

On a Small Collection of Earthworms from Geo-je Isl., Korea

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거제도산 육서빈모류의 분류학적 연구

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적 요

저자들은 1970년 8월에 채집된 거제도산 지렁이 총 251 개체를 정리한 결과 다음 2과 2속 9종을 얻었다. *Pheretima acincta*, *Ph. agrestis*, *Ph. geojeinsulae* n. sp., *Ph. gucheonensis* n. sp., *Ph. heteropoda*, *Ph. hilgendorfi*, *Ph. koreana* and *Ph. soulensis*; *Allolobophora caliginosa trapezoides*.

거제도의 지렁이에 관해서는 지금까지 보고된 바 없으므로 이들은 전부 거제도 미기록종이며 이들 중에는 한국 미기록종 *Ph. acincta* (Goto et Hatai, 1899)와 두개의 신종, *Ph. geojeinsulae*, *Ph. gucheonensis* 를 포함하고 있다. *Ph. geojeinsulae* 는 체장 185-210mm, 체폭 10-12mm, 체절수 125-136개, spermathecal pore 는 2쌍으로서 5/6 및 6/7에 있다. 본 종은 spermathecal pore region 과 male pore region 의 모양으로 이 속의 다른 종과는 뚜렷이 구별된다. 또 *Ph. gucheonensis* 는 일본산의 *Ph. tappensis* Ohfuchi, 1935와 비슷하나 체장이 짧으며 (70 : 100), 특히 내부의 spermatheca 의 모양이 전혀 다를 뿐 아니라 10/11, 11/12의 septa 가 있는 점으로 뚜렷이 구별된다.

INTRODUCTION

A small collection of earthworms from Geo-je Isl. was gathered on our special trip for collecting in August, 1970.

The materials obtained comprise 251 specimens which belong to two genera and nine species. All of them are reported for the first time in this area.

Among these, one species unrecorded in Korea and two species new to science will be

described in this paper.

Synonyms of the species which were previously described by authors (1969, 1970) are omitted here.

Specimens of the new species are deposited in the collection of Kyungpook National University, Taegu, Korea.

DESCRIPTION

Fam. *Megascolecidae*

Gen. *Pheretima* Kinberg, 1867

Pheretima agrestis (Goto et Hatai, 1899)

Korean name: Batt-Jileungi(밭 지렁이)

Specimens examined: Gu-cheon Valley, Geo-je Isl., (10 clitellate specimens, 7-VIII-1970, M.J. Song & K.Y. Paik); Jisim-do, Geo-je Isl., (39 clitellate specimens, 7~10-VIII-1970, M.J. Song & K.Y. Paik).

Pheretima heteropoda (Goto et Hatai, 1898)

Korean name: Byeoniseong-Jileungi(변이성 지렁이)

Specimens examined: Gu-cheon Valley, Geo-je Isl., (21 clitellate specimens, 7-VIII-1970, M.J. Song & K.Y. Paik)

Pheretima hilgendorfi (Michaelsen, 1892)

Korean name: Oe-munni-Jileungi(외무늬 지렁이)

Specimens examined: Gu-cheon Valley, Geo-je Isl., (34 clitellate specimens, 7-VIII-1970, M.J. Song & K.Y. Paik); Jisim-do, Geo-je Isl., (60 clitellate specimens, 7~10-VIII-1970, M.J. Song & K.Y. Paik)

Pheretima koreana Kobayashi, 1938

Korean name: Cham-Jileungi(참 지렁이)

Pheretima koreana Kobayashi, 1938, pp. 115-119. Ohfuchi, 1957, p.1366, fig. 3868.

Specimens examined: Jisim-do, Geo-je Isl., (7 clitellate specimens, 7~10-VIII-1970, M.J. Song & K.Y. Paik)

Pheretima soulensis Kobayashi, 1938

Korean name: Seoul-Jileungi(서울 지렁이)

Specimens examined: Jisim-do, Geo-je Isl., (44 clitellate specimens, 7~10-VIII-1970, M.J. Song & K.Y. Paik)

Pheretima acincta (Goto et Hatai, 1899)

(Figs. 1-9)

Korean name: Ankyung-Jileungi(안경 지렁이)

Perichaeta acincta Goto et Hatai, 1899, p.16.

