and fig. 2 type I) - see Blakemore (2012a). Both *A. fuscus* and *A. taiwumontis* were compared to *Amyntas fornicatus* (Gates, 1935) which is surprising as it is currently held in synonymy of Chinese *A. pingi* (Stephenson, 1925), itself usually in synonymy of *A. carnosus*. Senior synonyms were further ignored as *A. fuscus* was compared to *A. homosetus* (Shen, 1938) and the *A. sangumburi* synonyms of *A. corticis*; while *A.*

Fig. 6. *Amynthes aucklandis* sp. nov. holotype showing ventral aspect; prostomium and pygidium, spermathecae, prostate and caecum *in situ* with [boxed] enlargement of male pore 18lhs].

taiwumontis was also compared to *A. marenzelleri* (Cognetti, 1906) from Yokohama, a long established synonym of *A. corticis* (Kinberg, 1867) despite its recent re-description by Blakemore (2012b: 114). Despite their claim,

barcode data for “*A. taiwumontis*” could be found neither on GenBank nor on iBOLD site of the CCDB (www.ccbd.ca Feb., 2013).

These authors are invited to confirm their taxa, to cor-

rect their mistakes and to understand that no Asian country is in isolation as the species are often mutually shared. Moreover, ICZN requires consistency across names and treatments regardless of where specimens occur.

Amyntas corticis corticis (Kinberg, 1867)

Material examined. Five mature specimens from Hyomyungsa Temple, Mt Halla collected 12th June, 2012, one IV0000250394 providing DNA samples (WO47 redone as w25), the remainder labelled IV0000250395. [IV0000250399 a sub-adult with same collection data that provided DNA (WO50)]. IV0000251208 four mature specimens plus two immatures also identified from Cheonjiyeon Falls, Seogwipo, collected 13th June, 2012.

Note. DNA sample WO56 for “*A. agrestis*” was mixed in the lab. possibly with WO47 since it showed 100% megaBLAST agreement with *A. corticis*.

Remarks. It is one of the most widely cosmopolitan of Megascolecidae, being well-known from China, Japan and Korea including Jeju. Part of an *Amyntas corticis* species-complex *sensu* Blakemore (2010b), its many synonyms include *Perichaeta heteropoda* Goto & Hatai, 1898: 69 from Japan that, although still quoted as a valid taxon from Korea (e.g. Hong and Kim, 2007; 2009; Kim *et al.*, 2009), has long been held in synonymy of *A. corticis* and moreover, there are twenty synonyms with priority over *heteropoda* as fully described in Blakemore (2010b). As already noted, *Amyntas sangumburi* Hong & Kim, 2002 is a probable new synonym of *A. corticis*, here provisionally retained pending further research by its authors.

Amyntas corticis saeseum sub-sp. nov.

[Fig. 7]

Material examined. Holotype IV0000251310, H (mature figured and dissected providing DNA sample (WO57 resampled as w33); Paratypes IV0000251311, P1-3 (three matures, one posterior amputee dissected), P4 (immature inspected); all from Saeseum Island, Seogwipo, (33° 15' 10" N 126° 33' 40" E), collected RJB 13th June, 2012 from under rocks beside pathway.

Description. Length 100 mm (H). Colour brownish with darker dorsum, clitellum buff on 14-16. Epilobous. First dorsal pore in 12/13. Spermathecal pores in 5/6/7/8/9, ca. 0.3 C apart. Female pore single on 14. Male pores absent, replaced by superficial GMs on 18 with ca. 14 setae intervening. Other genital markings variable: paired or analogue discs posteriomedian to spermathecal pores in 7,8-9, each with stalked glands corresponding internally, some of those in P1 with multiple stalked glands numbering up to three per GM in some cases.

Internally, nephridial forests cover septa in 5 and 6.

Spermathecae with wide muscular duct and slightly dilated ampulla with terminal bulb consistently constricted or stalked; diverticulum stunted or with shorter and muscular stalk, the bulb absent or rounded and non-iridescent. Septa 8/9/10 absent around gizzard. Hearts in 10-13. Testis in 10 & 11 (non iridescent), seminal vesicles in 11 & 12. Prostates wholly absent, replaced by small gland, indicative of GM on 18 where male pores would be expected. Oesophagus dilated in 11,12-13. Intestine from 15, caeca simple from 27, typhlosole not noted. Parasites not found.

Remarks. Superficially complying with the nominal taxon, *Amyntas corticis saeseum* is possibly a ‘proto-species’ distinguished principally by its consistent bulbous augmentation to the spermathecae on either side. Although only parthenogenetic specimens were found indicating a clonal lineage that is only potentially interbreeding (and intrabreeding), here considered equivalent to an allopatric sub-species. Recent phenotypic divergence supported by its DNA barcode complying with some parts of the *A. corticis* species-complex (WO57 redone as w33 in Appendix) yet separable by about 3% from “*A. corticis*” specimens identified on Jeju (e.g. w25 in Appendix) and on the Korean mainland (w59) by the author (Blakemore in prep.). The only other species found on the island was *Metaphire californica* (IV0000250461 providing DNA WO58 (resampled as w34)).

Amyntas gracilis gracilis (Kinberg, 1867)

[Fig. 8A]

Material examined. IV0000251208 from Cheonjiyeon Falls, 13th June, 2012. Mature specimen sketched and dissected providing DNA sample (w63).

Description. (Jeju specimen in summary). Genital marking discs median to male pores, postsetally with small stalked glands corresponding internally. Spermathecal pores in 5/6/7/8, first dorsal pore in 11/12. Septa 7/8 present to base of gizzard, 8/9 absent. Spermathecae in 6-8, with saccular ampulla on muscular duct with thin diverticula stalk having small, spherical bulb. Holandric. Prostates glands well developed in 18. Intestinal caeca incised ventrally. Typhlosole absent.

Remarks. The current specimen complies morphologically with current concepts of “*A. gracilis*” (e.g., by Gates, 1972; Sims & Gerard, 1999; Blakemore, 2010b), another cosmopolitan species from tropical and warm temperate localities. Blakemore (2010b) noted that *Amyntas bouchei*, *A. omodeoi* and *A. edwardsi* all by Zhao & Qiu in Zhao *et al.*, 2009 from Hainan, China in the same “*hawayanus* species-group”, are possible syns. nov. of *A. gracilis*. Sims & Easton (1972: 176, 214) remarked that *gracilis* was the type-species of the monotypic genus *Nitocris* Kinberg, 1867, a pre-occupied name, and made it

Fig. 7. *Amynthes corticis saeseum* sub-sp. nov. holotype showing ventral aspect; prostomium, spermathecae (those on lhs from P1), gland in 18 and caeca *in situ* with [boxed] enlargement of spermathecae from H and P1 and of male area 18rhs].

representative of their “hawayanus species-group” while noting that the precise identity of the type-series could not be established as the specimens are immature.

Kinberg’s original description, in full, was: “*N. gracilis*

n. Lobus cephalicus longitudinem partis mediae superioris segmenti buccalis aequans; segmenta 89-91; longitudo 42-66 mm. Rio de Janeiro, in horto botanico.”

The current specimen complies with earlier descrip-

tions although it lacks the GMs frequently seen in some or all of 6-8,9 near the spermathecal pores in 5/6/7/8 and in groups of up to eleven (or twelve) median to male pores and sometimes on 17 and 19 too (Gates, 1972: 189; Sims & Gerard, 1999: 130). Without reference to DNA data, this would reasonably be the first record from Korea. However, a potential sub-species is tentatively described below that differs from the more familiar concept of the cosmopolitan *A. gracilis*, yet its DNA - at least for the part of the COI gene - agrees 100% with the current specimen. At the same time, the only previously *A. gracilis* barcodes from Japan seem to indicate slight differences (Appendix). Morphology and DNA are recorded, leaving the outcome of the issue of correct identity and taxonomic relationship of either taxon flagged for future reference.

***Amyntas gracilis insularum* sub-sp. nov.**
[Fig. 8B]

Material examined. IV0000251309, holotype (H) mature specimen sketched and dissected also providing DNA sample (WO55 resampled as w31). Collected from Cheonji-yeon Falls, Seogwipo, 13th June, 2012 by RJB.

Etymology. Latin for “of the islands” (latinized genitive plural).

Description. Length 110 mm, segments 86. Colour light brownish with darker mid-dorsal line, clitellum buff in 14-16. Prostomium epilobous. First dorsal pore in 10/11. Setae, larger and fewer in 4-7,8 (as in *A. gracilis* proper), number approximately 20 in 5 up to about 60 after clitellum. Spermathecal pores in 5/6/7/8 ca. 0.25-0.3 C. Female pore on 14. Male pores superficial 0.3 C apart on 18 with approximately 16 setae intervening. Genital markings in tight triplets, postero-median to male pores on 18, with corresponding branched glands internally.

Internally, tufted nephridia occur in 5 and 6. Septa 8/9/10 are aborted around muscular gizzard. Hearts in 10-13. Holandric, but iridescence not noted. Seminal vesicles are in 11 & 12 with pseudovesicles in 13 & 14. Spermathecal ampulla spherical, duct tapers with ental diverticulum as thin stalk and slightly dilated terminal portions. Oesophagus dilated and vascularized in 11-13, intestine begins in 15. Caeca single, incised ventrally and dorsally rugose from ca. 27.

Remarks. Differences from *A. gracilis* proper possibly are a reduced first segment, dorsal pore more anteriorly in 10/11, slight difference in shape of spermathecae, distinct distribution of genital markings between male pores on 18 (a triumvirate rather than characteristically in series laterally) and caeca that are ‘quasi-pinnate’, rather than incised on ventral edges. As with the sympatric specimen described above, GMs are lacking between spermathecal pores.

DNA data in Appendix indicates agreement with specimens from Okinawa identified as “*Amyntas gracilis*” but some slight genetic separation is apparent for other specimens from the Japanese mainland. No other COI data is yet available on GenBank thus the current name awaits confirmation from further data and comparison with the fifteen or so historical names included, in whole or in part, in the nominal taxon’s synonymy.

A similar species is *Amyntas papulosus* (Rosa, 1896) and the closeness of its relationship also requires consideration.

***Amyntas hupeiensis* (Michaelsen, 1895)**

Remarks. Cosmopolitan species also from Japan and mainland Korea often in or near irrigated rice paddy fields (that were not searched during current Jeju surveys). It was first described from Jeju by Kobayashi (1938: 152) and is fully described by Blakemore (2010b).

***Amyntas kanrazanus incretus* (Kobayashi, 1937)**

Remarks. *Amyntas kanrazanus incretus* (Kobayashi, 1937: 343, fig. 4) syn. *Amyntas alveolatus* Hong & James, 2001 after Blakemore (2015), from Mt Halla. *Amyntas yongshilensis* (an *A. tokioensis* synonym) was also described from Mt Halla, Yongshil, and stated (Hong & James, 2001: 81) only to be similar to their subsequent *A. alveolatus* yet, remarkably, *A. alveolatus* - that is an obvious junior synonym of *A. kanrazanus incretus* from the same type-locality - was not compared to any previous species! Moreover, their subsequent species, *A. geomunensis* Hong & James, 2001: 82, was similarly compared only their two preceding names ignoring similarity to *A. kanrazanus*.

The sub-species *A. kanrazanus incretus* was included under its nominal taxon by Song & Paik (1969: 136, 1970: 10), but this requires further consideration and it is here provisionally restored until a neotype can be selected from topotypes (and DNA extracted).

Taxonomic note. Kobayashi’s name *Pheretima kanrazana* var. *increta* (cf. *Pheretima incerta* Beddard, 1912: 197) was misspelled as “*incertus*” in Sims & Easton (1972: 237, 243) and this has been copied over to iBOLD, the Barcode of Life and other websites.

***Amyntas kanrazanus kanrazanus* (Kobayashi, 1937)**

Remarks. Nominal sub-species described from Mt Hala, Jeju (Kobayashi, 1937: 340, fig 3). *Amyntas yongshilensis* Hong & James, 2001 is possibly a synonym but is currently (Blakemore, 2010a) held under *A. tokioensis*. It was claimed on Jeju by Song & Paik (1969; 1970) but not found in the current survey (cf. *A. tokioensis*). There

Fig. 8. A. *?Amyntas gracilis gracilis* spermatheca from 7rh, male field and caeca from 27rh; B. *Amyntas gracilis insularum* sub-sp. nov. holotype showing ventral aspect; prostomium and pygidium, spermathecae, prostate *in situ* and caecum in 27 with [boxed] enlargement of male pore 18lh.

seems no reason why it was initially ignored by Hong & James (2001), nor subsequently during the last dozen years.

***Amyntas masatake* (Beddard, 1892)**
[Fig. 9A]

Material examined. British Museum lectotype (912) de-

signated and described by Blakemore (2012d). IV00002 50401 providing DNA samples (WO52 failed to yield results resampled as w28 that was contaminated in the lab but was successfully resequenced as w28b) from Cheonji-yeon Falls collected 13th June, 2012 by RJB.

Remarks. Originally from Japan and described from Jeju by Kobayashi (1937: 337) and Song & Paik (1970: 11); it was fully redescribed based on its London types by Blakemore (2012d: fig. 11hs). Results have since arrived for DNA barcode of the topotypic specimen from Nogeyama,

Fig. 9. A. *Amynthes masatacae* specimen showing ventral aspect; prostomium, spermathecae and prostate duct *in situ* and caecum in 27; providing DNA (w28b). B. *Amynthes tralfamadore* showing spermathecae and prostate duct *in situ* plus caecum in 27 (w29). C. *A. tralfamadore* second specimen providing DNA (w30).

Yokohama described in Blakemore (2012d, fig. 1rhs) (IV0000249941 WO35) that agrees 100% with Cheonjiyeon Falls samples, that now confirm the taxon on Jeju. DNA results for other potential specimens were inconclusive.

megaBLAST comparison indicates 100% match with EF077538 "*A. triastriatus*" from China (an erstwhile synonym of *M. masatacae*) that indicates the Chinese specimens are synonyms of *A. masatacae*, however it is not certain that their identification as *A. triastriatus* (Chen, 1946: 97) proper is correct thus the true synonymy of this name is not proven. Similarly *A. robustus* (Perrier, 1872) proper is not proven from Japan (nor Taiwan) and these GenBank vouchers should likely be recorded as *A. masatacae* following revision by Blakemore (2012b). Gates (1972) had *A. masatacae* in synonymy of *A. robustus* (Perrier, 1872) and hence included Quelpart in the domain of this latter taxon, now known to be doubtful due to recent work (Blakemore, 2012d), thus a restricted *A. robustus* is excluded.

Amyntas micronarius (Goto & Hatai, 1898)

Material examined. Korean specimen (NIBR IV0000246442) collected from NIBR's Jeju Island Biosphere in Incheon (NIBR IV0000246442 WO1) described by Blakemore (2012d, fig. 6rhs); Jeju Island new specimens (NIBR IV0000250396-7) from Hyomyungsa Temple, Mt Halla collected 12th June, 2012 providing DNA samples (WO48, w26).

Remarks. DNA data confirms a 100% match (Appendix) showing the Incheon specimens likely originated in Jeju just as the author suspected in the full redescription with revised synonymy provided by Blakemore (2012b: 138). A subsequent possible new synonym (noted by Blakemore, 2012d) is *Amyntas montanus* Qiu & Sun, 2012 that has its setae seriously miscounted between descriptions and tables compared to their fig. 2; e.g., 12-18 are described between male pores yet more than 26 are figured, thus setal ranges are given as 52-142 which approach the lower counts from *A. micronarius* synonyms are unreliable. Sun *et al.* (2012: 149) also misspell their earlier taxa as "trapezoidesi" rather than *A. trapezoides* Qiu & Sun, 2010.

Amyntas phaselus maculosus (Hatai, 1930: 661) comb. nov. [Fig. 10]

Material examined. IV0000261231 mature specimen collected from besides a stream near Sanbansan SW Jeju, 12th June, 2012 by RJB - a mature that was figured and dissected, providing DNA samples (WO51 redone as w27). Included in same jar is a tail portion.

