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Spirorbinae (Polychaeta, Serpulidae) from Hokkaido II[1)]

By

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(With 10 Text-figures and 9 Tables)

Most recently, two important papers on Spirorbinae have been published by Bailey (1969b) and Pillai (1970). They rearranged this group and described some new species. And we are surprised by the great degree of differentiation in this group, and the species with characteristic features were well surveyed and are recognizable as the different species, e.g. some similar species to *Laeospira militaris*, with the stable arrangement of spines on the opercular plate (*L. pseudomilitaris* Thiriot-Quiévreux 1965, *L. regaris* Bailey & Harris 1968, *L. quasimilitaris* Bailey 1970, and *L. grandis* Pillai 1970).

On the other hand, many papers have appeared about the developmental studies and larval ecology on many species of Spirorbinae (Högland 1952, de Silva 1958, 1962, Wiseley 1960, Quiévreux 1962, Gee 1963, 1967, Williams 1964, Gee & Williams 1965, and Potsward 1968). According to these results, we can easily expect the great variety of differentiations in this group, because of the probability of self-fertilization (Gee & Williams 1965) and short free-swimming stage of the larvae (Gee 1963, etc.). These facts can easily induce the isolation of the population of any species, and the populations of the species have high probability of differentiations each other. Therefore the author is convinced that more species or subspecies exist, and fully descriptions and the studies of development or cytology give the methods for the correct identifications and phylogeny. Hartman (1959, 1965) divided Spirorbinae into six genera, and many papers published after that followed her category. Bailey (1969b) and Pillai (1970) rearranged the genera or subgenera in the subfamily Spirorbinae. But these arrangements have not sufficient discussions on the phylogeny. Therefore the author follows the category in Hartman (1959) till the generic arrangements are stably established.

In Hokkaido, there are abundant colonies of several species of Spirorbinae in the tidal zone of rocky shores, in spite of poorer colonies of other Serpulidae. The author observed relative abundance of only one species, *Hydeoides ezoensis* Okuda 1934, but this species is not so many as the species belonging to Spirorbinae. A

1) Contribution No. 904 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

few individuals of *Serpula vermicularis* Linnaeus 1767 were collected in the tidal zone in Muroran. These two were all the species belonging to Serpulinae that the author has ever observed in the littoral zone from Hokkaido.

In 1971, the present author described four new species of Spirorbinae from Hokkaido. In this time, one species of *Dexiospira*, two of *Leodora* and one species of *Laeospira* are described, two are already known from Hokkaido, and two are new to science. Among the nine species, hitherto reproted from Hokkaido, only one species (*Dexiospira spirillum* Linnaeus 1767) has not yet be described by the present author, this will be treated in near future.

The tenchnique proposed by Gee (1964) for observing the arrangements of setae and uncini was employed. It was, however, found that his method is not suitable for the identification and counting of thoracic setae, especially for the long deposited materials in formalin solution. Preparations were made by the following method. 1) The body is separated into two parts, thorax and abdomen, by the fine needles. 2) The thorax is separated once again into six parts, namely right and left collar, second and third setal fascicles. 4) It is mounted with Neo-Shigaral[1]. 5) As the thoracic setal fascicle is composed of many setae and setae cannot be counted exactly, the preparation is squashed before the Neo-Shigaral becomes hard.

The author wishes to express his gratitude to Prof. Mayumi Yamada and Dr. Shôichi F. Sakagami for their advices promoting this study. He is also indebted to Prof. Yoshiteru Nakamura, Institute of Algological Research of Hokkaido University, Muroran, and Prof. Yasuhiko Kanoh, Akkeshi Marine Biological Station, Akkeshi for their kind procedures to this study at their laboratories.

Descriptions of the Species

Dexiospira nipponica Okuda 1934

(Figs. 1, 2. Tables 2, 3)

Spirorbis (Dexiospira) nipponicus Okuda 1934a, p. 242, figs. 8–11; Okuda 1937, p. 67; Uschakov 1955, p. 428, fig. 162; Chlebovitsch 1961, p. 233.
Spirorbis nipponicus Okuda 1946, p. 189, pls. 27–28.
Dexiospira alveolatus Imajima & Hartman 1964, p. 377. *non* Zachs 1933, p. 136.

Tube dextrally coiled, chalky white with three longitudinal ridges, among them middle one the strongest, outer one weak and inner one somewhat weaker than the middle one. The opening with two remarkable projections continued to the strong ridges. The tube regularly coiled, 2–2.5 mm in diameter.