Pheretima acincta: Ohfuchi, 1957, p.1360, fig. 3849.

External characteristics: Length, 82-155 mm, diameter, 5-6mm, at male genital region of XVIII, number of segments 71-121. Prostomium epilobous.

Color in formalin: light brown dorsally; ventrally, lighter than the former; and clitellum dark brown. First dorsal pore in 12/13. Setae present from II; 31-38/III, 46-47/V, 57-60/VIII, 54-57/XII, 63-73/XX, 3-6, between male pores, spermathecal setae 9-12/V, 10-12/VI, 11-13/VII.

Clitellum usually present but one out of eighteen is lacking, annular, extending forwards well towards 13/14 and back to XVI; setae lacking on XIV-XVI; intersegmental furrows 14/15-15/16 obliterated; sites of dorsal pores usually unrecognizable.

Male pores, ventrally on the setal line of XVIII; each pore on a large disc which is round in shape, about 2-2.4mm in diameter, moderately protuberant, nearly flat on surface, and fully occupying the whole segment and more slightly pushing 18/19 posteriorwards. The pores are small transverse slits or small prophores and are separated by 4 setae (varying from 3-6). Female pore single on ventral side of XIV.

The spermathecal openings are in three pairs in 5/6, 6/7 and 7/8, about 1/4 of the circumference ventrally apart. The openings seem to be very small wart-like protuberances from a top view, though this was not clearly seen. There are no more genital markings elsewhere.

Internal anatomy: Septa 5/6-7/8, 10/11-12/13 slightly thickened, 8/9, 9/10 probably lacking; and succeeding septa membraneous.

Gizzard in VIII-IX. Intestinal origin in XV. Intestinal caeca originating in XXVII, simple

and extending anteriorly into about XXIII, with incisions on ventral side which are teethshaped. Typhlosole present at about XXIV posteriorly, broadened and flattened from XXVII segment posteriorly, and gradually narrows towards distal part.

Heart of X asymmetrical, hearts of XI-XIII as usual, small in calibre, paired lymph glands present from XXVII posteriorly.

Testis sacs are two pairs in X and XI, filled with a compact coagulum. Anterior pair placed on anterior face of 10/11, posterior pair broadly connected or completely fused into a transverse sac, and heart of X-XI and anterior vesicles included. Seminal vesicles two pairs in XI and XII. The first pair is within the posterior testis sacs, the second pair medium-sized. Anterior pair is nearly equal or slightly smaller than the posterior one. Pseudovesicles small, one pair, cling to posterior faces of septa XII.

Ovaries usual in position. Prostates are large, in XVI, XVII-XXI, XXII; consist of two or three main lobes, each divides into small lobes. Prostatic duct is a U-shaped or question mark-shaped loop, at most 2-3mm long with muscular sheen.

Ectal limb thicker than ental limb.

Spermathecae in VI, VII and VIII. Ampulla ovoid, or slightly elongated sphere, or large sac-shaped, generally smooth on surface; ampulla duct slightly shorter than the ampulla, and is clearly distinguished from the latter. Diverticulum is either longer and slender, or slightly shorter than the main pouch, and is elongated, tubular or slightly curved or twisted, about half calibre of main duct, the ental half serving as a seminal chamber with whitish color not distinctly separated from its duct, the latter as long as, or longer than ampulla duct, joining

the latter near body wall. Measurements of one specimen: ampulla=1.9-2mm long, 1.9-2mm wide; ampulla duct=0.9mm long, 0.3mm wide seminal chamber=1.6-1.9mm long, 0.2-0.3mm wide; diverticular duct=1.1-1.4mm long, 0.1-0.2mm wide.