Description. (Jeju specimen). Length 100 mm. Segments

99. Colour brownish, clitellum buff. First dorsal pore 11/12. Genital markings absent. Setae ca. 36 on segment 10. Spermathecae ca. 0.3 C apart in 5/6/7/8. Male pores superficial on 18 with 12 setae intervening. Septa 8/9/10 are aborted around gizzard. Spermathecae in 6-8 with elongate and corrugated ampulla on shorter duct with clavate diverticulum. Hearts are in 13. Holandric: testis in 10 & 11, seminal vesicles in 11 & 12 the latter pair with finger-like dorsal projections. Ovaries in 12, no ovisacs. Prostates large in 18. Oesophagus dilated in 11-13. Intestinal origin in 15, no typhlosole to about 35. Gut contains mainly soil.

Remarks. The current specimen agrees with earlier descriptions of *Amyntas kamitai* (Kobayashi, 1934) from Jeju that appears now to correspond with *A. maculosus* (Hatai, 1930) from northern Japan, that itself was previously included in synonymy with *A. phaselus* (Hatai, 1930), e.g. by Blakemore (2008). *A. maculosus* was revived based on a Tokyo syntype by Blakemore (2012: 113, fig. 12). Its new synonyms are *Pheretima kamitai* Kobayashi (1934: 5, figs. 4-6; 1938: 146, fig. 11) that was from Seoul and latterly included *Ph. serrata* Kobayashi (1936: 165, text fig. 10) in synonymy. Referred to as *Ph. phaselus* var. *kamitai* by Kobayashi (1938: 411) and by Song & Paik (1969: 16, 1970: 11) on specimens from Hokkaido and Jeju, respectively. Since nothing of substance separates *Amyntas minjae* Hong, in Hong, Lee & Kim (2001) from these prior taxa, it too is included in synonymy. Reduced to a sub-species of the nominal taxon, the question of its relationship to *A. phaselus* is not fully resolved. This Jeju specimen (initially thought similar to *A. gracilis*) complies with *A. maculosus*, or rather its synonym *A. kamitai*, more so than with *A. phaselus* proper.

Amyntas phaselus phaselus (Hatai, 1930: 659) [Fig. 11]

Material examined. IV0000251101, mature posterior amputee specimen collected from Mt Halla 12th June, 2012 from under bridge on Rt 516 that provided DNA (WO42 resampled as w22). An unregistered specimen from Cheonjiyeon collected by RJB on 13th June, 2012 is similar.

Description. (Of Jeju specimen). Length 50+mm. Darkish dorsum, clitellum buff. First dorsal pore 12/13. Setae ~60. Spermathecal pores distinct and nozzle-like in 5/6/7/8 ca. 0.3 C apart. Male pores as small lateral slits centred on flat porophore on 18 with ca. 14 setae intervening. No GMs. Nephridia are tufted in 5 & 6. Septa 8/9/10 aborted around gizzard, otherwise thin. Body filled with gregarines, especially segment 12. Spermathecae in 6-8, corrugated ampulla with shorter duct and digitiform diverticulum. Holandric, testis in large sacs in 10 and free

Fig. 10. *Amynthus phaselus maculosus* (Hatai, 1930: 661). Ventral view with prostomium, spermathecae and prostates *in situ*; caeca 27rhs.

in 11, non-iridescent, seminal vesicles anteriorly in 11 & 12 with pseudovesicles in 13. Hearts in 10-13. Ovaries in 13, no ovisacs in 14. Prostates with large glands on flaccid duct in 18. Oesophagus dilated and vascular in

11-13, intestine from 15, intestinal caeca simple but deeply incised ventrally (hemi-pinnate), typhlosole not noted.

Remarks. Current specimens resemble *Amynthus phaselus* (Hatai, 1930) that is known from Japan and main-

Fig. 11. *Amynthus phaselus phaselus* (Hatai, 1930: 659). Ventral view with prostomium, spermathecae and prostates *in situ*; caeca 27rhs shown with lymph glands on dorsal blood vessel; [boxed are enlargemnts of spermathecal and male pore in 7/8rhs and 18rhs].

land Korea and nominally includes synonyms: ?*Pheretima maculosus* [sic] Hatai, 1930b: 661 (non *Pheretima maculosa* Gates, 1933=*Pheretima malacus* Gates, 1936), *Pheretima kamitai* Kobayashi, 1934, *Pheretima serrata* Kobayashi, 1936, ?*Pheretima phaselus tamurai* Kobaya-

shi, 1938, *Pheretima mutica* Chen, 1938 and *A. minjae* Hong, 2001. Whether *A. maculosus* and its synonyms (mentioned above) should remain separate or be combined in *A. phaselus* depends of further work. Currently, only the more “bean-shaped” male pores seem to sepa-

rate them but confirmation from DNA data is wanting. Blakemore (2012: 113) recorded a possible syntype in Tokyo Museum, while noting that revision is underway based on new material recently collected not only from Jeju but also from Tokyo, from Seoul and on Ulleung-do Island (see Blakemore, 2013). Its full description is pending.

Amyntas sangumburi Hong & Kim, 2002

Remarks. Described by Hong & Kim (2002: 198, fig. 4) from Sangumburi volcanic crater near Mt Halla, it resembles *A. toriii* (Ohfuchi, 1941: 244) from a cave in Oita-ken that is currently in synonymy of *A. corticis*. However, Blakemore (2012b: 143) found this indistinguishable from *A. subrotundus* (Ishizuka, 2000) itself similar to *A. rufidulus* (Ishizuka, 2000) that were both placed in *A. corticis* complex by Blakemore (2003). Therefore, possibly *A. sangumburi* also belongs in synonymy either of *A. corticis* or of the Japanese species, otherwise its validity dependent upon deeper research by its original authors. Sometimes misspelt “*A. sangumburiensis*” (e.g. http://www.annelids.org/bbta/Main/main_3_2_1.asp). *A. sangumburi* is compared by Sun *et al.* (2012: 152, 153, tab. 1) to their *A. fuscus* that is actually yet another junior synonym of *A. carnosus* as already clarified above. A similar taxon is *A. simplex* sp. nov. described below.

Amyntas seungpanensis (Song & Paik, 1970)

Remarks. *Amyntas seungpanensis* (Song & Paik, 1970: 11, figs. 1-13) described from “Mt Hanra, Cheju-do Isl.”, has not been seen since. Its definitive characteristics were supposed to be spermathecal pores intrasegmental on 6 and 7 and distinctive male pores. Its name is sometimes misspelt “*Ph. seungpanensis*”. “Mt Hanra”, or Mt Hanla amongst its ten or so previous names, is now known as Mt Halla.

Amyntas simplex sp. nov.

[Fig. 12]

Material examined. IV0000251102 Holotype (H) mature specimen from Mt Halla under bridge on Rt 516, 12th June, 1023; providing DNA sample (WO43 resampled as w23). Paratype (P) in same jar, undissected.

Etymology. Latin for “simple” due to its lack of GMs and other complex attributes (Non Michaelsen, 1928).

Description. Length 80 mm (H), 60 mm (P). Segments 100 (H), 101 (P). Darkish dorsum but transparent ventrum when preserved with internal parasites visible, clitellum buff and rather knobbly (H & P) possibly due to parasitism. First segment reduced with thin and wide epilobous prostomium. First dorsal pore minute in 12/13, open from

13/14 (H & P). Spermathecal pores ca. 0.3 C apart in 5/6/7/8/9. Setae ca. 24ish per segment with ventral gaps in anterior; the penultimate three segments of ‘tail’ lack setae. No GMs. Male pores small in centres of large circular flat porophores. Nephridial forests in 5 & 6. Septum 8/9 aborted, 9/10 displaced by gizzard. Holandric with large testis sac in 10 and seminal vesicles in 11 & 12. Hearts 10-13. Ovaries in 13, no ovisacs present. Oesophagus vascularized and dilated in 12 & 13. Intestine from 15. Intestinal caeca simple. No typhlosole. Gut contains organic soil. Some large nematodes and much mucus seen in anterior segments, with many gregarine cysts, especially on ventral nerve cord under intestine.

Remarks. Similarities to *A. phaselus* are lack of GMs, ruggose spermathecae and simple, circular male fields. Differences are an extra pair of spermatheca in 8/9 and non-incised intestinal caecae. The other similar Jeju species with spermathecae in 5/6-8/9 and simple caeca is *Amyntas sangumburi* Hong & Kim, 2002 that, however, is smaller (46-68 mm), has more setae (39-43 with only 3-4 between male pores) and quite different shape of spermathecae plus a large typhlosole from 27. These specimens are named as new on the basis of these morphological differences that, unfortunately, could not yet be confirmed by DNA.

Amyntas tokioensis (Beddard, 1892)

Material examined. [IV0000250398 a sub-adult specimen from Hyonyungsa Temple (12th June, 2012, RJB) that provided DNA sample (WO49 detailed in Appendix) complying with either (or both?) *A. tokioensis* and *Metaphire hilgendorfi* using megaBLAST searches].

Remarks. *Amyntas tokioensis* (Beddard, 1892) [syns. ?*schizopora*, ?*irregularis*, *levis*, ?*parvicystis*; ?*verticosa*; ?*yongshilensis* Hong & James, 2001, ?*eastoni* Hong & James, 2001; ?*boletiformis* Hong & James, 2001 (these last two synonyms as per Blakemore, 2003: 43, addenda); ?*gucheonensis* Song & Paik, 1970; ?*jiriensis* Song & Paik, 1971; ?*paiki* Hong in Hong, Lee & Kim, 2001: 266 (these last three synonyms as per Blakemore, 2006; 2008)]. Plus ?*Pheretima gucheonensis* Song & Paik, 1971, ?*Pheretima surcata* Ishizuka, 1999 and *A. sonjaesiki* Hong & James, 2009 were placed in synonymy of *A. tokioensis* by Blakemore (2010a: 13, fig. 2) based on reinspection of its London types. Blakemore & Ueshima (2011) & Blakemore (2012d, f) described syntypes of *Amyntas levis* (Goto & Hatai, 1899) as being similar to a parthenogenetic form of *A. tokioensis* and thus a possible synonym, as was already noted by Blakemore (2012b).

Amyntas conferticurtus Hong & James, 2009: 1241 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;

Fig. 12. *Amynthes simplex* sp. nov. H. Ventral view with prostomium and pygidium, spermathecae and prostates *in situ*; caeca 27rhs.

however, they are shown in their fig. 7 to be in 6/7/8! Moreover the supposed genital markings on 7 & 8 and

18 are not shown in their figure 7! Their description with this new name appears to be indistinguishable from the subsequent *A. sonjaesiki* Hong & James, 2009: 1243 that has markings resembling those claimed for *A. conferticurtus* and is moreover similar to *A. paiki* Hong, 2001 and/or to *A. fasciiformis* Hong & James, 2001, thus both latter names are probably in an *A. tokioensis* species-group, if not also synonyms. It seems that the *A. conferticurtus* name also belongs.

A. tokioensis is included due to record from Jeju of the likely synonym *A. yongshilensis* Hong & James, 2001; cf. *Metaphire hilgendorfi* noted below.

Note. Regarding types, *Amynthes conferticurtus* Hong & James, 2009 with types IV0000120468 (H) & 479 (P) not traceable in NIBR, its synonym, *A. sonjaesiki* Hong & James, 2009 with types IV0000120469 (H) & 480 (P) also not traceable in NIBR.

***Amynthes tralfamadore* Blakemore, 2012 [Fig. 9B, C]**

Material examined. Type specimen (NIBR IV0000246441) collected from NIBR's Jeju Island Biosphere at Incheon were described by Blakemore (2012d). New specimens (IV0000250402-3) three mature specimens sketched and dissected, providing DNA samples (WO53-54 re-sampled as w29-30) collected outside of Cheonji-yeon Falls Park, Jeju on 13th June, 2012 by RJB from under rocks and beside a spring.

Remarks. These specimens confirm, as anticipated, both separation of *A. tralfamadore* from *A. masatakeae* and the provenance of both from Jeju suggested by Blakemore (2012d: 143).

***Metaphire agrestis* (Goto & Hatai, 1899)**

Material examined. IV0000250406-7 Cheonji-yeon Falls, Seogwipo, collected 13th June, 2012 by RJB; two mature specimens, one sketched and dissected, providing DNA sample (WO56 mixed in lab and resampled as w32 in Appendix). Seven similar mainly immature specimens collected from Cheonji-yeon Falls on 14th June, 2012 (undissected).

Remarks. These specimens conform to the redescription by the current author from Japan and Korea. A neotype in Tokyo Museum is in process of description as noted by Blakemore (2012b; 2012f). Further work is currently in progress to define this cosmopolitan species.

***Metaphire californica* (Kinberg, 1867)**

Material examined. NIBR IV0000246440, found beside Temple at Mt Sanbansan, Jeju, collected by R.J. Blakemore, 17th Feb. 2012, from near drainage ditch and described Blakemore (2012: fig. 2); IV0000250461, single

specimen from Saeseum Island, Seogwipo, collected 13th June, 2012 by RJB, providing DNA (WO58 that was probably mixed with WO57 see Appendix). Cheonji-yeon Falls, 13th June, 2012 collected by RJB (four specimens undissected).

Remarks. This was the first record from Jeju and Korea of this cosmopolitan species (Blakemore *et al.*, 2012).

***Metaphire haenyeo* sp. nov.**

[Fig. 13]

Material examined. IV000246445 Holotype (H) mature, sketched and dissected providing DNA samples (WM12 redone as w5); collected from Sehwa Beach near to Haenyeo Museum, 16th Feb., 2012 by RJB under rocks on machair. IV0000249896-7 Paratypes (P1-2) two mature specimens, inspected.

Etymology. Due to location, near The Jeju Haenyeo Museum named after the Jeju diving ladies called ‘haenyeo’ (noun in apposition).

Description. Length 140 mm (H), 120 (P1), 95 (P2); segments 109 (H, P1). Colour a light green in life, soon bleached out in alcohol. Clitellum weakly formed. Epilobous. First dorsal pore in 12/13 (H, P1) or 11/12 (P2). Setae number about 60-66 per segment. Spermathecae in wide slits in 6/7/8/9 about 0.3 C apart. Female pores paired on 14. Male pores in small c-shaped pouches with 15-17 setae intervening, everted in P2. No genital markings present but small glands noted associated with each spermathecae posteriorly.

Internally, nephridial forests fill 5 and 6. Septa 5/6/7/8 are thin, 8/9/10 are absent in position of muscular gizzard, and 10/11-13/14 have some thickening. Dorsal blood vessel single, hearts in 10-13. Spermathecae with large oval ampulla on short duct and medium diverticulum with inseminated terminal bulb having irregular outline. A small gland associated with each spermatheca ectally. Holandric, with iridescent testis small in 10 & 11, seminal vesicles in 11 & 12. Prostates on thick duct to small copulatory pouch. Ovaries small in 13, no ovisacs in 14. Oesophagus slightly dilated in 12-15, intestine from 16, with caeca broadly based from 27 and deeply incised ventrally. Typhlosole not well developed, gut contains organic soil and sand grains. No parasites were noted.

Remarks. Complying with the *M. houletti* species-group of Sims & Easton (1972) that included *indigo* Ohfuchi, 1951, *keishuensis* Kobayashi, 1938 and *quelparta* Kobayashi, 1937. Perhaps it is closest to the latter taxon both morphologically and geographically. Similarity is their characteristic greenish blue dorsum and light blue ventrum. Differences in *M. quelparta* are that the spermathecal and male pores have saccular bodies internally that may protrude and the former are accompanied with paired short stalked accessory glands. An apparently ma-

jor difference is that only one, rather than a pair of glands accompanies the spermathecae in the current species that, nevertheless, may only merit sub-specific status, cf. *M. quelparta*. DNA data are provided and compared in the Appendix.