Branchiae pale orange in colour, and seven in number, each slender with 10–11 pairs of branches and with long distal abranched region. Okuda (1934 a) described

1) Neo-Shigaral is the commercial name of a mount medium for the preparation of insects sold from the Shiga Konchu Fukyusha Co. Ltd. Tokyo. Its component seems to be an aquatic solution of gum arabic and sucrose.

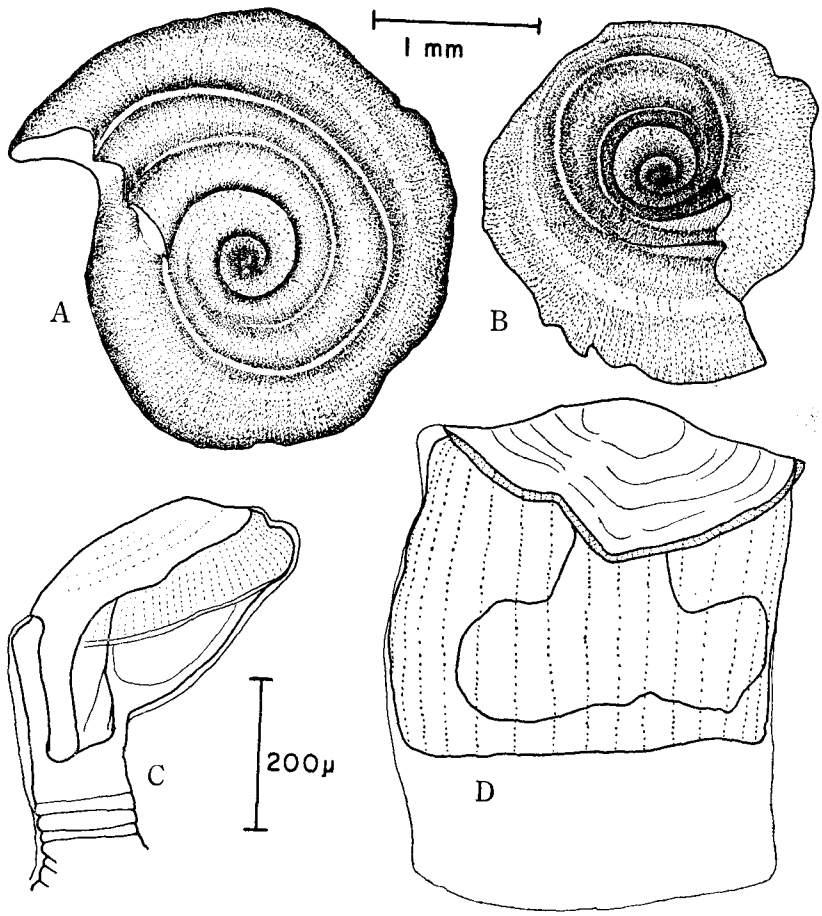


Fig. 1. *Dexiospira nipponica* Okuda. A-B. Tubes; C. Non-breeding operculum; D. Breeding operculum removed embryos.

and figured the species with 6 branchiae, but the author could not find the mature specimens with 6 branchiae.

Operculum cylindrical with a short stalk. A calcareous opercular plate with a large talon, and cylindrical skirt process with dots on its surface (Fig. 1, D). But in immature specimen, operculum conical with the calcareous plate same as above, and with the short opened skirt process (Fig. 1, C). Some part of the skirt process thickens forming a wide T-shaped talon. Skirt process gradually loses the calcium toward the base and becomes to a thin translucent membrane.

Thorax three-segmented, orange in colour without eye-spots in adult. Thoracic setae and uncini are shown in Fig. 2. and Tables 2 and 6.

Collar setae are of two kinds, the ones are winged setae, and the others are capillary setae with weak serration in distal part and slightly geniculate in the serrated part. The winged setae without fin and almost the same as bordered setae in the second and the third thoracic segments, but with shorter blade. Teeth consisting of brush-like serration. No differences between both sides in the forms of winged and capillary setae.

Second thoracic setae are of two kinds, bordered and capillary. Bordered setae with long serrated part, and capillary setae same as that in coll r fascicles. Two kinds of setae with no differences in both sides.

Third thoracic setae are of two kinds, bordered and capillary. Both kinds of setae are of the same forms as those in second thoracic fascicles.