Specimens examined: Jisim-do, Geo-je Isl., (17 clitellate, 1 aclitellate specimens, 7~10-VIII-1970, M.J. Song & K.Y. Paik)

Distribution: Geo-je Isl. (Korea), Japan.

Pheretima geojeinsulae n. sp.

(Figs. 10-23)

Korean name: Geoje-Jileungi(거제 지렁이)

External characteristics: Length 185-210 mm, diameter, 10-12mm, at male genital region of XVIII, segments, 125-136.

Prostomium epilobous. First dorsal pore in 12/13. Color in formalin: blackish brown or chocolate dorsally; ventrally greyish pale brown; clitellum pale yellowish brown.

Setae present from II, setal number as follows: 38-50/III, 46-60/V, 62-80/VIII, 57-70/XII, 71-90/XX, between spermathecal pore setae 22-37/VI, and 27-43/VII.

Clitellum entire, in XIV-XVI, without setae and dorsal pore, intersegmental furrows obliterated. Secondary annulations developed on the segments from V, posteriorly.

Spermathecal pores are in two pairs, in 5/6-6/7, about 1/2 of body circumference apart, usually invisible, sometimes with a small transverse slit in intersegmental furrow; epidermis below each pore slightly wrinkled and more deeply pigmented than the rest. No genital papillae in this region.

Female pore single, on ventral side of XIV.

Male pores are situated on ventro-lateral side of XVIII, usually more than 1/3 of the circumference ventrally apart, each pore on a char-

acteristic genital area which is protuberant in general appearance, and nearly circular in outline; its posterior and anterior margins are quite close to the intersegmental furrows, so XVIII segment is actually slightly longer than the neighbouring segments; each area is distinctly delineated by a glandular, light-coloured, slightly elevated, circumferential band with one or more incomplete circumferential furrows;

On such a circumvallated area a C-shaped groove faces laterally and terminates anteriorly in the pore; in most cases it is formed in front of the setal line and is cut by the setal line. At the posterior end of the groove a male pore opens which is a somewhat transverse slit; between them 8 to 13 setae are planted. The region on the ventro-lateral extremities of XVII and XVIII are raised in general appearance, and nearly circular in outline, more light coloured than the rest.

Internal anatomy: Septa 5/6-7/8, 10/11-12/13 very much thickened; 8/9-9/10 lacking; 4/5, 13/14-14/15 thickened and succeeding septa slightly thickened.

Gizzard globular or barrel-shaped. Intestinal origin in XVI. Intestinal caeca simple, originating in XXVII and extending anteriorly to XXIII or XXII, with a lot of teeth-shaped incisions on ventral side. Typhlosole broadened and flattened in XXVI-XXVII, posteriorly, narrowing anteriorly, lamelliform posteriorly.

Hearts of X both present. Last hearts in XIII, but connectives to dorsal trunk in X-XI more slender than in the other two segments. The hearts of X-XI are within the testis sacs. Paired lymph glands fairly large, adherent to anterior faces of septa and dorsal vessel, present at least from XXVII posteriorly. Testis sacs of X well above nerve cord, the ventral blood

vessel between the sacs. One or both of the sacs may be vertical, reaching up to level of dorsal face of gizzard and somewhat resembling a seminal vesicle. The testis sac of XI is of a squarish to oblong shape, and anterior vesicles included. Seminal vesicles medium-sized or small. Anterior pair is slightly smaller than the posterior one. Pseudovesicles still smaller, present in XIII, but sometimes, it is considerably larger. Prostate glands usually well-developed in XVII-XVIII, XIX, with large lobules with duct which is stout and looped in a somewhat V-shape; if the glandular portion was removed slightly, the duct is looped in an S-shape. Thickness is almost equal throughout.