Metaphire quelparta valhalla sub-sp. nov. from Mt Halla appears to differ morphologically, but has similar DNA. Another taxon is *M. q. seogwipo* sub-sp. nov. that appears to differ molecularly from *M. haenyeo* and morphologically from *M. quelparta quelparta*. At the same time, no confirmed specimens of *M. quelparta* have been found in the current surveys and thus neither a neotype nor its DNA library can be provided presently.

?*Metaphire hilgendorfi* (Michaelsen, 1892)

Material examined. [IV0000250398 a sub-adult specimen from Hyonyungsa Temple (12th June, 2012, RJB) provided DNA sample (WO49 details in Appendix that gives some slight indication cf. *A. tokioensis* noted above].

Remarks. Despite the specimen providing the DNA being not fully mature, its DNA should be definitive. However, the GenBank voucher library gave unreliable results and, moreover, there is the slight possibility that this sample was mixed in the genetics lab. Thus this species record is only tentative for Jeju and requires confirmation from resurvey.

***Metaphire quelparta quelparta* Kobayashi, 1937**

Material examined. A possibly similar specimen is IV000250892 from beside Temple at Mt Sanbongsan, Jeju-do collected by RJB 17th Feb. 2012 from near drainage ditch that provided DNA samples (WM13, WO11 and w6). Types are not known.

Remarks. Not definitely identified in current studies as the similar specimen found was damaged and thus was not fully studied. Yet *Metaphire quelparta* was said to be “the most common species on this small volcanic island” (Kobayashi, 1937: 35, fig. 5) and it was also claimed on the Korean peninsula (Kobayashi, 1938: 155) where it was initially mistakenly labelled as “*Pheretima keishuensis*” *nom. nudum* by Kobayashi (1938: 90), as noted by Song & Paik (1970: 11).

In discussing *Metaphire yamadai* (Hatai, 1930) neotype, Blakemore (2012b: 119) said that, apart from its non-maniculate caeca, “*M. quelparta* is almost exactly the same in each described character except for its large saccular bodies associated with the spermathecal pores. But it may belong in synonymy nevertheless, along with *M. sanseiana* (Hatai, 1951: 56), and the probable syn. nov. of the latter species, *M. indigo* (Hatai, 1951: 58)” and another possible synonym is *M. sanseiana* (Ohfuchi, 1951) from China. Blakemore (2010a: 18, 2012b: 117) reviewed *M.*

Fig. 13. *Metaphire haenyeo* sp. nov. holotype showing ventral aspect; prostomium and pygidium, spermathecae, prostate and caecum *in situ* with [boxed] enlargement of male pore 18lhs].

yamadai, latterly based on Tokyo Museum neotype and noted that for *M. yamadai* from China, Chen (1933: 259, figs. 20, 21) shows variations with the caeca either deeply incised or manicate, but this was likely a misdescrip-

tion by Chen of a composite of both Michaelsen's *Pheretima pectenifera* and *Ph. tschiliensis*. This latter taxon may indeed have incised caeca and is currently classified as *?Metaphire tschiliensis* (Michaelsen, 1928), but further

research is required from China to confirm its full relationships.

Kobayashi (1938: 155, 157) had said that his *Ph. aggera* Kobayashi, 1938: 153 was close to and may be synonymous with some of the species above and with his *Ph. quelparta*. However, Easton (1981)'s inclusion of *Metaphire soulensis* (Kobayashi, 1938) in synonymy of *M. yamadai* (Hatai, 1930) is no longer supported as there are notable differences in morphology (pers. obs.), especially of the markings around the male pores (when present). Thus, *M. soulensis* is thus maintained separately and has *M. shinkeiensis* (Kobayashi, 1938), *M. aokii* (Ishizuka, 1999) and *Amyntas dageletensis* Hong & Kim, 2005 included as its junior synonyms, as clearly stated previously by Blakemore (2003; 2010a; 2012a).

***Metaphire quelparta seogwipo* sub-sp. nov.**
[Fig. 14]

Material examined. IV000261223 Holotype (H) semi-mature specimen, sketched and dissected providing DNA samples (WO66); Collected 9th Sept. 2012 by RJB, during a short walk from the Botanic Gardens to IUCN meeting at Seogwipo (33° 15' 10" N 126° 33' 40" E) from under rocks beside road.

Etymology. Based on location: Seogwipo (noun in apposition).

Description. Length 130 mm; segments 93. Colour green-blue with dark mid-dorsal line in life. Paler in alcohol. Clitellum weak in 14-16. Epilobous. First dorsal pore in 12/13. Setae number 50-60. Spermathecae in 6/7/8/9 about 0.3 C apart. Female pore on 14. Male pores in small C-shaped pouches with 12 setae intervening. No genital markings.

Internally, nephridial in 5 & 6. Septa 8/9/10 aborted around muscular gizzard. Hearts in 10-13. Spermathecae, probably not fully formed, with saccular ampulla on longer duct, and with elongate uninseminated diverticulum that is straight rather than folded. A small stalked gland associated with spermatheca in 7 & 8 ectally (not in 9 nor near prostates). Holandric, with iridescent testis in small sacs in 10 & 11 posteriorly, seminal vesicles in 11 & 12 anteriorly. Prostates on thick duct. Ovaries small in 13, ovisacs absent. Oesophagus dilated and vascularized in 13; intestine from 1/215; caeca from 27 incised ventrally. Typhlosole not noted.

Remarks. Although possibly not fully mature, apparent differences from the nominal taxon are lack of noticeable saccular bodies on male and spermathecal pores, and absence of paired spermathecal glands that are shown consistently in Kobayashi's work. Moreover, only a dozen setae intervene between male pores rather than 18-21 as in *M. quelparta* proper. It is somewhat similar, but differs from *M. haenyeo*, not least by having longer sperma-

Fig. 14. *Metaphire quelparta seogwipo* sub-sp. nov. holotype showing ventral aspect; prostomium, spermathecae, prostate and caecum *in situ*.

thecal diverticula although DNA data indicates slight (~3%) separation.

Full relationships require comparison with new material of nominal *M. quelparta* which had type-localities

in Seogwipo as well as Jeju-township and Mt Halla listed by Kobayashi (1937). So far such material has been elusive although both the current and subsequent sub-species come closest.

***Metaphire quelparta valhalla* sub-sp. nov.**
[Fig. 15]

Material examined. IV0000251099 Holotype (H) mature specimen, sketched and dissected providing DNA samples (WO40 resampled as w20); collected from Mt Halla under Bridge on Rt 516, 12th June, 2012 by RJB, from under a large rock of valley beside creek.

Etymology. Based on location: a valley on Mt Halla (noun in apposition).

Behaviour. sluggish and non responsive to touch.

Description. Length 250 mm; segments 112. Colour white, unpigmented with distinctive blue dorsal blood vessel and guts visible in life. Clitellum pale too. Epilobous. First dorsal pore in 12/13. Setae number about 60 per segment on 12, 64 on 20; those on ventrum more pronounced in anterior. Spermathecae obvious in 6/7/8/9 about 0.25 C apart. Female pores paired on 14. Male pores in small pouches with 14 setae intervening. No genital markings present but small glands noted behind each spermatheca posteriorly.

Internally, nephridial forests on 4/5/6/7. Septa 8/9/10 aborted around muscular gizzard, otherwise muscular in anterior. Dorsal blood vessel single, hearts in 10-13. Spermathecae with saccula ampulla, often flattened on medium duct and long diverticulum with inseminated ental half that zig-zags. A small stalked gland associated with each spermatheca ectally. Holandric, with iridescent testis small in 10 & 11, seminal vesicles in 11 & 12 anteriorly and pseudovesicles in 13. Prostates on thick duct to small presumably eversible pouch. Ovaries in 13, ovisacs vestigial in 14. Oesophagus slightly dilated and vascularized in 12 & 13; intestine from 15; caeca from 27 deeply incised ventrally. Typhlosole not noted.

Remarks. The current sub-species differs from the nominal taxon on several points, especially lack of noticeable saccular bodies on male and spermathecal pores. It is approximately twice the size and lacks the distinctive green colouration. It is somewhat similar, but differs from *M. haenyeo*, not least by having longer spermathecal diverticula although DNA data indicates only slight separation (~1%).

Complete comparison with *M. quelparta* depends upon discovery of specimens that comply with Kobayashi's description having green colouration and paired spermathecal glands shown in Kobayashi (1937: figs. 5E-G; 1938: figs. 14c & c'). Specimens claimed by Song & Paik (1970: 11) were not described in any detail, they merely their presence on "Chejoo-do" was noted.

***Metaphire soulensis* (Kobayashi, 1938)**

Remarks. Song & Paik (1970: 11) also located *Metaphire soulensis* (Kobayashi, 1938) on "Chejoo-do". Its synonyms are *Pheretima shinkeiensis* Kobayashi, 1938; *Ph. aokii* Ishizuka, 1999 - synonymy as per Blakemore (2003: 43) plus *A. dageletensis* Hong & Kim, 2005 from Ullungdo. Revision is currently in progress based on Seoul and Ulleungdo specimens (Blakemore, in prep.).

***Pontodrilus litoralis* (Grube, 1855)**

Material examined. IV0000245076 four specimens as newly reported on Jeju by Blakemore *et al.* (2012) and it was subsequently confirmed by the author abundantly in Seogwipo port 22nd May, 2012 (unpublished data). One of the latter provided DNA (WO39 that was mixed in the genetics lab. with WO38).

Remarks. Blakemore (2007; 2010b) lists its many synonyms and pantropical distribution.

Lumbricidae

***Aporrectodea caliginosa* (Savigny, 1826)**

Material examined. IV0000249913 mature specimen from Hamdeok Sewoobyong beach collected 15th Feb., 2012 by RJB providing DNA sample (WO17 that gave ambiguous result).

Remarks. Cosmopolitan species, this the first record from Jeju.

***Aporrectodea trapezoides* (Dugès, 1828)**

Material examined. Mature specimen from Hamdeok Sewoobyong beach collected 15th Feb., 2012 by RJB providing DNA sample (WO16), as yet inconclusive/mixed (cf. WO7 & WO13).

Remarks. Cosmopolitan species, first recorded on Jeju by Kobayashi (1941).

***Bimastos parvus* (Eisen, 1874)**

Material examined. Jeju from Hamdeok Sewoobyong beach, under logs and stones behind shop fronts unregistered samples with clitellum 24-30, one providing DNA (WO13 currently inconclusive and probably mixed with WO16 or some other sample in lab.).

Remarks. Cosmopolitan species, this the first record from Jeju.

***Dendrobaena* sp.?**

Material examined. IV0000249923 a mature specimen collected from Hyomyungsa Temple on Mt Halla 16th

Fig. 15. *Metaphire quelparta valhalla* sub-sp. nov. holotype showing ventral aspect; prostomium and pygidium, spermathecae, prostate and caecum *in situ* and folded back with [boxed] enlargement of spermathecal pore and male pore 18lhs.

Feb., 2012 by RJB (providing DNA sample WM10 as “*Dendrobaena* cf. *attemsi*” that was mixed in the lab with specimen of *E. japonica* from NZ in Blakemore (2012c); redone as w1 that has yet to provide a result).

Remarks. Pale lumbricid, 62 mm long, with segment 9 tumid laterally and 16 ventrally; clitellum 27-33, with tubercula pubertates wide in 29-32. Currently unidentified.

Fig. 16. A *Eisenia fetida/andrei* specimen providing DNA sample (WM18) ventral view plus prostomium, calciferous glands in 11 & 12, some nephridia (13 & 20) and the spermathecae *in situ* in 9 & 10; lateral views show pale patch near 9 and tubercula pubertates in 28-31. B *Eisenia fetida/andrei* specimen providing DNA sample (WO7=w62) for comparison.

?*Eisenia andrei* Bouché, 1972
[Fig. 16A]

Material examined. IV0000249915 mature specimen providing DNA sample (WM18 with nil result, redone as WO12 and as w11 to recheck). From Hamdeok, Sewoo-byong beach, Jeju-si, Jocheon-eup, Hamdoek-ri (N33° 30' E126° 30') north coast of Jeju-do Island. Collected by R.J. Blakemore, 15th Feb. 2012 from sandy parkland be-

hind shops on beachfront, under logs and stones along with many other introduced lumbricids, pheretimoids, and an ocnerodrilid.

Remark. DNA sample WO12 returned a megaBLAST result of 100% for both *E. fetida* and for *E. andrei* (GenBank Nos GU013883.1, FJ214228.1, AY874508.1). Thus *E. andrei* is very tentatively included in the Jeju list. However, there are a dozen species names with priority over the *E. andrei* associated with *E. fetida* and no DNA an-

alysis has yet used types of either taxon to definitively prove their differences. These two species are thus in serious need of revision worldwide. Hong *et al.* (2001) claimed it from Korean vermiculture based solely on supposed color differences from *E. fetida*, however *E. fetida* colour varies greatly and, as noted in its description below, there is no DNA evidence based on types to determine whether or not the name *andrei* takes priority from the dozen or so synonyms of *E. fetida*.

Eisenia fetida (Savigny, 1826)

[Fig. 16B]

Material examined. In addition to specimen IV0000249915 as noted above that provided DNA sample (WO12) and gave a result of either *E. fetida* or *E. andrei*. Two other specimens, one IV0000249919 providing DNA sample (WO7 that was mixed, resampled as w62 that is yet to provide results) from Songsaneup, Jeju collected 16th Feb., 2012 by RJB.

Remarks. Cosmopolitan species, this the first record from Jeju; often confused with *E. andrei* Bouché, 1972 as either a synonym, morph, ‘variety’, sub-species, or as a separate species; however, several prior synonyms of *E. fetida* compete for priority (Blakemore, 2010b).

Eisenia japonica (Michaelsen, 1892)

Material examined. Samples from Songsaneup volcanic cone, collected 16th Feb. 2012 by RJB (unregistered). Samples from Mt Halla near Nongyo Bridge on Rt 516 16th Feb., 2012 (unregistered); and further under bridge on Rt 516 two mature specimens, one (IV0000251103) providing DNA (WO45 redone as w18 and as w18b), the other (IV0000251104). Sanbansan in drain next to Temple, specimens inspected but not registered. DNA results are in the Appendix.

Remarks. This taxon was first recorded on Jeju by Kobayashi (1941) is here confirmed. A redescription based on types by the author is reported in Blakemore and Grygier (2011).

DISCUSSION

The earliest taxonomic work on Korean earthworms was by Kobayashi (1934; 1936; 1938; 1941), who listed approx. 45 earthworm species from the Korean peninsula (including North and South Korea), of which ca. 27 were considered native (i.e., ca. 18 exotics). He included ten species from Jeju which the current study has raised to about 40 taxa. Surprisingly the two taxa thought most common by Kobayashi, *Drawida anchingiana* Chen, 1933

and *Metaphire quelparta* (Kobayashi, 1937), were not relocated possibly because they have been subsumed by newer introductions or because their sub-species were not previously separable without the aid of genetic data. Further surveys are required around Jeju Town, where Kobayashi found some of the *Drawida* and *Metaphire* specimens. Newly recognized is the presence of members of the ubiquitous and readily transported *Amyntas toki-oensis*/*Metaphire hilgendorfi* species-complex but not being as common as on adjacent lands and even on remote Ulleungdo (see Blakemore, 2013).

The conclusion of the relatively high biodiversity is that the interval since introduction of earthworms to this volcanic island, perhaps initially by ‘rafting’ and more recently by human activity, has since allowed speciation within certain taxa, perhaps related to the selection for the abrasive basaltic soils that Kobayashi (1937) thought hostile to earthworm survival. Although the current species inventory is reasonably high, several other species may be expected with further rigorous study.

The idea that some of the irregular “markings” in *Drawida* species may actually be parasitic artefacts has yet to be demonstrated, however the appearance of a nematode in the more regular and thus more likely “true” GMs in *D. halla* is rather unexpected but was not supported by the DNA results. Possibly the DNA primers kits used are more suitable to extract from annelids rather than microbial parasites thus only detecting host tissue.