Thoracic uncini sub-rectangular with shrot basal process, and with many teeth on the dorsal side in 6–7 longitudinal rows (Fig. 2, K). On the distal edge of dentation, there is a peculiar trifurcated large gouge. The uncini in left side (opercular side) smaller than those in right side (Left: 30–40 μ in length of dentate part, right: 45–50μ).

Abdomen consisting of about 15 setigerous segments, and pale orange in colour. Hepatic pigments yellowish brown. The numbers of setae and uncini on each segment are shown in Tables 2 and 3. Asetigerous region between the thorax and the abdominal setigerous segments wide and almost as long as the setigerous part.

Abdominal setae geniculate with serrated and much dentated blade. Undeveloped ones with short blade, and simple slender setae presented in the last setigerous segment on both sides.

Abdominal uncini sub-triangular with almost same width as the thoracic uncini. One large round-head gouge, and two small side teeth on the distal edge of uncinus. There are 11 longitudinal rows of teeth on its free edge.

Setation (Tables 2 and 3): Collar fascicles consisting of ten winged and ten capillary setae on both sides in well developed specimens, but in small (but mature) specimens with each nine winged and capillary setae. The second thoracic fascicles consist of the same numbers of capillary setae in collar fascicles, and more variable numbers of bordered setae (17–23), but the bordered setae are the same number in both sides in the same specimen. The third thoracic fascicles consist of the same nature of components as those in the second fascicles, and the same number of two kinds of setae as the second fascicles in the same specimen.

Generally speaking, there are the tendencies that the numbers of capillary setae are comparatively stable in number (9–10) throughout the first to the third thoracic segments among the specimens, but those of bordered setae are much cahngeable among the specimens.

The left (opercular) side in the second thoracic segment always has the least number of uncini, and that is about half as that of others. The right side of the second thoracic segment and the left side of the third segment have almost the same number of uncini. The right side of the third thoracic segment always has