Spermathecae lying in VI and VII. Ampulla voluminous, generally pear-shaped or elongated oval with a narrow pointed apex, or red-pepper shaped, and is uneven on surface, especially near the region of the apex, its duct shorter than the ampulla; moderately thickened, and becoming thicker entally, not distinctly separated from the latter. Diverticulum usually shorter than main pouch (duct+ampulla), tubular, straight or slightly curved, about half of one-third calibre of main duct, the ental half serving as a seminal chamber; it is not swollen especially but distinctly separated from its ectal part by whitish color; sometimes ental part is slightly swollen to form sausage-like seminal chamber which is a whitish color; the ectal part as long as, or slightly longer than, ampulla duct, joining the latter near body wall.

Measurements of one specimen: ampulla=4-5mm long. 2-3mm wide; ampulla duct=2-3 mm long. 0.8mm wide; seminal chamber=2mm long. 0.4mm wide; diverticular duct=4mm long. 0.3mm wide.

Specimens examined: Gu-cheon Valley, Geo-

je Isl., (4 clitellate specimens, 7-VIII-1970, M. J. Song & K.Y. Paik); Jisim-do, Geo-je Isl., (10 clitellate specimens, 7-10-VIII-1970, M.J. Song & K.Y. Paik)

Diagnosis: Present species clearly differs from all the species described until now with respect to the shape of male pore region, and to the body size.

Pheretima gucheonensis n. sp.

(Figs. 24-35)

Korean name: Gucheon-Jileungi(구천 지렁이)

External characteristics: Length, 105-125 mm, diameter, 6-7mm, at male genital region of XVIII, segments, 83-101. (from Geo-je Isl.). The measurements of the body and number of the segments of worms from Mt So-paik(main land) are as follows:

Specimens	Length (mm)	Diameter (mm)	Segments
1	147	6	95
2	125	8	93
3	119	6	100
4	130	7	99
5	103	6	96
6	130	8	119
7	107	6	95
8	110	5.5	95

Prostomium epilobous. First dorsal pore in 12/13. Color in formalin: blackish brown dorsally; ventrally greyish brown; clitellum pale yellowish brown.

Setae present from II on which the circle is complete. Setal numbers of the worms are as follows: 54-60/V, 57-64/VI, 59-79/VII, 63-80/VIII and 65-82/XX.

Clitellum annular, in XIV-XVI, dorsal pores occluded, intersegmental furrows obliterated

and setae are indistinct.

Spermathecal pores are in two pairs in 6/7-7/8, each on a minute tubercle, intersegmental in position, about 1/3 of the circumference ventro-laterally apart. In the region below each pore is found from three to ten small genital papillae which are nearly circular. Furthermore, GM patches are present at midventral sites in the presetal of VII-VIII. Tubercles, one for each GM patch, are numerous (11) in the anterior patch but are few in the posterior one (5), on on specimen from Geo-je Isl.

The variations of the number in spermathecal genital papillae are as follows:

Loc.	Spec./Seg.	VII		VIII	
		R	L	R	L
Geo-je Isl.	1	3	9	4	3
	2	6	8	8	6
	3	4	6	5	5
	4	3	3	1	4
Mt. So-paik	1	5	7	5	4
	2	10	8	4	5
	3	7	5	6	6
	4	3	3	7	7
	5	8	4	5	3
	6	3	3	6	7
	7	7	6	6	7
	8	5	5	5	7

Female pore median.

Male pores situated ventro-laterally, each in a lateral circular-shaped male disc, the region medial to it wrinkled but not glandular. Paired GM patches are present in the neighborhood of the male pores medially and anteriorly close to the setal line of XVIII, which is transverse oval or oblong-shaped. Tubercles, one for each GM patch, are numerous from 11 to 19. In addition, one or two small genital papillae are

also found medially near both male pores and posteriorly close to the setal line of XVIII in some specimens from Mt. So-paik; pores are separated by 16-28 setae.

The variations of the number of genital papillae in male pore region of XVIII are as follows:

Loc.	Spec.	R.	L.
Geo-je Isl.	1	13	12
	2	12	11
	3	12	11
	4	11	11
Mt. So-paik	1	18	19
	2	12	14
	3	14	13
	4	13	13

Internal anatomy: Septa 4/5-7/8 considerably thickened; 10/11-12/13 slightly thickened; 8/9-9/10 lacking.