The possible clonal parthenogenetic entities of *Amyntas corticis saeseum* described in this paper are provided with scientific names, although they may yet prove to be of infra-subspecific rank and thus outside of zoological nomenclature. They are provisionally regarded as a valid taxon and there is slight (1-2%) mitochondrial DNA detection indicative of divergence. Similarly, there is only slight indication of separation of the *A. gracilis insularum* sub-species that may be a sexual form and thus more representative of a conventional “species concept” having acquired some genetic modification apparently manifest only on islands. This too has yet to be definitively proven.

Taxonomic revision has obliged several often obvious synonyms to be added to historical taxa and this study has aimed for confidence of combining morphological information with genetic barcoding. Unfortunately there were some initial laboratory errors in failing to get any DNA results, the mixing of samples and contamination in the genetic laboratories/sequencers. Outside of these basic technical problems, the comparisons of molecular data depend entirely upon the reliability of identification of voucher references on GenBank and the Barcode-of-Life library database. Anomalous identifications have been noted in several cases in the current study (e.g. for *Metaphire hilgendorfi* and *Eisenia fetida*) as well as current

lack of comparison for some less common Moniligastridae, Ocnodrilidae and even Lumbricidae. These are indicative of the relative infancy of this research field that is expected to improve with accumulation of verifiable data with taxonomic names corrected, hopefully based upon their definitive type materials. While the hunt for neotypes of Kobayashi's Jeju worms continues, tangible results can be expected in due course as researchers collaborate to refine use of molecular and computing methods in combination.

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Appendix - COI barcode preliminary results (in chronological order).

Simply obtaining barcodes has been horrendously difficult and some data are yet wanting. Especially EWU unreliably mixed samples at random. Small tissue from representative specimens, mostly freshly collected, were carefully labelled and refrigerated with batches sent for analysis. Various laboratories were commissioned when initial results were inconsistent. The first “WMxx” series rarely produced data yet used all the DNA extracted requiring resampling from the original specimens as many as five times over three months. The second “WOyy” samples batches either failed to return results or were catastrophically mixed samples in the laboratory invalidating results. Many of the third “wzz” samples returned contamination data due to lack of sequencer hygiene in the NSU. Samples from w43 onwards were performed by different workers outside of NIBR subcontractors, some by Hanyang University student Seunghan Lee, that were mostly successful one year later.

> WM10 Jeju1 #6 lumbricid tumid 9 (*Dendrobeana attemsi*?). Species unknown.

megaBLAST results=556/658 (84%) for unidentified *Amyntas* sp. or <85% for various megascoleids and only <81% from my *D. attemsi* from NZ - thus possibly sample mixed or a new species not yet on GenBank; rechecked as w1 but nil results thus far.

BLAST WM10 vs. WM6 - NZ “*Eisenia japonica*” Identities=660/660 (100%) i.e. same! So the NZ sample (Blakemore, 2012c) was contaminated with the Jeju lumbricid sample.

AATCAAAATAGGTGCTGATATAGAATAGGGTCTCCCCGCTGCAGGATCGAAGAATGATGTATTTAGGTTTCGGTCTGTGA
GAAGTATTGTAATAGCCCCAGCCAGTACGGGCAATGAGAGCAATAGAAGTACTACGTAATAACCACTGCTCATACAAATA
GGGGAATTCGTTCTAATCGTAGTCCCGATCAGCGTATATTAATTACTGTGGTGATGAAGTTGATAGCCCCCTAGAATTGAGGA
TGCTCCGGCTAAGTGGAGTGAGAAAAATTGCTAGATCCACAGAAGGTCCAGCATGTGCAATATTTCTTGCTAGGGGTGGATAT
ACCGTTCACCCGGTCTCTGCCCCCTTCTCTACTGTCTGTGAGGATACTAGTAAAATTAGAGACGGCGGTAGTAGTCAGAATC
TTATGTTATTTAGTCTGGGAATGCTATGTCTGGTGTCCCCAATATAAGAGGTAGTAGCCAATTTCCAAAGCCCCCAATAAA
TACTGGTATAACTAAGAAAAAGATTATTAGAAAATGCGTGTGCAGTAACAATTGTGTTGTATAGTTGATCGCTCCCTATAAAG
GACCCGGGCTGCCTTAGCTCAATCCGAATAAGTAATCTTATCCCGGCACCCACCATGCCGGCCCAATTCTTAAGATAAAAT
ATAAAGTTCCA

> WM11 Jeju1 #3 *Amyntas arx* H from beach at “Sunrise Peak”.

megaBLAST nothing better than <86% for *M. sieboldi*, *M. tschiliensis* or *A. vittatus* - i.e., a new species or not yet on GenBank; rechecked as w4.

TAGGTGTTGGTAGAGGATTGGATCCCCCTCCCCGGCCGGGTGCAAGAAGGATGTATTTAGATTTTCGATCTGTGAATAGTATT
GTAATGGCTCCCGCTAGCACAGGTAGGGATAGGAGTAGTAGTACCACAGTAATTACGACTGCCAGACAAATAGTGGGATT
CGCTCTAATCGTAAACCTGATCAACGTATATTAATTACAGTGGTGATAAAGTTGATCGCCCCCAGAATTGATGATGCCCCG
CCAAGTGAAGGGAGAAAATTGCAAGATCTACAGATGGCCCAGCATGTGCAATATTTCTTGCAAGGGGTGGATATACTGTTC
ATCCTGTCCCTGCCCCTTTTTCAACGGCAGCAGATGATACTAATAAAAAAAGTGATGGGGGGAGTAATCAAAATCTCATATT
ATTTAGTCGTGGGAATGCTATATCTGGTGTCCCCAGTATTAGGGGTAAAAGTCAGTTTCCAAATCCCCCAATAAAATCTGGT
ATTACTAGAAAAGAAAATTATTAATAATGCGTGTGCTGTAACAATAGTATTATAGAGTTGGTCTCTACCTAGGAATGATCCTG
GTTGTCTTAGCTCAACTCGAATAAGGAGTCTCATACCTGCTCCAATTATCCCAGCTCAAATACCTAAAAATGAAATAAA

> WM12 Jeju1 #5 *Metaphire haenyeo* H sp. nov from Machair (redone as w5).

megaBLAST result 93% for “Lumbricina sp. - Chinese Herbal Medicine”; or <87% *A. fuscatus* from Japan, or *A. tuberculatus*/*M. tschiliensis* from China.

WM12 vs. w20 *M. q. valhalla* Identities=650/657 (98.9%) i.e., similar/same samples/species.

AATAGGTGTTGATATAGAATTGGATCTCCTCCACCAGCTGGATCAAAAAATGATGTATTTAGGTTTCGATCTGTGAATAACA
TTGTAATAGCCCTGCTAGTACCGGTAGGGATAGTAGTAATACTACGGTAATTACTACTGCTCACACAAATAGTGGGAT
TCGCTCTAACCGCAGTCCCGATCACCGCATATTAATTACAGTAGTGATGAAATTAATAGCTCCCCAAATGATGATGCCCCA
GCAAGATGAAGTGAAAAGATTGCCAAATCTACTGAAGGTCCAGCGTGGGCAATATTTCTTGCTAGTGGGGGATATACTGTT
CACCTGTCTCTGACCCCTTTTCAACTGCCGCGGATGATACTAGTAGAATAAGTGAGGGTGGTAGAAGTCAGAACTTATAT
TATTTAGTCGTGGGAAAGCTATGTCTGGTGTCCCAAGTATTAGGGGGAGTAGCCAGTTTCCGAAGCCCCCAATAAAATCTGG
TATTACCAGAAAGAAAATTATTACGAATGCGTGAGCAGTTACAATTGTATTATATAGTTGATCTCTTCTAGAAATGATCCA
GGCTGTCTTAGCTCAATTCAATAAGTAGTCTTATACCGGCTCCAATTATTCCAGCTCAAATACCCAAAATAAAATATAGTG
TT

> WM13 Jeju1 #8 Sanbansan Temple big green damaged *Metaphire* - BLAST ditto WM12 “chinese herbal medicine” and WO11 redo of WM16! But WM13 vs. WM12 Identities=631/650 (97%); and **WM13 vs. WO11=646/646 (100%)!** So WM13=WO11.

AGAATAGGTGTTGATATAGAATTGGATCTCCTCCACCAGCTGGATCAAGAATGATGTATTTAGGTTTCGATCTGTGAATAA
TATTGTAATAGCCCTGCTAGTACCGGTAGGGATAGTAGTAATACTACGGTAATTACTACTGCTCACACAAATAGTGGGG
ATTCTGCTCTAACCGCAGTCCCGATCACCGCATATTAATTACAGTAGTGATGAAATTAATAGCTCCCCAAATGATGATGCCC
CAGCAAGATGAAGTGAAAAGATTGCCAGGTCTACTGAAGGTCCAGCGTGGGCAATATTTCTTGCTAGTGGGGGATATACTG
TCCACCCTGTCTCTGACCTTTTTCAACTGCCGCGGATGACACCAATAGAATAAGTGAGGGTGGCAGAAGTCAGAATCTTAT
ATTATTAGTCGTGGGAAAGCTATGTCTGGTGTCCCGAGTATTAGGGGGAGTAGCCAGTTTCCGAAGCCCCCAATAAAATCT
GGTATTACCAGAAAGAAAATTATTACGAATGCGTGAGCAGTTACAATTGTATTATATAGTTGATCTCTTCTAGAAATGATC
CAGGTTGTCTTAGCTCAATTCAATAAGTAATCTTATACCGGCTCCAATTATTCCGGCTCAAATACCCAAAATAAAATA

> WM14 Korea 1st survey from smallest lumbricid - BLAST 84% *Dendrodrilus rubidus* from Austria, i.e. different species not yet on GenBank.

AGTGTGATATAAAAATTGGATCTCCTCCCCCGCAGGGTCAAAAAATGAAGTGTTAAGTTTCGATCAGTTAATAATATAGT
AATTGCGCCAGCAAGAAGCTGGAAGAGATAAAAAGAAGTAAAAACAACAGTAATTAGAACTGCTCATACAAATAAGGGAATCC
GTTCTAAACGTAACCCGGCTCATCGTATGTTAATGACGGTGGTGATAAAGTTAATTGCACCAAGAATTGAAGATGCACCTGC
CAGGTGAAGGGAGAAAATTGCTAGATCTACTGAAGGTCCAGCATGAGCAATATTTCTAGAGAGAGGAGGGTATACAGTTCA
ACCAGTTCAGCTCCTTTTTCTACTGCCGAGAGGATACTAGGAGAATCAGTGAAGGAGGTAAAAGTCAGAATCTTATATTA
TTTAACCGAGGAAATGCTATATCTGGTGCACCTAGTATTAATGGAAGAAGTCAATTTCCAAATCCTCCAATAAATACAGGCA
TAACTAGGAAGAAAATTATTACGAAGGCATGGGCTGTAACGATTGTATTATATAATTGATCCCTTCCTAAGAAAGCTCCAGG
TTGCTTAATTCAATTCAATTAGAAGTCTTATTCCGGCACCTACTATTCCGGCTCAGACACCTAAAATAAAGTAAA

> WM17 Jeju1 #1 *Oc. occidentalis* tissue - megaBLAST nothing better than <85% for random megadriles, i.e., nothing similar yet available on GenBank/iBOLD.

GGTGTGATATAAAAATTGGGTCTCCTCCTCTGCTGGATCAAAGAATGAGGTATTTAGATTTCGATCTGTTAGGAGTATTGTA
ATAGCTCCTGCTAGTACAGGAAGTGATAATAGTAGAAGTACTACCGTAATTACTACTGCTCATACAAATAATGAGATTTCGTT
CTAATCGTAGGCCATTTTCATCGTATATTAATACTACTGTAGTGATAAAGTTGATTGCCCTAAAATTGATGAGGCACCGGCTAG
ATGAAGTGAGAAAATTGCTAGGTCTACTGATGGTCTGCGTGTGCTATATTTCTGGCTAGTGGTGGATATACTGTTTCATCCA
GTTCTGCTCCTTTTTCTACTGCTGCGGATGAGACTAGTAGGATTAGGGCAGGAGGGAGTAGTACGAATCTTATGTTATTTA
GTCGTGGGAAGGCTATATCTGGTGCCTAGTATTAAGGTAGTAATCAGTTTCCAAACCCCCCAATAAATACTGGTATTAC
CAGGAAGAAAATTATTAAGGCATGTGCTGTTACGATAGTATTATATAGTTGATCTCTGCCTAGGAATGCACCTGGTTGC
CTTAATTCAATTCAATTAATAGTCTTATTCCGGCCCCCTACTATTCTGCTCATACCCCTAGGATAAAATATAAGGT

> WM18 Jeju1 #1 Red dorsum *Eisenia* worm NIL result - redone as WO12

> WO7 Jeju1 #4 Pale lumbricid (*Eisenia fetida*?) dissected on sheet 26.III.2012 - BLAST *A. trapezoides* 100%. (Same 100% as WO13 - i.e., mixed sample or contamination?)

AACCCTATATTTTATTCTTGGGGTCTGAGCTGGCATAGTGGGTGCCGGTATAAGGCTCCTTATTCGAATTGAGCTAAGTCAG
CCGGGAGCTTTTCCTAGGAAGAGACCAACTCTACAATACCATTGTTACAGCCCATGCATTTGTAATAATTTCTTTTATGTTAT
GCCCCGATTTATTTGGTGGCTTCGGAAACTGACTACTACCCCTAATACTAGGAGCTCCAGATATAGCCTTTCCTCGACTAAAT
AACATAAGATTCTGGCTACTACCACCTCATTAATTTCTTCTAGTATCTTCTGCTGCTGTAGAAAAAGGAGCAGGAACAGGTT
GAACAGTATATCCACCATTAGCCAGAAATCTAGCCCATGCCGGCCATCAGTAGACCTTGCCATTTTCTCACTTCATTTAGC
AGGGGCACTTCTCAATCTAGGAGCTATCAACTTTATTACAACCGTAATCAACATACGGTGAAGTGTTTACGACTAGAACGA
ATCCCCCTTATTTGATGGGCAGTAGTAATTACTGTTGTGCTTCTTCTATATCCCTACCAGTGCTTGCCAGGAGCTATTACTATG
CTTTAACAGACCGAAATCTTAACACTTCATTCTTTGACCCTGCCGGAGGAGGAGACCCTATTTTATATCAACATCTATT

> WO11 Jeju1 #8 Big damaged pale *Amyntas* (redo of WM16) - ditto "chinese herbal medicine" and WO11 vs WM13 Identities= 646/646 (100%), Gaps=0/646 (0%)! i.e. **WM13=WO11**.

GGTGTGATATAGAATTGGATCTCCTCCACCAGTGGATCAAAGAATGATGTATTTAGGTTTCGATCTGTAAATAATATTGTA
ATAGCCCTCTAGTAGTACCGGTAGGGATAGTAGTAATACTACGGTAATTACTACTGCTCACACAAATAGGGGGATTGCT
CTAACCGCAGTCCCGATCACCGCATATTAATTACAGTAGTGATGAAATTAATAGCTCCCAAAATTGATGATGCCCCAGCAAG
ATGAAGTGAAGAGATTGCCAGGTCTACTGAAGGTCCAGCGTGGGCAATATTTCTTGCTAGTGGGGGATATACTGTCCACCT
GTTCTGACCTTTTTCACTGCGGCGGATGACACCAATAGAATAAGTGAGGGTGGCAGAAGTCAGAATCTTATATTTTA
GTCGTGGGAAAGCTATGTCTGGTGTCCCGAGTATTAGGGGGAGTAGCCAGTTTCCGAAACCCCCAATAAATACTGGTATTAC
CAGAAAGAAAATTATTACGAATGCGTGAGCAGTTACAATTGTATTATATAGTTGATCTCTTCTAGAAATGATCCAGGTTGT
CTTAGCTCAATTCAATAAGTAATCTTATACCGGCTCCAATTATTCCGGCTCAAATACCCAAAATAAATAATATAGTGTT

> WO12 Jeju1 #1 Red backed *Eisenia* lumbricid (redo of WM18) BLAST - 100% for "DNA barcodes for soil animal taxonomy: transcending the final frontier" by Bouche and James from France as "Lumbricidae sp." or 100% *E. fetida* or 100% *E. andrei*; GenBank Nos [GU013883.1](#), [FJ214228.1](#), [AY874508.1](#). October redo W11 exactly same results as WO12.