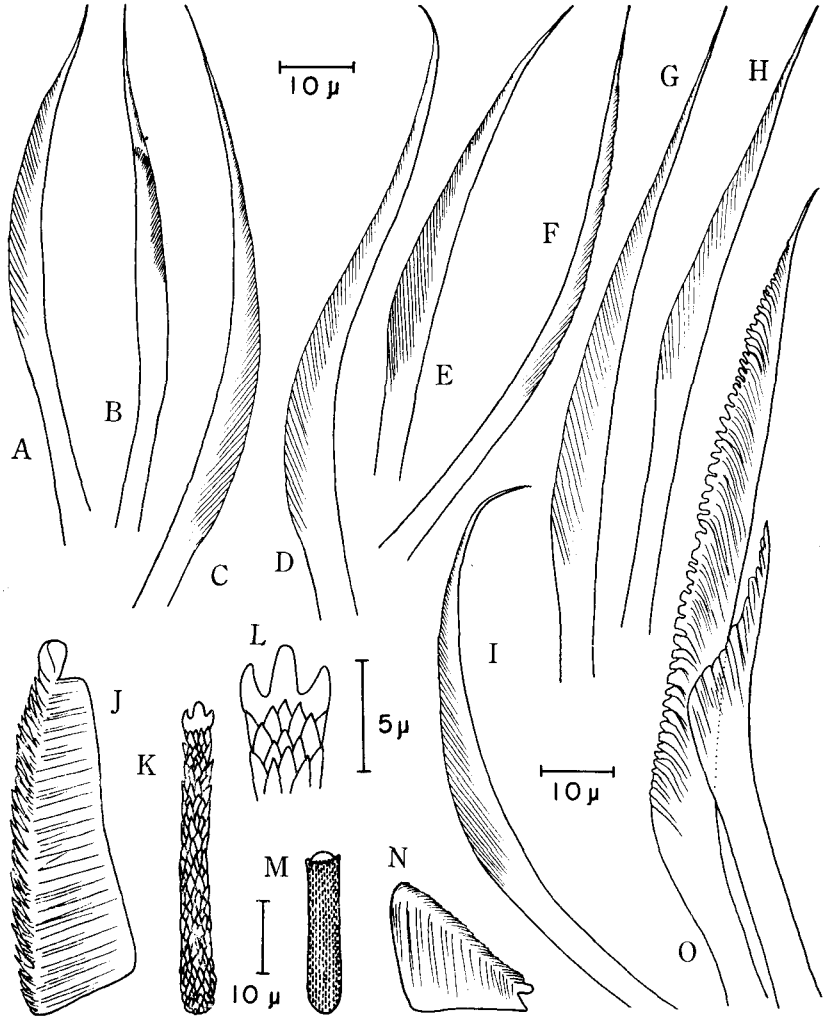


Fig. 2. *Dexiospira nipponica* Okuda. A. Right collar winged seta; B. Left collar winged seta (oblique view); C and E. Left second thoracic bordered setae; D. Right second thoracic bordered seta; F. Left third thoracic capillary seta; G and I. Left third thoracic bordered setae; H. Right third thoracic bordered seta; J. Left second thoracic uncinus; K. Left third thoracic uncinus; L. Anterior part of the same uncinus; M-N. 5th abdominal uncini; O. Abdominal geniculate setae.

the most number of uncini.

Abdominal segment with one or two geniculate setae, but sometimes there are segments with three setae. The position of the torus with maximum number of

uncini is the second segment in right, and the third or the 4th segment in left in abdomen.

Incubation in the operculum. Eggs in the operculum are greenish gray in colour, and 180–200 μ in diameter in well developed embryos.

Larvae well agree with Okuda's description in his developmental studies (1946).

Habitat: Settled on the brown alga *Sargassum confusum* Agardh in the tide pools.

Locality: Oshoro.

Remarks

This species can be identified by possessing the trifurcated gouge in the thoracic uncini among many species of *Dexiospira* (Key in Uchida 1971, p. 645).

There are some differences between this materials and Okuda's description. Okuda's materials bore six branchiae and he gave no description on the opercular talon. But there are seven branchiae and characteristic talon in this materials. The talons were clearly observed in the immature specimens, but in the specimens with fully developed embryos in their operculum, the talons were observed not so clear, especially by using passed light (the talons were more easily observed by reflected light). The abdominal uncini in this materials without distinct trifurcated gouge, but with one large gouge and two associated small teeth (Fig. 2, M).

Imajima & Hartman (1964) referred *Spirorbis* (*Dexiospira*) *nipponicus* Okuda 1934 to the synonym of *Spirorbis alveolatus* Zachs 1933. But the description of *S. alveolatus* by Zachs was imperfect and he proposed no figures, and *S. nipponicus* can not be referred to *S. alveolatus* as in Uschakov (1955, p. 428). In addition to these facts, Zachs described the tube semitranslucent, coiled up to 3 1/2 times, and with one or two longitudinal ridges. But in *D. nipponica*, the tube is opaque chalky white, coiled up to more than 4 times in adult, and with three distinct longitudinal ridges. Zachs also described that the incubation seemed to be held in the tube and *S. albeolatus* was found on *Zostera marina* or *Ptylota* sp. According to the several factors mentioned above, the author's opinion is that *D. nipponica* can not be referred to the synonym of *S. alveolatus*.

Modification of the key in Uchida 1971 (p. 645) for the genus *Dexiospira*, adding the new species described by Bailey (1969a, 1970) and Pillai (1970).

⋮

4 With third thoracic sickle-shaped setae 4–1
4 Without third thoracic sickle-shaped setae 5
4–1 Calcareous plate with one tall and outward curved projection on its ridge .....*D. unicornis*
4–1 Calcareous plate with raised rim in one side .....*D. epichysis*
4–1 With biased conical projection on calcareous plate .....*D. gnomonica*

⋮

8 Collar setae with low teeth .....*D. treadwelli*

8 Collar setae with tall teeth 8–1
8–1 Breeding operculum decreasing in diameter at distal end ....*D. ceylonica*
8–1 Breeding operculum equal in diameter in distal and basal part..*D. benhami*
⋮
11 Tube with many foramina .....*D. foraminosa*
11 Tube without foramina 11–1
11–1 Calcareous plate dome-like .....*D. tambalagamensis*
11–1 Calcareous plate flat with short frill 11–2
11–2 Talon hand-shaped .....*D. formosa*[1)]
11–2 Talon rhombic .....*D. fauveli*
⋮
15 Cross-striation weak .....*D. ainu*
15 Cross-striation strong 16
16 Without talon, tube small .....*D. parva*
16 With talon 17
17 Talon cross-shaped in mature specimen, and opposite trapezoid in immature specimen .....*D. steueri*
17 Talon triangular 18
18 Thoracic uncini with nine rows of teeth .....*D. mannarensis*
18 Thoracic uncini with four rows of teeth .....*D. corrugata*

Genus *Leodora* Saint-Joseph 1894

Spirorbinae with sinistral opaque white tube. Three thoracic setigerous segments. Collar setae with neither proximal fin nor cross-striation. Third thoracic fascicles with or without sickle-shaped setae. Incubation in tube or operculum.