Gizzard is bell-shaped. Intestinal origin in XV. Intestinal caeca originating in XXVII, with five to seven secondary caeca, of which the dorsal-most one is the largest, extending anteriorly XXIV-XXIII. Typhlosole lacking or quite rudimentary and then present only from XXVII posteriorly. Slight roughenings of intestinal roof at mD are all that is recognizable.

Heart of X is asymmetrical, and cases which present both hearts of X are rare; hearts of XI-XIII are normal. Paired lymph glands present on both sides of dorsal vessel appearing in XVI, although indistinct; from caecal to anal regions, distinct with whitish color.

Testis sacs are in two pairs in X and XI. Both sacs in XI, XII are V-shaped. Seminal vesicles in XI and XII, well-developed, smooth on surface, posterior and anterior subequal in

size.

Prostate glands always well-developed, in XVI-XX, XXI, thick and expanded, whitish and smooth on surface, divided into two or three large parts and again subdivided into small pieces. Prostatic duct is a U-shaped loop, narrowed entally, with muscular sheen. Both GM glands, which are a compact and whitish mass, present corresponding to papillae outside; each gland part is rather round with a short stalk.

Spermathecae lying in VII and VIII. Ampulla fairly large, usually elongated oval, narrow entally and rounded at free end, smooth or weakly grooved; sometimes dorso-ventrally slightly flattened, and a little wrinkled when it is empty; ampulla duct stout and shorter than ampulla, and is sharply distinguished from the latter. Diverticulum is elongated with a rather long sausage-like seminal chamber, and is slightly shorter than the main pouch in most cases, although it's often slightly longer or equal to the latter; its duct is very slender, longer than ampulla duct, and is joining the latter near body wall, distinctly separated from the seminal chamber.

Measurements of one specimen: ampulla=4.5-5.5mm long, 2.5-3mm wide; ampulla duct=1.5-2mm long 0.7-1mm wide; seminal chamber=3.5-4mm long, 0.5-0.7mm wide; diverticular duct=2mm long, 0.3mm wide.

Corresponding to the external spermathecal papillae, several mushroom-like glands are present in coelom surrounding the ectal-most portion of the diverticular duct.

Specimens examined: Gu-cheon Valley, Geo-je Isl., (4 clitellate specimens, 7-VIII-1970, M. J. Song & K.Y. Paik); Mt. So-paik. (51 clitellate specimens, 19~23-VIII-1968, Y. Heo)

Diagnosis. Present species is very closely

related to *Pheretima tappensis* Ohfuchi, 1935 and clearly differs from all the species described up to now with respect to genital papillae which are found in both the spermathecal pore region and the male pore region of XVIII. This new species clearly differs from the *Ph. tappensis* with respect to body length and to the shape of the spermathecae; and the septa 10/11 to 11/12 are present.

Fam. Lumbricidae

Gen. Allolobophora Eisen, 1874

Allolobophora caliginosa trapezoides

(Anton duges, 1828)

Korean name: Galsaeg-nagsi-Jileungi

(갈색 낙지 지렁이)

Specimens examined: Jisim-do, Geo-je Isl., (5 clitellate specimens, 7~10-VIII-1970, M.J. Song & K.Y. Paik)

REFERENCES

Chen, Y., 1931. On the terrestrial Oligochaeta from Szechuan, with descriptions of some new forms. *Contr. Biol. Lab. Sci. Soc. China. Zool. Ser.* **7**(3) : 117-171.

Chen, Y., 1933. A preliminary survey of the earthworms of the lower Yangtze Valley. *Ibid.* **9**(6) : 177-269.

Chen, Y., 1935. On two new species of Oligochaeta from Amoy. *Ibid.* **11**(4) : 109-122.

Chen, Y., 1936. On the terrestrial Oligochaeta from Szechuan II. *Ibid.* **11**(8) : 269-304.