ATAAATGTTGGTAGAGAATAGGGTCGCCACCTCCAGCAGGGTCAAAGAATGAGGTATTTAGGTTTCGATCTGTCAATAGTAT
AGTGATAGCTCCCGCAAGTACTGGAAGAGATAAAAAGTAGTAACACCACGGTAATAACTACAGCTCATACAAATAGGGGGAT
TCGTTCTAGTCGAAGCCCACTTCATCGTATGTTAATACTGTAGTAATGAAGTTAATTGCCCTAAAATTGAGGAGGCACCT
GCTAAATGGAGGGGAAAAAATAGCCAGGTCCACTAGGGGCCCGCTGCGCTAAGTTACTGGATAGGGGTGGGTAAACTGTC
CACCTGTTCCAGCACCTTTTTCCACTGCAGCAGAGGATACTAGGAGAATTAGGGAAGGGGGCAGAAGTCAAAATCTTATG
TTGTTGAGACGTGGAAAGGCTATGTCTGGAGCTCCTAGTATAAGAGGTAGAAGTCAGTTTCCAAATCCACCAATAAATACA
GGTATTACCAGAAAGAAAATTATTACAAATGCATGGGCTGTAACAATTGTATTATATAGTTGGTCCCTTCCTAGGAAGGCAC
CTGGTTGCCTTAGCTCGATTCAATGAGAAGGCTTATACCAGCACCAACCATACCTGCTCAGACCCCGAGAATGAAATAGA
G

> WO13 Jeju1 #1 smaller lumbricids in vial *B. parvus* - megaBLAST *A. trapezoides* 100% (same as WO7! - contamination or mixed in lab.?)

TGGAACCCTATATTTTATTCTTGGGGTCTGAGCTGGCATAGTGGGTGCCGGTATAAGGCTCCTTATTCGAATTGAGCTAAGTC
AGCCGGGAGCTTTTCCTAGGAAGAGACCAACTCTACAATACCATTGTTACAGCCCATGCATTTGTAATAATTTCTTTTATGTT

ATGCCCGTATTTATTGGTGGCTTCGGAACTGACTACTACCCCTAATACTAGGAGCTCCAGATATAGCCTTTCTCGACTAA
ATAACATAAGATTCTGGCTACTACCACCTCATTAACTTCTTCTAGTATCTTCTGCTGCTGTAGAAAAAGGAGCAGGAACAGG
TTGAACAGTATATCCACCATAGCCAGAAATCTAGCCCATGCCGGCCCATCAGTAGACCTTGCCATTTTCTCACTTCATTTAG
CAGGGGCATCTTCAATTCTAGGAGCTATCAACTTTATTACAACCGTAATCAACATACGGTGAAGTGGTTTACGACTAGAACG
AATCCCCTTATTTGTATGGGCAGTAGTAATTACTGTTGTGCTTCTTCTATATCCCTACCAGTGCTTGCAGGAGCTATTACTAT
GCTTTTAACAGACCGAAATCTTAACACTTCATTCTTTGACCCTGCCGGAGGAGGAGACCCTATTTTATATCAACATCTATT

> WO16 Jeju1 #1 dark *A. trapezoides* not figured - megaBLAST only <84% *Dendrodrilus rubidus*. i.e. new or more likely mixed in the laboratory!

CTTTACTTTATTTTAGGTGTCTGAGCCGGAATAGTAGGTGCCGGAATAAGACTTCTAATTCGAATTGAATTAAGACAACCTG
GAGCTTTCTAGGAAAGAGATCAATTATATAACAATTGTTACAGCCACGCCCTTCGTAATAATTTTCTTCTAGTTATGCCT
GTATTTATTGGAGGATTTGGAAATTGACTTCTTCCATTAATACTAGGTGCACAGACATAGCATTTCCTCGATTAAATAATAT
AAGATTCTGACTTTTACCTCCTTCACTGATTTTCTTAGTTTCTTTTGCAGGAGTAGAAAAAGGAGCGGGAACCTGGTTGAACGG
TATACCTCCTCTCTCTAGAAATATTGCTCATGCTGGACCTTCAGTAGATCTAGCAATTTTCTCCCTTACCTGGCAGGTGCA
TCTCAATTCTTGGTGCAATTAACCTTATCACCACTGTCATTAACATACGATGAGCCGGGTTACGTTTGAACGGATTCCCTT
ATTTGTATGAGCAGTTCTAATTACTGTTGTTTTACTTCTTTTATCTTCTTCCAGTTCTTGTGCGGCATTTACTATATTATTAAC
GATCGAAACTTAAACACTTCATTTTTTGACCCTGCCGGAGGAGGAGATCCAATTTTATATCAAC

> WO17 Jeju1 #1 pale *A. caliginosa* not figured - - megaBLAST nothing better than 83% lumbricids (new?) ? redone below as wo17b.
BLAST WO17 vs wo17b Identities=480/636 (75%)! Thus samples were mixed in lab.

ACTCTATATTTTATTCTAGGAGTATGAGCCGGCATAGTAGGTGCTGGAATAAGTCTTCTTATTTCGAATTGAGCTAAGTCAAC
CTGGGGCTTTTCTAGGTAGAGATCAACTCTACAACAGATTGTTACAGCTCATGCAATTTGTGATAATCTTCTTCTTAGTAATA
CCCGTATTTATTGGAGGATTTGGAACTGACTCTTACCTCTAATATTAGGAGCACCTGATATAGCCTTCCCCCGTCTAAATAA
TATAAGATTCTGATTACTACCTCCTTCCCTCATTCTTCTGTATCTTCTGCAGCAGTAGAAAAAGGGGCCGGAACAGGCTGA
ACCGTATATCCCCCTCTATCGAGGAACCTTGCACATGCCGGCCCATCCGTAGATTTAGCTATCTTCTCCCTTCACTTAGCAGG
AGCTTCTTCTATTCTCGGGGCCATCAATTTCACTACTACAGTTATTAATATGCGGTGAACAGGAATACGTCTAGAACGAATC
CCTTTATTTGTTTGAGCTGTAATCATTACAGTAGTTCTTCTTCTTCTTCTTCACTTCCAGTGCTTGTGAGCAATTACAATGCTC
CTAACAGATCGAAACCTCAATACTTCACTTCTTGTATCCTGCGGGAGGAGGAGACCCTATCCTTTATCAACATCTATTCT

> WO17b redo of Jeju #1 pale *A. caliginosa* - megaBLAST=99% "*Drawida* sp. Watarase" i.e. mixed sample again! - maybe first WO17a is correct. But what is this? Data is the same as WO28 *D. koreana* from Shindo and with WO32a "*P. sanctaehelenae*" types! I.e., earthworm sample of unknown origin mixed in genetics lab.

TTTATTTTAGGTGTATGAGCTGGGATAATTGGTGCGGGAATGAGGCTATTAATTCGAATTGAGTTAAGACAACAGGTTTCGT
TTTTAGGCAGAGATCAGCTTTATAATACTATTGTTACTGCACATGCTTTTATTATAATTTTCTTCTTAGTAATACCCGTATTTA
TTGGTGGCTTTGGTAATTGATTATTACCCTTAATACTTGGGGCTCCAGACATGGCTTTCCCTCGACTTAATAATTTAAGATTT
TGGCTCTTACCGCCGGCTTTAATTTCTTTAGTGTCGTCAGCAGCAGTGGAAGGGTGCTGGTACCGGGGTGAACAGTTTATC
CGCTCTGGCTAGTAATTTAGCACATGCCGGGCCATCAGTCGACCTAGCGATTTTCTTTTACATTTTGGCAGGAGCATCCTCT
ATTTAGGGGCCACTAATTTTATTACAAGTGTATTAACATACGATGGGTTGGCATAACCTTTGAGCGAATTCCGCTATTCTGT
GTGGGGAGTTTAAATTACTGTAGTACTATTACTTCTTCTTGTGCTGTGTTGGCCGGCGCAATTACTATGCTTTTAAACCGATC
GAAACTTAAATACTTCACTTCTTTGATCCGGCCGGAGGCGGAGACCCTATTTTATACCAGCATT

> WO35 Nogyama *A. masatakeae* 5/5/12 - megaBLAST=99-100% "*A. triastrianus*" from China or "*A. robustus*" from Japan - these misidentifications, as expected!

WO35 vs. w28b Identities=657/657 (100%), i.e. *A. masatakeae* confirmed from Jeju. QED.

WO35 vs. w29 Identities=614/657 (93%), i.e. different taxa (= *A. tralfamadore*).

WO35 vs. w30 Identities=617/657 (94%), i.e. different taxa (= *A. tralfamadore*).

GGAACCTTATACTTTATCCTGGGAATTTGAGCAGGAATAATTGGTGAGGAATAAGACTACTTATTCGTATTGAATTAAGAC
AACCGGGATCCTTCTTGGTAGAGACCAACTATATAATAACAATTGTAACAGCACATGCATTCTTAATAATCTTCTTTCTAGTA
ATGCCAGTATTTATTGGTGGATTTCGAAACTGGCTACTGCCCTAATACTTGGAAACCCAGATATGGCGTTCCCCCGATTAA
ATAACATAAGATTTTGAAGTACTTCCACCATCCCTAATTTTATTAGTAAGATCGGCCCGGCTAGAAAAAGGAGCGGGCACAG
GTTGGACAGTTTACCCACCCCTAGCAAGAAATATAGCACATGCCGGCCCTTCACTAGACCTTGAATTTTCTCACTCCATCTT
GCAGGTGCCTCATCAATTTCTGGAGCTATTAACCTTTATCAACAGTAATTAACATGCGATGATCTGGGCTACGTCTAGAAC
GAATCCCACTATTGTATGAGCAGTAGTGATCACCGTAGTACTATTATTATCCCTACCTGTACTGGCTGGGGCAATTACC
ATATTACTAACGGATCGAAACCTTAATACATCATTCTTTGACCCAGCAGGAGGGGGGACCCAGTTCTATACCAACACCTAT
T

> WO38 April 18th Tubificidae - megaBLAST 99% *Pontodrilus littoralis* - i.e., sample mixed probably with WO39 that is *P. littoralis*
TACTTCATCCTAGGAGTATGAGCTGGGATAAATTGGAGCTGGAATAAGACTACTTATTCGAATTGAACCTAAGACAACAGGA
GCATTTCTAGGGAGAGATCAACTATATAACAATTGTTACTGCACAGCAGCATTTTCTAATAATTTTCTTCTAGTAATACCTGT
ATTTATTGGAGGATTTGGAACTGATTACTACCCCTTATACTAGGAGCACCAGATATAGCTTTTCCACGACTAAACAACATA
AGATTTTGAAGTCTTACCTCCTTCTCTAATCCTTCTAGTTTCATCAGTGCAGTAGAAAAAGGTGCAGGAACCTGGATGAACAG
TTTATCCACCATAGCAAGTAATATTGCCCATGCTGGGCCATCAGTAGATCTAGCCATTTTCTCACTACATTTAGCCGGGGCT
TCATCAATTCTAGGAGCTATTAACCTTTATTACAACAGTTATTAATATACGATGATCAGGATTACGACTAGAACGAATTCAT

TATTCGTATGGGCTGTAGTTATTACAGTAGTGCTACTACTATTATCCCTTCCTGTGTTAGCAGGGGCTATTACAATACTATTA
ACAGATCGCAATCTAAATACATCTTTCTTCGACCCAGCAGGTGGGGGAGATCCA

> WO39 - *Pontodrilus litoralis* - nil result (but cf. WO38!).

> WO40 - *Metaphire q. valhalla* - nil result (redone as w20).

> WO41 - *Amyntas aucklandis* - nil result (redone as w4).

> WO42 - *Metaphire* cf. *phaselus* - nil result (redone as w22).

> WO43 - *Amyntas simplex* H - nil result (redone as w23).

> WO44 “*Drawida* cf. *koreana*” Jeju #2 June 2012 - megaBLAST 94% some lumbricids, i.e., mixed in lab with “*Eisenia* cf. *japonica*” sample (WO45) as this barcode data is the same as for w18b redone for *Eisenia japonica* from Jeju (cf. WO45). WO44 redone as w17.

> WO45 “*Eisenia* cf. *japonica* from Mt Halla Jeju #2” megaBLAST=<82% for some Moniligastrid, i.e., sample mixed in lab. BLAST WO45 vs. w24 Identities=650/650 (100%). [WO45 vs. WO28 Identities=516/648 (80%), i.e., “*D. cf. koreana*” from Incheon is a different species]. Sample “WO45” was mixed in the genetics lab probably with WO44. WO45 redone as w18.

TTATATTTCATTTTAGGTGTGTGGGCAGGTATAAATTGGTGCTGGTATAAGTCTTTTGATTTCGGATTGAATTAAGACAGCCTGG
CTCATTTTTTGGGAAGCGATCAGCTCTATAATACTATTGTTACTGCTCATGCTTTCGTTATAATTTTTTCTTGTAATACCTGT
ATTTATTGGTGGCTTCGAAATTGACTTCTTCTCTTATACTAGGGGCTCCGGATATAGCATTCCACGCTCTTAATAATCTGA
GATTTTGGCTATTGCCCCAGCATTAACTCTTTAGTTTCTTCGGCAGCAGTGGAAAAAGGTGCTGGTACTGGGTGAACAGT
ATACCCACCGCTAGCAAGCAACCTGGCTCACGCCGGTCCCTCAGTTGATTAGCAATTTTTCTCTTCATTTAGCAGGAGCGT
CTTCAATTTTGGGCTCAATTAATTTTATTACAATGTAATTAATATGCGATGATCTGGGATAAATGTAGAGCGAATTCCACTA
TTTGTGTGAGGTGTAGTTATTACTGTAGTATTACTTTTATTATCTCTTCCGGTTTTAGCGGGAGCAATTACTATGCTTTTGACA
GATCGAAATCTGAATACGCTCTTCTTCGATCCTGCCGGTGGTGGAGACCAATTCTGTATCAGCACTT

> WO46 *Drawida* sp Jeju #2 June, 2012. mega BLAST=*Amyntas corticis* 100%, i.e., (apparently mixed in lab with sample “> WO47 of *Amyntas corticis*”. Resampled as w24.

> WO47 - *A. corticis* Hyomyungsa, Halla 12th June, 2012 - nil result (resampled as w25).

> WO48 - *A. micronarius* from Hyomyungsa Temple, Jeju 12th June, 2012 - nil result.

> WO49 *Amyntas* sp. #1 immature from Hyomyungsa Temple, Hallasan, Jeju 12th June, 2012 - megaBLAST=100% *M. hilgendorfi* (AB543234) and 100% *A. tokioensis* (AB542560, 542556) from Japan which are either (or both!) misidentifications. It is not known if this sample is reliable or mixed but it provides evidence of the *M. hilgendorfi* spp.-gp. on Jeju.

ACTATACCTTCTAGGTATTTGAGCTGGAATAATTGGAGCAGGAATAAGACTCCTTATTCGAATTGAGCTAAGACAAGCC
GGGTCCTTTTAGGTAGAGACCAACTCTACAATACAATCGTAACAGCTCATGCATTCTTAATAATTTTCTTTCTTGTAATGCC
TGTATTTTGGAGGATTTGGAAATTGATTACTACCTCTAATGTTAGGTGCACCCGATATAGCATTCCACGACTCAACAATA
TAAGATTTTGATTACTGCCCCGCTCACTAATTCTACTAGTATCCTCGGCTGCGGTAGAGAAAGGTGCAGGTACAGGATGAAC
AGTATATCCCCCACTATCAAGAAATATTGCTCATGCAGGCCCATCAGTAGATCTAGCTATTTTCTCACTCCACTTAGCAGGTG
CCTCTTCAATTTTAGGTGCTATCAACTTTATTACCACAGTAATTAATATACGATGATCCGACTACGCTTAGAGCGAGTACCT
CTATTTGTATGAGCAGTTGTAATTACTGTAGTTCTTCTACTTCTATCTCTGCCAGTCTAGCAGGTGCTATCAATACTACT
AACAGATCGAAATCTAAATACATCTTTTTTGTATCCAGCAGGTGGGGGAGACCAATTCTATATCAACACCTAT

> WO50 *A. corticis* #2 im Temple Jeju ? megaBLAST=*A. corticis* 90% - i.e., mixed in lab with WO47 or WO51?