Gates, G.E., 1958. On some species of oriental earthworm Genus *Pheretima* Kinberg, 1867, with key to species reported from

Americas. *Amer. Mus. Novit.* (1888):1-33.

Goto, S. and S. Hatai, 1898. New or imperfectly known species of earthworms, No. 1. *Annot. Zool. (Jap.)* **2**(1) : 65-78.

Goto, S. and S. Hatai 1899. New or imperfectly known species of earthworms, No. 2. *Ibid.* **3**(2) : 13-23.

Hatai, S., 1930. Note on *Pheretima agrestis* (Goto et Hatai), together with the description of four new species of the genus *Pheretima*. *Sci. Rep. Tohoku Imp. Univ. Biol.* **5**(4) : 651-667.

Kobayashi, S., 1936. Earthworms from Koryo, Korea. *Ibid.* **11**(1) : 139-184, 15 figs.

Kobayashi, S., 1938. Earthworms of Korea. I. *Ibid.* **13**(2) : 89-170.

Kobayashi, S., 1941. Earthworms of Korea, II. *Ibid.* **16** : 147-156.

Ohfuchi, S., 1935. On some new species of earthworms from North-Eastern Hondo, Japan. *Ibid.* **10**(2) : 409-415. 10 figs.

Ohfuchi, S., 1937. On the species possessing four pairs of spermathecae in the Genus *Pheretima*, together with the variability of some external and internal characteristics. *Saito Ho-on Kai. Mus. Res. Bull.* (12) : 32-136.

Ohfuchi, S., 1957. Annelida, Oligochaeta. Illustrated Encyclopedia of the Fauna of Japan. *Hokuryukan, Tokyo* (Jap.). pp.1352-1369.

Song, M.J. and K.Y. Paik, 1969. Preliminary survey of the earthworms from Dagelet Isl., Korea. *Korean. J. Zool.* **12**(1) : 13-21.

Song, M.J. and K.Y. Paik, 1970. Earthworms from Chejoo-do Isl., Korea. *Ibid.* **13**(1) : 9-14.

Explanation of Figures

Pheretima acincta (Goto et Hatai, 1899)

1. Ventral view of the anterior portion of the body.
2. Ventral view of male pore region of XVIII.
3. Spermathecae, left II (VII).
4. Same, right II (VII).
5. Same, left II (VI).
6. Dorsal view of testis sacs and seminal vesicles of XII.
7. Dorsal view of seminal vesicle in XI and XII, left.
8. Prostate gland, left.
9. Intestinal caecum, left.

Pheretima geojeinsulae n. sp.

10. Dorso-lateral view of male genital region, right (XVII, XVIII and XIX).
11. Ventral view of male genital region, left (XVII, XVIII and XIX).
12. Same, left.
13. Lateral view of spermathecal pore region, left (VI, VII).
14. Dorsal view of testis sacs, seminal vesicle in XII, and pseudovesicle in XIII left.
15. Dorsal view of seminal vesicles, left (XI, XII).
16. Prostate gland, right.
17. Same, left.

18. Intestinal caecum, left.

19. Spermathecae, left I (VI).

20. Same, left II (VII).

21. Same, left I (VI).

22. Same, right II (VII).

23. Same, left II (VII).

Pheretima gucheonensis n. sp.

24. Ventral view of the anterior portion of the body.
25. Vento-lateral view of spermathecal pore region and genital papillae, right (VII, VIII), specimen from Geo-je Isl.
26. Ventral view of male pore region, right (XVIII), specimen from Mt. So-paik.
27. Vento-lateral view of male pore region, left (XVIII), specimen from Geo-je Isl.
28. Vento-lateral view of spermathecal pore region and genital papillae, left (VI/VII), specimen from Mt. So-paik.
29. Dorsal view of seminal vesicle, right (XI, XII).
30. Prostate gland and GM gland, left.
31. Spermathecae, right II (VIII).
32. Same, right I (VII).
33. Same, right II (VIII).
34. Spermathecal GM gland, left (VII, VIII).
35. Intestinal caecum, left.