CTCTATATTTTCATTTTAGGAATTTGAGCCGGAATAATTGGAGCAGGGATAAGCCTACTTATCCGAATTGAATTAAGACAACC
AGGATCATTCCTTGGGAAGTGATCAACTATATAACACAATTGTAACAGCAGCATGCATTCTTAATAATCTTTTTCTAGNGATAC
CAGTATTTATTGGTGGATTTGGAAACTGATTATTACCCCTTATATTAGGGACTCCAGACATAGCATTCCCTCGACTAAACAAT
ATGAGATTTTGAATTTGCCACCCTCACTGATCTTACTAGTCTCATCTGCCGAGTAGAAAAAGGTGCAGGGACAGGGTGGA
CAGTTTACCCACCCCTAGCAAGAAATATCGCACATGCGGGACCATCAGTAGATCTTGCAATTTTCTCACTACACTTAGCAGG
AGCATCATCAATCTTGGGAGCAATTAATTTTATTACCACAGTAATTAATATACGGTGATCTGGGCTACGACTAGAACGAATT
CCACTATTTGTCTGAGCAGTGGTAATTACCGTAGTTTCTACTCTTTTACTACTACCTAGCAGTACTAGCCGAGCTATTACAATACT
ACTAACAGATCGAAACCTTAATACATCATTCTTTGACCCAGCAGGGGGAGGAGACCAATTTTATATCAACACCTA

> WO51 - “*A. gracilis*?” from Cheonji Falls - nil result. Redone as w27.

> WO52 - *A. tralfamadore/masatacae* from Cheyonji Falls - nil result. Redone as w28a, b.

> WO53 - darker *A. tralfamadore/masatacae* from Cheyonji Falls - nil result. Redone as w29.

> WO54 paler *A. tralfamadore/masatacae* from Cheyonji. Seogwipo Falls paler spec - *Amyntas gracilis* 100% - I need to CHECK... most likely mixed with WO55? - redone as w30 (QED).

CCCTATATTTTATTCTAGGAATTTGAGCCGGAATAATTGGAGCTGGAATAAGGCTACTTATTCGAATTGAACTCAGACAGCC
GGGATCGTTTCTGGGAAGAGATCAACTATATAACAATTGTAACAGCTCATGCATTGTAAATAATTTCTTTCTGGTAATAC
CAGTATTCATTGGTGGATTTGGAAACTGACTACTACCTCTAATGCTGGGTACACCAGACATAGCATTTCGCGACTTAATAA

TATAAGATTTTGGACTACTCCCCCGTCACTTATCTTACTAGTAAGATCCGCGGCCGTTGAAAAGGGGGCGGGAAGTGGATGA
ACAGTATATCCCCGCTGGCAAGAAATATTGCACATGCTGGTCCATCAGTAGATCTAGCAATCTTCTACTACACTTGGCAG
GAGCATCATCTATTCTTGGGGCCATTAACCTTTATTACAACCTGTAATTAATATACGATGATCTGGATTACGGCTAGAACGAAT
CCCCCTATTTGTATGGGCGGTAGTAATTACTGTAGTACTTCTACTATTATCTCTACCTGTACTAGCCGGAGCTATTACTATATT
ATTAACAGATCGAAACCTTAACACATCATTCTTTGATCCCCGCTGGAGGTGGAGACCCTATTCTATATCAACACCTA

> WO55 - *Amyntas* sp. Cheyonji - nil result. Redone w31.

> WO56 *Metaphire* cf *agrestis* from Cheonji - megaBLAST=100% *A. corticis* - i.e., WO56 was mixed in lab (with WO57). BLAST WO56 vs. w33 Identities=646/646 (100%) i.e., confirming samples were mixed.

> WO57 *A. corticis saeseum* - megaBLAST *M. californica* <99%, i.e. WO57 mixed in lab (with WO58)? Redone as w33.
CCTTATATTTTATTCTAGGAATCTGAGCAGGGATAATCGGAGCAGGGATAAGATTACTTATTCGCATCGAACTAAGACAGCC
TGGATCATTCTTGGGAAGAGACCAACTATATAATACAATTGTGACAGCACACGCATTTNTAATAATTTCTTTNTGGTGATA
CCAGTATTTATTGGGGGATTTGGAACTGACTTCTCCCACTAATGTTAGGAACCCCTGACATAGCGTTCCCTCGACTAAATA
ACATAAGATTCTGACTACTGCCACCCTCATTAATTCTACTAGTTAGATCCGCGGCAGTAGAAAAGGGAGCAGGTACAGGAT
GAACAGTGTAACCTCCACTAGCTAGAAACATAGCACACGCAGGTCCATCAGTAGATCTTGCAATTTTCTACTACATTTAGC
AGGTGCCTCATCAATTTTGGGGGCCATCAATTTTCACTACCCTGTGATCAACATGCGATGATCAGGCCCTACGCCCTAGAGCGA
ATCCCACTATTCGTATGAGCCGTAGTAATCACTGTAGTACTCCTTCTACTATCACTTCTGTGCTAGCGGGAGCAATTACTAT
ATTATTAACGGATCGAAACCTAAATACCTCATTCTTCGACCCTGCA

> WO58 - *M. californica* from Saeseum Island - nil results (cf. WO57). Resampled as w34.

> WO66 Green *M. quelparta seogwipo* from Jeju bot gars 9/9/12 - megaBLAST <93% for “Chinese herbal medicine” species. BLAST WO66 vs. WM11 Identities=550/648 (84.9%) shows *Amyntas arx* to be a different taxon while WO66 vs. WM12 Identities=635/657 (96.7%), WO66 vs. WM13 Identities=633/652 (97.1%) and WO66 vs. w20 *M. q. valhalla* Identities=637/658 (96.8%), ? i.e., possibly sub-species?

GGTCAACAAATCATAAAGATATTGGAACACTATATTTTATCTTGGGTATTGAGCCGGAATAATTGGAGCCGGTATAAGATT
ACTTATTCGAATTGAGCTAAGACAACCTGGATCATTCTAGGAAGAGATCAACTATATAATACAATTGTAAGTCTCACGCA
TTCGTAATAATTTTCTTTCTGGTAATACCAGTATTTATTGGGGGTTTCGGAACTGGCTACTCCCCCTAATACTTGGGACACC
AGACATAGCTTTCCACGACTAAATAATATAAGATTTTGACTTCTACCCCTCACTTATTCTATTAGTGTCATCCGCCGCGAG
TTGAAAAGGGTGACAGGGACAGGATGAACAGTATATCCCCCACTAGCAAGAAATATTGCCACCGCTGGACCTTCAGTAGATC
TGGCAATCTTTTCACTTCATCTTGCTGGGGCATCATCAATTTGGGAGCTATTAACCTTCATCACTACTGTAATTAATATGCGG
TGATCGGGACTGCGGTTAGAGCGAATCCCCCTATTTGTGTGGGCAGTAGTAATTACCGTAGTATTATTACTATTATCCCTACC
GGTACTAGCAGGAGCTATTACAAATGTTATTAACAGATCGAAACCTAAATACATCATTCTTTGATCCGGCTGGTGGAGGAGAT
CCAATTCATATCAACATCTATTCTGATTTTTTGGTCAACCTGAAGTTTA

> WO67 *A. carnosus* from Jeju botanic gardens 9/9/2012 - megaBLAST <99% *A. carnosus* Nara. [Note: BLAST WO67 vs. WO24 Identities=657/657 (100%), WO67 vs. WO32 Identities=655/655 (100%), WO67 vs. WO34 Identities=657/657 (100%) - i.e., some other *A. carnosus* specimens identified from mainland Korea (Blakemore, in prep.)].

GGTCAACAAATCATAAAGATATTGGAACCTTATATTTTATCTTGGGAATCTGGGCAGGAATAATTGGTGCCGGTATGAGACT
ACTTATTCGAATCGAGCTCAGGCAACCGGGCTCCTTTCTGGGAAGGGACCAACTATATAACACAATTGTAACAGCACACGC
ATTCCTTATAATTTTCTTTCTAGTTATACCAGTATTCATTGGGGGATTTGGAAATTGGCTACTACCACTCATACTGGGAACAC
CGGACATAGCATTTCACGCCTAAACAACATGAGATTCTGGCTACTGCCCCATCACTAATCTTACTAGTATCTTCCGCCGC
AGTAGAGAAAGGAGCAGGTACAGGATGAACAGTATATCCCCCTAGCAAGAAATATTGCTCATGCGGGGCCATCAGTAGA
CCTGGCAATTTTCTCACTCCACTAGCTAGTGGGGCATCTCAATTTTGGGGGCCATTAACCTTATTACTACAGTAATTAATATGC
GCTGGTCTGGACTACGTCTAGAGCGAATCCCGCTATTTGTATGAGCAGTAGTAATTACTGTGCTACTACTATTACTATCATTA
CCAGTTCTTGGCGGAGCTATTACAATACTACTAACAGACCGAAACCTAAATACATCATTCTTCGACCCAGCGGGAGGGGGG
GACCAATTCTGTACCAACACCTATTTTGATTTTTTGGTCAACCTGAAGTTTA

> WO68 *Drawida iucn* H megaBLAST closest to unidentified Japanese Moniligastridae <81%. BLAST WO68 vs. WO69 “*D. a. seogwipo*” - Identities=686/709 (97%); WO68 vs. WO46? (or rather vs. WO45) mixed and resampled as w24 “*D. a. halla*” Identities=625/650 (96%), i.e., likely different taxa.

GGTCAACAAATCATAAAGATATTGGAACCTTATATTTTATCTTGGGAATCTGGGCAGGTATAATTGGTGCTGGTATGAGTCT
TTTGATTCGGATTGAACTAAGACAGCCTGGCTCTTTTTTGGGGAGTGATCAGCTCTATAATACTATTGTTACTGCTCATGCTT
TCGTTATAATTTTTTCTTGTAAATACCTGTATTTATGGTGGATTTCGGAAATTGACTTCTCTCTTATATTAGGAGCACCGG
ATATAGCATTTCCACGCTCTTAATAATCTGAGATTTTGGACTATTGCCCCCAGCATTAATCTTTTAGTTTCTTCCGCAGCAGTG
GAAAAAGGTGCTGGTACTGGGTGAACAGTATACCCGCCGTAGCAAGAAACCTGGCTCAGCCGGTCCCTCAGTTGATTTA
GCAATTTTTTCTCTTCTTATTTAGCAGGGGCATCTTCAATTTTGGGCTCTATTAATTTTATTACAACCTGTAATTAATATACGATGA
TCTGGGATAAATGTAGAACGAATTCCTACTATTTGTTGAGGTGTAGTTATTACTGTAGTATTACTTTTACTATCTCTTCCAGTT
TTAGCAGGGGCAATTACTATGCTTTTGACAGATCGAAATCTGAATACGTCTTTCTTCGATCCTGCCGGCGGTGGTGACCCAA
TTTTGTACCAGCACTTATTTTGATTTTTTGGTCAACCTGAAGTTTA

> WO69 *Drawida a. seogwipo* H - megaBLAST unidentified Japanese Moniligastridae <81%. BLAST WO69 vs. WO45 (=w24 *D. a. halla*) Identities=642/650 (99%) i.e., perhaps part of the sub-sp complex; cf. WO70.

GGTCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTACGTGTGTGGGCAGGTATAATTGGTGCTGGTATAAGTCTT
TTGATTCGGATTGAATTAAGACAGCCTGGCTCATTTTGGGAAGCGATCAGCTCTATAATACTATTGTTACTGCTCATGCTTT
CGTTATAATTTTTTTCTTGTAATACCTGTATTTATTGGTGGCTTCGGAAATTGACTTCTTCCTCTTATATTAGGGGCTCCGGA
TATAGCATTCCCACGCTTAATAATCTGAGATTTTGGCTATTGCCCCAGCATTAACTCTTTAGTTTCTTCGGCAGCAGTGG
AAAAAGGTGCTGGTACTGGGTGAACAGTATACCCGCCGCTAGCAAGCAACCTGGCTCACGCCGGTCCCTCAGTTGATTTAG
CAATTTTTTCTCTTCATTTAGCAGGAGCGCTTCAATTTTGGGCTCTATTAATTTTATTACAACCTGTAATTAATATGCGATGAT
CTGGGATAAATGTAGAGCGAATTCCACTATTTGTTTGGGTGTAGTTATTACTGTAGTATTACTTTTATTATCTCTCCGGTTT
TAGCGGGAGCAATTACTATGCTTTTGACAGATCGAAATCTGAATACGTCTTTCTTCGATCCTGCCGGCGGTGGAGATCCAAT
TTTGATCAGCACTTATTTTGATTTTGGTCCACCTGAAGTTTA

> WO70 *Drawida* sp.1 - megaBLAST unidentified Japanese Moniligastridae <91%. BLAST WO70 vs. WO69 *D. a. seogwipo* Identities=702/709 (99.0%); WO70 vs. w24 *D. a. halla* Identities=647/658 (98.3%).

GGTCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTAGGTGTGTGGGCAGGAATAATTGGTGCTGGTATAAGTCTT
TTTGATTCGGATTGAATTAAGACAGCCTGGCTCTTTTGGGAAGCGATCAGCTCTATAATACTATTGTTACTGCTCATGCTT
TCGTTATAATTTTTTTCTTGTAATACCTGTATTTATTGGTGGCTTCGGAAATTGACTTCTTCCTCTTATATTAGGGGCTCCGG
ATATAGCAATCCCACGCTTAATAATCTGAGATTTTGGCTATTGCCCCAGCATTAACTCTTTAGTTTCTTCGGCAGCAGTG
GAAAAAGGTGCTGGTACTGGGTGAACAGTATACCCGCCGCTAGCAAGCAACCTGGCTCACGCTGGTCCCTCAGTTGATTTA
GCAATTTTTTCTCTTCATTTAGCAGGAGCGCTTCAATTTTGGGCTCTATTAATTTTATTACAACCTGTAATTAATATGCGATGA
TCTGGGATAAATGTGGAGCGAATTCCACTATTTGTTTGGGTGTAGTTATTACTGTAGTATTACTTTTATTATCTCTCCGGTT
TTAGCGGGGGCAATTACTATGCTTTTGACAGATCGAAATCTGAATACGTCTTTCTTCGATCCTGCCGGCGGTGGAGACCCAA
TTTTGTATCAGCACTTATTTTGATTTTGGTCCACCTGAAGTTTA

> WO71 *Drawida a. seogwipo* P1 - BLAST WO69 vs. WO71 - Identities=708/709 (99.9%), i.e., same taxon.

GGTCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTAGGTGTGTGGGCAGGTATAATTGGTGCTGGTATAAGTCTT
TTTGATTCGGATTGAATTAAGACAGCCTGGCTCATTTTGGGAAGCGATCAGCTCTATAATACTATTGTTACTGCTCATGCTTT
CGTTATAATTTTTTTCTTGTAATACCTGTATTTATTGGTGGCTTCGGAAATTGACTTCTTCCTCTTATATTAGGGGCTCCGGA
TATAGCATTCCCACGCTTAATAATCTGAGATTTTGGCTATTGCCCCAGCATTAACTCTTTAGTTTCTTCGGCAGCAGTGG
AAAAAGGTGCTGGTACTGGGTGAACAGTATACCCGCCGCTAGCAAGCAACCTGGCTCACGCCGGTCCCTCAGTTGATTTAG
CAATTTTTTCTCTTCATTTAGCAGGAGCGCTTCAATTTTGGGCTCTATTAATTTTATTACAACCTGTAATTAATATGCGATGA
TCTGGGATAAATGTAGAGCGAATTCCACTATTTGTTTGGGTGTAGTTATTACTGTAGTATTACTTTTATTATCTCTCCGGTT
TAGCGGGGAGCAATTACTATGCTTTTGACAGATCGAAATCTGAATACGTCTTTCTTCGATCCTGCCGGCGGTGGAGATCCAAT
TTTTGTATCAGCACTTATTTTGATTTTGGTCCACCTGAAGTTTA

> w1 Jeju #1 trip lumbricid tumid 9 (*D. attemsi*?) from site #6 redo of WM10 - nil result.

> w4 Re-do of WM11 *A. arx* from Sunrise Peak above beach...BLAST nothing better than <86% *Metaphire sieboldi* from Japan or *Amyntas* spp., i.e., new species to GenBank.

BLAST w4 vs. WM11 Identities=649/650 (99.9%) - OK confirms original result.

BLAST w4 vs. w5 Identities=552/657 (84%), i.e., different species.

BLAST w4 vs. w6 Identities=517/617 (84%), i.e., different species.

BLAST w4 vs. WO40 (w20) Identities=552/657 (84%), i.e., different species.

BLAST w4 vs. w21 Identities=630/655 (96.2%), i.e. close but different taxa.

AACCTTTATTTTCATTTTAGGTATCTGAGCTGGGATAATTGGAGCAGGTATGAGACTCCTTATTCGAGTTGAGCTAAGACAA
CCAGGATCATTCCTAGAGACCAACTCTATAATACTATTGTTACAGCACACGCATTTTAATAATTTTCTTTCTAGTAAT
ACCAGTATTTATTGGGGGATTGGAAACTGACTTTTACCCCTAATACTGGGGACACCAGATATAGCATTCCCACGACTAAAT
AATATGAGATTTTGATTACTCCCCCATCACTTATTTTATTAGTATCATCTGCTGCCGTGAAAAAGGGGCAGGGACAGGAT
GAACAGTATATCCACCCCTTGCAAGAAATATTGCACATGCTGGGCATCTGTAGATCTTGCAATTTTCTCCCTCACTTGGCG
GGGGCATCATCAATTCTGGGGGCGATCACTTTATCACTGTAATTAATATACGTTGATCAGGTTTACGATTAGAGCGAA
TCCCACTATTTGTCTGGGCAGTCGTAATTACTGTGGTACTACTCTCTATCCCTACCTGTGCTAGCGGGAGCCATTACAATA
CTATTAACAGATCGAAATCTAAATACATCCTTCTTCGACCCGGCCGGGGAGGGGATCCAATCCTCTACCAACACCTATTT

> w5 re-do of WM12. *Metaphire haenyeo* H sp. nov from Machair.

megaBLAST <93% Chinese herbal medicine as for other samples above.

BLASTn w5 vs. WM12 Identities=657/657 (100%) QED.

BLASTn w5 vs. W20 *M. valhalla* Identities=651/658 (98.9%), i.e., similar samples/sub-species?

AACACTATATTTTATTTTGGGTATTTGAGCTGGAATAATTGGAGCCGGTATAAGACTACTTATTCGAATTGAGCTAAGACAG
CCTGGATCATTTCTAGGAAGAGATCAACTATATAATACTAATGTAAGTCTACGCATTCGTAATAATTTTCTTTCTGGTAAT
ACCAGTATTTATTGGGGGCTTCGGAAACTGGCTACTCCCTAATACTTGGGACACCAGACATAGCTTTCCACGACTAAAT
AATATAAGTTTCTGACTTCTACCACCTCACTTATTCTACTAGTATCATCCGCGGCAGTTGAAAAGGGTGCAGGAACAGGGT
GAACAGTATATCCCCCACTAGCAAGAAATATTGCCACGCTGGACCTTCAGTAGATTTGGCAATCTTTTCACTTCATCTTGCT
GGGGCATCATCAATTTTGGGAGCTATTAATTTTCACTACTGTAATTAATATGCGGTGATCGGGACTGCGGTTAGAGCGAA

TCCCCTATTTGTGTGAGCAGTAGTAATTACCGTAGTATTACTACTATCCCTACCGGTACTAGCAGGGGCTATTACAATG
TTATTAACAGATCGAAACCTAAATACATCATTTTTTGTATCCGGCTGGTGGAGGAGATCCAATTCTATATCAACACCTATTC

> w6 “*Metaphire cf. quelparta*”? Sanbansan Temple big green damaged *Metaphire* (redo of WM13 & WO11). megaBLAST <93% Chinese herbal medicine as for other samples above...BLAST w6 vs. w5 Identities=599/618 (97%) as before for WM13, so probably different (sub-)species?

GGAGCCGGTATAAGATTACTTATTCGAATTGAGMTAAGACAACCTGGATCATTTCTAGGAAGAGATCAACTATATAATACA
ATTGTAACTGCTCACGCATTCGTAATAATTTCTTTCTGGTAATACCAGTATTTATTGGGGGTTTCGGAAACTGGCTACTCCC
CCTAATACTCGGGACACCAGACATAGCTTTCCACGACTAAATAATATAAGATTCTGACTTCTGCCACCCTCACTTATTCTAT
TGGTGTCTATCCGCCGAGTTGAAAAAGGTGCAGGAACAGGGTGGACAGTATATCCCCCTAGCAAGAAATATTGCCCACG
CTGGACCTTCAGTAGACCTGGCAATCTTTTCACTTCATCTTGCTGGGGCATCATCAATTTTGGGAGCTATTAATTTTCATCACT
ACTGTAATTAATATGCGGTGATCGGGACTGCGGTTAGAGCGAATCCCCCTATTTGTGTGAGCAGTAGTAATTACCGTAGTAT
TACTACTACTATCCCTACCGGTACTAGCAGGGGCTATTACAATATTATTAACAGATCGAAACCTAAATACATCATTTCTTTGAT
CCAGCTGGTGGAGGAGATCCAATTCTATATCAACACCTATTC

> w17 *Drawida cf. koreana* Jeju #2 June 2012 (redo of WO44).

megaBLAST <80% for unidentified Glossoscolecidae - this possibly indicating a new moniligastrid. W17 vs. “WO44”=491/647 (76%) - confirming WO44 was mixed, probably with WO45 “*Eisenia cf. japonica*” from the same locality

GACTTTATATTTTATTTTAGGTGTGTGAGCTGGTATAATTGGTGTGGAATAAGCCTACTTATTCGAATTGAGTTAAGGCAGC
CTGGGGCATTTCTAGGAAGTGATCAGCTATATAACACTATTGTTACTGCACATGCTTTTATTATAATTTTCTTTCTAGTAATG
CCTGTTTTTATTGGTGGTTTTGGAATTTGGCTGCTACCACTAATGTTAGGGGCACCAGATATAGCTTTTCCACGGTTAAACAA
TTTAAGGTTTTGACTCTTACCACCCGCACTAATTTTATTAGTGTCTTCCGAGCTGTAGAAAAGGGTGTGTTACTGGTTGAA
CTGTATACCCCCGCTAGCTAGAAACTTAGCTCATGCGGGCCCTTCTGTTGATTGGCTATTTTTTCGTTACATTTAGCTGGT
GCATCTTCCATTTTGGGCGCTATTAACCTTATCACAACCTGTTGTAATATGCGATGATCTGGAATGCATTTGGAGCGAATTCC
TTTATTTGTGTGAGGCGTAGCTATTACTGTTGATTACTTTTACTTTCTCTGCCAGTTTTAGCAGGCGCGATTACAATGCTTCT
GACAGATCGTAATCTTAACACTTCCTTTTTTCGACCCAGCTGGAGGAGGAGATCCAATTTTATACCAACATTTGTTC

> w18a Jeju #2 *Eisenia japonica* (redo of WO45) BLAST 99% *Ischnura asiatica* (a dragonfly from Japan)! Same as w10, w12, w15-16, w19, w22-23, w26, w28 and w40. All contamination from the genetics laboratory.

> w18b Jeju #2 *Eisenia japonica* (redo of WO45). BLAST 93% for *Eisenia japonica* from Japan. This 2nd try by NICEM had good result. w18b vs “WO44” Identities=651/651 (100%), i.e., sample “WO44” was mixed in the original lab with WO45 that was *E. japonica*.

AACTCTATACTTCATTCTCGGGGTTTGAGCTGGTATAGTGGGCGCCGGTATAAGACTTCTTATTCTGAATCGAACTAAGCCAA
CCGGGAGCTTTTCTAGGGAGAGACCAATTATACAACACAATTGTGACAGCACATGCATTTGTAATAATCTTCTTTCTAGTAA
TACCTGTATTTATCGGGGGTTTGGAAATTGACTTCTACCCCTTATATTAGGAGCTCCTGATATAGCCTTCCCAGCGGCTAAAT
AACATAAGATTTTGACTTTTACCCCCATCCCTTATCCTTCTAGTATCTTCTGCCGCTGTGCAAAAAGGCGCGGGGACGGGAT
GAACAGTTTATCCCCCCTATCAAGAAATCTTGCTCATGCGGGCCCTCAGTAGACCTAGCTATTTTTTCTCTACACTTAGCA
GGAGCTTCTCAATTCTGGGGCTATCAACTTTATTACCACAGTTATTAATATACGATGAAGCGGATACGTTTAGAGCGAA
TCCCCCTATTTGTATGAGCGTAGTTATCACAGTAGTACTTCTTACTCTTATCCCTACCAGTCTTGCAAGGACCCATTACCATA
TTATTAACAGACCGAAACCTTAATACCTCATTTCTTTGACCCTGCAGGAGGCGGAGACCCCTATCTTATATCAACATCTTTTT

> w20 *Metaphire valhalla* redo of WO40 BLAST <94% for some Megascoclecidae “Chinese herbal medicine” (as before for WO11, WM12, WO66).

BLASTn w20 vs. WM12 (w5) Jeju1 #5 *Metaphire* from Machair - 650/657 (99%) i.e., similar or same species.

AACCTATATTTTATTTTGGGATTTTGGAGCCGAATAATTGGAGCCGGTATAAGACTACTTATTCGAATTGAGCTAAGACAG
CCTGGATCATTTCTAGGAAGAGATCAACTATATAATACAATTGTAACCTGTCACGCATTCGTAATAATTTTCTTTCTGGTAAT
ACCAGTATTTATTGGGGGCTTCGAAACTGGCTACTCCCCCTAATACTTGGGACACCAGACATAGCTTTCCACGACTAAAC
AATATAAGTTTCTGACTTCTACCCCCCTCACTTATTCTATTAGTATCATCCGCGCAGTTGAAAAGGGTGCAGGAACAGGGT
GAACAGTATATCCCCCTAGCAAGAAATATTGCCACGCTGGACCTCAGTAGATTAGCAATCTTTTCACTTCATCTTGCT
GGGGCATCATCAATTTTGGGAGCTATTAATTTTATCACTACTGTAATTAATATGCGGTGATCGGGACTGCGGTTAGAGCGAA
TCCCCTATTTGTGTGAGCAGTAGTAATTACCGTAGTATTACTTCTACTATCCCTACCGGTACTAGCAGGAGCTATTACAATG
TTATTAACAGATCGAAACCTAAATACATCATTTTTTGTATCCGGCTGGTGGAGGAGATCCAATTCTATATCAACACCTATTC

> w21 *Amyntas aucklandis* (redo of WO41). BLAST <86% for *M. sieboldi* or *M. agrestis* from Japan. BLAST w21 vs. w20 *M. q. valhalla* Identities: 544/655 (83%), i.e., different taxa.

AACCCTTATTTTCATTTTAGGTATTTGAGCTGGGATAATTGGAGCAGGTATGAGACTCCTTATTCGAGTTGAGCTAAGACAA
CCAGGATCATTTCTAGGTAGAGACCAACTCTATAATACTATTGTTACAGCACACGCATTTTAAATAATTTTCTTTCTAGTAAT
ACCAGTATTTATTGGAGGATTTGGAAATTGACTTTTACCCTAATACTGGGGACACCAGATATAGCATTTCCACGACTAAAT
AATATGAGATTTTGATTGCTCCCCCATCACTTATTTATTAGTGTCTGCTGCTGTTGAAAAGGGGCGGGAACAGGAT
GAACAGTATATCCACCCCTTGCAAGAAATATTGCACATGCTGGGCATCTGTAGATCTTGCAATTTTCTCCCTTCACTTGGCC
GGGGCATCATCAATTTTGGGGCCATCACTTTATCACCCTGTAATTAATATACGCTGATCAGGTTTACGATTAGAACGAA
TCCCCTATTTGTGTGGGAGCTCGTAATTACTGTGGTACTGCTACTTCTATCCCTACCTGTGCTAGCGGGAGCCATTACAATA
CTATTAACAGATCGAAACCTAAATACATCCTTCTTCGATCCAGCAGGGGGCGGGGACCAATCCTCTACCAGCACCTA

> w22 *Amyntas* sp (redo of WO42). Nil - contaminated in lab.

> w23 *Amyntas simplex* (redo of WO43). Nil result - contaminated in lab.

> w24 *Drawida a. halla* H (redo of WO46). BLAST <81% for some unidentified Moniligastridae from Japan. w24 vs. WO45 "*Eisenia japonica* from Mt Halla" - 650/650 (100%) shows that WO45 was mixed with original WO45. BLAST w24 vs. WO68 *D. a. iucn* Identities =633/658 (96%), i.e. probably different taxa. w24 vs. WO69 *D. a. seogwipo* Identities=650/658 (98.8%) i.e. a close match but morphological differences indicative.

AACTTTATATTTTCATTTTAGGTGTGTGGGCAGGTATAAATTGGTGCTGGTATAAGTCTTTTGATTTCGGATTGAATTAAGACAGC
CTGGCTCATTTTGGGAAGCGATCAGCTCTATAATACTATTGTTACTGCTCATGCTTTCGTTATAATTTTTTTCTTGTAAATAC
CTGTATTTATTGGTGGCTTCGGAAATTGACTTCTTCTCTTATACTAGGGGCTCCGGATATAGCATTCCACGCTTAATAAT
CTGAGATTTTGGCTATTGCCCCAGCATTAAATTTAGTTTCTTCGGCAGCAGTGGAAGGTTGCTGGTACTGGGTGAA
CAGTATACCCACCGCTAGCAAGCAACCTGGCTCAGCCGGTCCCTCAGTTGATTAGCAATTTTTCTCTTCATTTAGCAGGA
GCGTCTTCAATTTGGGCTCAATTAATTTATTACAACGTGAATTAATATGCGATGATCTGGGATAAATGTAGAGCGAATTCC
ACTATTTGTTTGAGGTGTAGTTATTACTGTAGTATTACTTTTATTATCTCTTCCGGTTTTAGCGGGAGCAATTACTATGCTTTT
GACAGATCGAAATCTGAATACGTCTTCTTCGATCCTGCCGGTGGTGGAGACCAATTCTGTATCAGCACTTATTT

> w25 *A. corticis* Mt Halla temple (redo of WO47). megaBLAST 99-100% *A. corticis* as expected.

AACTCTATACTTCATTTTAGGAATTTGAGCCGGAATAAATTGGGGCTGGAATAAGTCTTCTTATTGGAATCGAATTAAGACAA
CCTGGGTCAATTCCTGGGAAATGACCAACTTTATAACACAATTGTAACAGCACATGCATTCTTAATAATTTTTTTCTAGTAAT
ACCAGTATTTATTGGTGGTTTTGGTAATTGACTATTACCCTTATATTGGGGACTCCAGATATAGCATTTCACGCTAAATA
ATATAAGATTCTGACTATTACCCCTCCTCATCTTATTAGTCTCTTCTGCAGCAGTGGAAGGTTGCTAGGAACAGGATG
AACAGTTTACCCCTACTAGCAAGTAACATTGCGCATGCTGGACCATCAGTAGATCTGGCAATTTCTCACTACACTTAGCA
GGGGCATCATCAATTTAGGTGCAATCAATTTTATTACTACAGTAATTAATATACGATGATCAGGCCTACGACTAGAACGAA
TTCCCTATTTGTATGAGCAGTAGTAATTACCGTAGTTCTACTACTTCTATCATTACCAGTACTAGCCGGTGTATCACAATA
CTATTAACAGATCGAAACCTTAATACATCCTTCTTGATCCAGCAGGAGGGGGAGACCAATTTTATATCAACACCTATTT

> w26 *A. micronarius* Mt Halla Temple (redo of WO48). megaBLAST 100% *A. micronarius* from Japan. This was 2nd try by NICEM.

BLAST WO1 vs. w26 Identities=655/655 (100%), i.e., =*A. micronarius* from NIBR.

AACTTTATACTTCATCTTAGGGATCTGAGCCGGAATAAATTGGTGCCGGAATAAGATTACTCATTCGAGTCGAATTAAGACAA
CCCGGACCAATTTCTAGGTAGGGATCAACTATACAATACAATTGTAACCGCACACGCATTCTTAATAATCTTCTTTCTAGTAAT
GCCAGTATTTATTGGAGGATTTGGAAATTGATTACTACCTCTAATGTTGGGAACACCAGATATAGCATTCCCACGTCTAAAT
AACATGAGATTTTGATTATTACCTCCGTCACCTTATTCTCTGTTTCTGTCAGCCGTAGAAAAAGGAGCGGGAACAGGGT
GAACAGTATACCCCTCGCTAGCAAGAAACATTGCCCATGCCGGGCCATCAGTAGACCTTGCAATTTTCTCACTACACTTAGC
AGGAGCCTCCTCAATTTTAGGGGCAATTAACCTTTATTACTACAGTAATTAACATGCGATGATCGGGACTACGCTTAGAACGA
ATTCCCTATTCGTATGGGCAGTCGTAATACCGTAGTATTACTTCTTCTATCACTACCAGTATTAGCGGGAGCCATTACAAT
ACTTCTTACAGACCGAAACCTTAACACATCGTCTTTGATCCAGCAGGTGGGGGGGACCCTATTCTATACCAGCACCTGTTT

> w27 *A. kamitai* (=maculosus) from Sambangan stream (redo of WO51). megaBLAST <90% *A. corticis/diffingens* i.e. something different! [Originally thought to be *A. gracilis*].

BLAST w27 vs. WO50 Identities=619/620 (99.9%) i.e. WO50/51 were mixed.

AACTCTATATTTTCATTTTAGGAATTTGAGCCGGAATAAATTGGAGCAGGGATAAGCCTACTTATCCGAATTGAATTAAGACAA
CCAGGATCATTCCTTGGAAAGTGATCAACTATATAACACAATTGTAACAGCACATGCATTCTTAATAATCTTTTTTCTAGTGAT
ACCAGTATTTATTGGTGGATTGGAAACTGATTATTACCCCTTATATTAGGGACTCCAGACATAGCATTCCCTCGACTAAAC
AATATGAGATTTTGAATTTGCAACCTCCTGATCTTACTAGTCTCATCTGCCGCAGTAGAAAAAGGTGCAGGGACAGGGT
GGACAGTTTACCCACCTTAGCAAGAAATATCGCACATCGGGGACCATCAGTAGATCTTGCAATTTTCTCACTACACTTAGC
AGGAGTATTCACCACTTAGCAAGAAATATTATACACAGTAATTAATATACGGTGATCTGGGCTACGACTAGAACGA
ATTCCACTATTTGTCTGAGCAGTGGAATTACCGTAGTTTACTACTTTTATCACTACCAGTACTAGCCGGAGCTATTACAAT
ACTACTAACAGATCGAAACCTTAATACATCATTCTTTGACCCAGCA

> w28 *A. tralfamadore/masatacae* from Cheyonji (redo of WO52). Contaminated in the lab.

> w28b *A. tralfamadore/masatacae* from Cheyonji (redo of WO52). megaBLAST 100% *A. robustus* from Japan, or 99% for "*A. triastriatus*" and "*A. hawayanus hawayanus*" from China. This was 2nd try from NICEM. WO2 *A. tralfamadore* vs. w28 Identities=608/647 (94%), i.e., different species.

BLAST WO35 vs. w28b Identities=657/657 (100%) i.e. =*A. masatacae* QED.

AACCTTATACTTTATCCTGGGAATTTGAGCAGGAATAAATTGGTGACAGGAATAAGACTACTTATTCGTATTGAATTAAGACAA
CCGGGATCCTTCTTGGTAGAGACCAACTATATAACAATTGTAACAGCACATGCATTCTTAATAATCTTCTTTCTAGTAAT
GCCAGTATTTATTGGTGGATTTCGGAAACTGGCTACTGCCCTAATACTTGGAAACCCAGATATGGCGTTCCCCCGATTAAAT
AACATAAGATTTTGACTACTTCCACCATCCCTAATTTTATTAGTAAGATCGGCCGCTAGAAAAAGGAGCGGGACAGGTT
GGACAGTTTACCCACCTTAGCAAGAAATATAGCACATGCCGGCCCTTCAGTAGACCTTGCAATTTTCTCACTCCATCTTGC
AGGTGCCTCATCAATTTTGGAGCTATTAACCTTTATCACACAGTAATTAACATGCGATGATCTGGGCTACGTCTAGAACGA
ATCCCACTATTTGTATGAGCAGTAGTGATCACCGTAGTACTATTATTATTATCCCTACCTGTACTGGCTGGGGCAATTACCAT
ATTACTAACGGATCGAAACCTTAATACATCATTCTTTGACCCAGCAGGAGGGGGGACCAGTTCTATACCAACACCTATTT

> w29 *A. tralfamadore/masatacae* small (redo of WO53). BLAST 93-94% for the same triumvirate as w28. w28b vs. w29 Identities=615/658 (93%) i.e., **different species.**

WO2 vs. w29 Identities=647/650 (99%) i.e. probably same as *A. tralfamadore*.

WO35 vs. w29 Identities=614/657 (93%) i.e. different to *A. masatacae*.

AACCCTATACTTTATTCTAGGAATTTGAGCAGGAATAATTGGTGCAGGAATAAGACTACTTATTCGTATTGAGTTAAGACAA
CCTGGATCCTTCCTTGGTAGGGACCAGCTATATAATACAATTGTAACAGCACATGCATTTTAAATAATCTTCTTTCTAGTAAT
GCCAGTATTTATTGGTGGATTTCGAAACTGGTTACTACCCCTAATACTTGGAAACCCAGATATGGCGTTCCCTCGATTAAAT
AACATAAGATTTTGACTACTCCCGCCATCATTAATTTTATTGGTAAGATCTGCCGCGGTAGAAAAGGGGGCTGGCACAGGTT
GAACAGTTTACCCACCTTAGCAAGAAATATAGCACATGCCGGTCTTCAGTAGACCTTGCAATTTTCTCACTTCATCTTGCA
GGTGCCTCGTCAATTCTTGGAGCTATTAACTTTATCACAACAGTAATTAACATACGATGATCTGGGTTACGTCTAGAACGAA
TCCCACTATTTGTGTGAGCAGTAGTAATCACTGTAGTACTATTACTATTGTCCCTACCTGTACTGGCAGGGGCAATTACCATA
TTACTAACAGATCGAAACCTCAATACWTCATTCTTTGATCCAGCAGGAGGSSGAGATCCAATCCTATACCAACACCTATTT

> w30 *A. tralfamadore/masatacae* paler (redo of WO54). BLAST 93-94% for the same triumvirate as W28..ditto W29 vs. w30 Identities=655/658 (99%) i.e. same or similar species.

w30 vs. WO2 Identities=650/650 (100%), i.e., same as *A. tralfamadore* QED.

w30 vs. W29 Identities=647/650 (99%), i.e., same (w29 has sampling error "SS" and "W").

AACCCTATACTTTATTCTAGGAATTTGAGCAGGAATAATTGGTGCAGGAATAAGACTACTTATTCGTATTGAGTTAAGACAA
CCTGGATCCTTCCTTGGTAGGGACCAGCTATATAATACAATTGTAACAGCACATGCATTTTAAATAATCTTCTTTCTAGTAAT
GCCAGTATTTATTGGTGGATTTCGAAACTGGTTACTACCCCTAATACTTGGAAACCCAGATATGGCGTTCCCTCGATTAAAT
AACATAAGATTTTGACTACTCCCGCCATCATTAATTTTATTGGTAAGATCTGCCGCGGTAGAAAAGGGGGCTGGCACAGGTT
GAACAGTTTACCCACCTTAGCAAGAAATATAGCACATGCCGGTCTTCAGTAGACCTTGCAATTTTCTCACTTCATCTTGCA
GGTGCCTCGTCAATTCTTGGAGCTATTAACTTTATCACAACAGTAATTAACATACGATGATCTGGGTTACGTCTAGAACGAA
TCCCACTATTTGTGTGAGCAGTAGTAATCACTGTAGTACTATTACTATTGTCCCTACCTGTACTGGCAGGGGCAATTACCATA
TTACTAACAGATCGAAACCTCAATACATCATTCTTTGATCCAGCAGGAGGGGGGAGATCCAATCCTATACCAACACCTATTT

> w31 *A. gracilis insularum* (redo of WO55). megaBLAST=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*" (AB542589.1 & 542491.1) from Japanese mainland. Therefore, my conclusion is this is a new sub-species or species comparable to parts of *A. gracilis gracilis*.

AACCCTATACTTTATTCTAGGAATTTGAGCCGGAATAATTGGAGCTGGAATAAGGCTACTTATTCGAATTGAACTCAGACAG
CCGGGATCGTTTCTGGGAAGAGATCAACTATATAATACAATTGTAACAGCTCATGCATTTGTAATAATTTTCTTTCTGGTAAT
ACCAGTATTCATTGGTGGATTGGGAACTGACTACTACCTCTAATGCTGGGTACACCAGACATAGCATTTCCGCGACTTAAT
AATATAAGATTTTGACTACTCCCCCGTCACTTATCTTACTAGTAAGATCCGCGGCCGTTGAAAAGGGGGCGGGAAGTGGAT
GAACAGTATATCCCCCGTGGCAAGAAATATTGCACATGCTGGTCCATCAGTAGATCTAGCAATCTTCTCACTACACTTGGC
AGGAGCATCATCTATTCTTGGGGCCATTAACTTTATTACAACGTGAATTAATATACGATGATCTGGATTACGGCTAGAACGA
ATCCCCCTATTTGTATGGGCCGTAGTAATTACTGTAGTACTTCTACTATTATCTCTACCTGTACTAGCCGGAGCTATTACTAT
ATTATTAACAGATCGAAACCTTAACACATCATTCTTTGATCCCGCTGGAGGTGGAGACCCTATTCTATATCAACACCTATTT

> w32 *Metaphire* cf. *agrestis* (redo of WO56) ? nil result.

> w33 *A. corticis saeseum* (redo of WO57). BLAST <99-100% *A. corticis* from Japan that has this Note: "*The organism belongs to Amyntas heteropoda, presently a junior synonym of Amyntas corticis*". This then is a allopatric and morphological sub-species that has recently diverged and is thus undetected by mitochondrial change.

w33 vs. w25 (redo of WO47) Identities=614/658 (93%) i.e., potentially different species.

w33 vs. w59 *A. corticis* from Incheon, Identities=611/654 (93%), i.e., ditto.

AACCCTATACTTCATTTTAGGAATTTGAGCCGGAATAATTGGGGCAGGAATAAGTCTTCTTATTCGAATCGAATTAAGACAA
CCAGGATCATTCTGGGAAGTGACCAACTATATAACACAATTGTAACAGCACATGCATTTTAAATAATTTTTTTCTAGTAAT
ACCAGTATTTATTGGTGGCTTTGGTAACTGATTATTACCACTTATATTAGGAACTCCAGATATAGCATTTCCACGCCTAAATA
ATATAAGATTCTGACTATTGCCTCCATCGCTCATCTATTAGTCTCTTCTGCAGCAGTAGAAAAGGGGTGCGGGAACAGGATG
AACAGTATATCCCCACTAGCAAGTAATATTGCACATGCTGGACCATCAGTAGATCTAGCAATTTTCTCACTACACTTAGCG
GGGGCATATCAATTCTAGGTGCAATCAATTTTATTACTACAGTAATTAATATACGATGATCCGGGCTACAAGTGAACGAA
TTCCCTATTTGTATGAGCAGTGGTAATCACCACAGTTTTACTACTTATATCATTACCAGTACTAGCAGGTGCTATTACAATA
CTATTAACAGATCGAAACCTTAATACATCATTCTTTGATCCTGCGGGAGGGGGGACCCAATTTTATATCAACATCTATTT

> w34 *M. cal.* (redo of WO58). mega BLAST=100% *M. californica* - OK.

AACCTTATATTTTATTCTAGGAATCTGAGCAGGGATAATCGGAGCAGGGATAAGATTACTTATTCGCATCGAACTAAGACAG
CCTGGATCATTCTTGGGAAGAGACCAACTATATAATACAATTGTGACAGCACACGCATTTCTAATAATTTTCTTTCTGGTGAT
ACCAGTATTTATTGGGGGATTGGGAACTGACTTCTCCCACTAATGTTAGGAACCCCTGACATAGCGTTCCCTCGACTAAAT
AACATAAGATTCTGACTATTGCCTCCATCGCTCATCTATTAGTCTCTTCTGCAGCAGTAGAAAAGGGGTGCGGGAACAGGATG
TGAACAGTGTACCCTCCACTAGCTAGAAACATAGCACACGCAGGTCCATCAGTAGATCTTGCAATTTTCTCACTACATTTAG
CAGGTGCCTCATCAATTTTGGGGGCCATCAATTTTATTACCCTGTGATCAACATGCGATGATCAGGCCTACGCCTAGAGCG
AATCCCACTATTCGTATGAGCCGTAGTAATCACTGTAGTACTCTTCTACTATCACTTCTGTGCTAGCGGGAGCAATTACTA

TATTATTAACGGATCGAAACCTAAATACCTCATTCTTCGACCCTGCAGGTGGGGGAGACCCAATTCTGTATCAACACCTATT
C

> w43 *Drawida a. halla* H “GM” cyst > BLAST w43 vs. w24 Identities 654/654 (100%).

> w44 *D. a. seogwipo* H “GM” glands (parasites?) > BLAST w44 vs. WO69 Identities=656/657 (99%), i.e., indicates only host tissue.

> w63 *Amyntas gracilis* Cheonji 13 June 2012 - on sheet 17th Dec. 2012.

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

BLAST w63 vs. w31 Identities=650/650 (100%). Taxa correspond.

TATATTTTATTCTAGGAATTTGAGCCGGAATAATTGGAGCTGGAATAAGGCTACTTATTCGAATTGAACTCAGACAGCCGGG
ATCGTTTCTGGGAAGAGATCAACTATATAATACAATTGTAACAGCTCATGCATTGTAAATAATTTCTTTCTGGTAATACCAG
TATTCATTGGTGGATTTGGAAACTGACTACTACCTCTAATGCTGGGTACACCAGACATAGCATTTCCGCGACTTAATAATAT
AAGATTTTGACTACTCCCCCGTCACTTATCTTACTAGTAAGATCCGCGGCCGTTGAAAAGGGGGCGGGAAGTGGATGAACA
GTATATCCCCCGCTGGCAAGAAATATTGCACATGCTGGTCCATCAGTAGATCTAGCAATCTTCTCACTACACTTGGCAGGAG
CATCATCTATTCTTGGGGCCATTAACCTTATTACAACCTGTAATTAATATACGATGATCTGGATTACGGCTAGAACGAATCCCC
CTATTTGTATGGGCCGTAGTAATTACTGTAGTACTTCTACTATTATCTCTACCTGTACTAGCCGGAGCTATTACTATATTATTA
ACAGATCGAAACCTTAACACATCATTCTTTGATCCCGCTGGAGGTGGAGACCCTATTCTATATCAACACCTA