Leodora coronata (Zachs 1933)

(Figs. 3, 4. Tables 1, 4)

Spirorbis coronatus Zachs 1933, p. 136.
Spirorbis (*Leodora*) *coronatus* Uschakov 1955, p. 431, fig. 164.
Leodora coronatus Imajima & Hartman 1964, p. 380, pl. 38.

Tube sinistral, opaque, white, thick with one median longitudinal ridge, and with a central cavity. Sometimes the tube has one additional weak longitudinal ridge. Diameter 4–5 mm.

Branchiae of ten filaments, each thick and almost colourless, with 16–17 pairs of branches, and with long slender terminal abranched region.

Operculum fully agrees with the descriptions by Zachs (1933), Uschakov (1955)

1) Bailey (1969b) mentioned that *D. formosa* seemed to be the synonym of *D. steueri* (Sterzinger 1909).

and Imajima & Hartman (1964). The new opercular plate is formed at the basal part of the older one, and its peculiar rim connects each other forming a trumpet-shape. After releasing the old plate, the new opercular rim sprits gradually. Sometimes the old plate lacks the central calcareous projection and the rim just before omission (Fig. 3, D). The juvenile specimens are without the peculiar rim in the operculum and much differ from the well developed ones (Fig. 3, A-C).

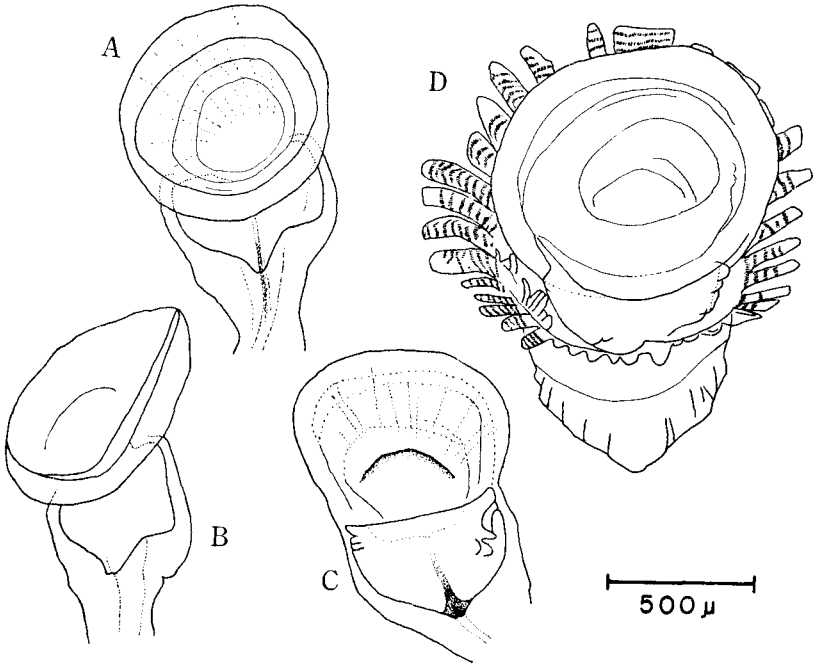


Fig. 3. *Leodora coronata* Zachs. A. Operculum in juvenile specimen in front view; B. Same in side view; C. Same in back view; D. Double opercular calcareous plates, older one losts the rim and the central plate.

Thorax three-segmented, orange in colour with no eye-spots in adult. Thoracic membrane very large attaining the 7th abdominal segment, orange in colour, and covering almost whole body when the worm is removed from the tube and coils up. Hepatic pigments violet in colour, but look dark brown through the orange bogy. Thoracic setae and uncini are shown in Fig. 4 and Table 4.

Collar setae are of three kinds, winged, bordered and capillary. Winged seta only one in each fascicle, and geniculate with broad blade (Fig. 4, C). Bordered setae with narrow blade without dentation (Fig. 4, A & D), the undeveloped bordered setae with blade broader a little (Fig. 4, F-G). Capillary setae very

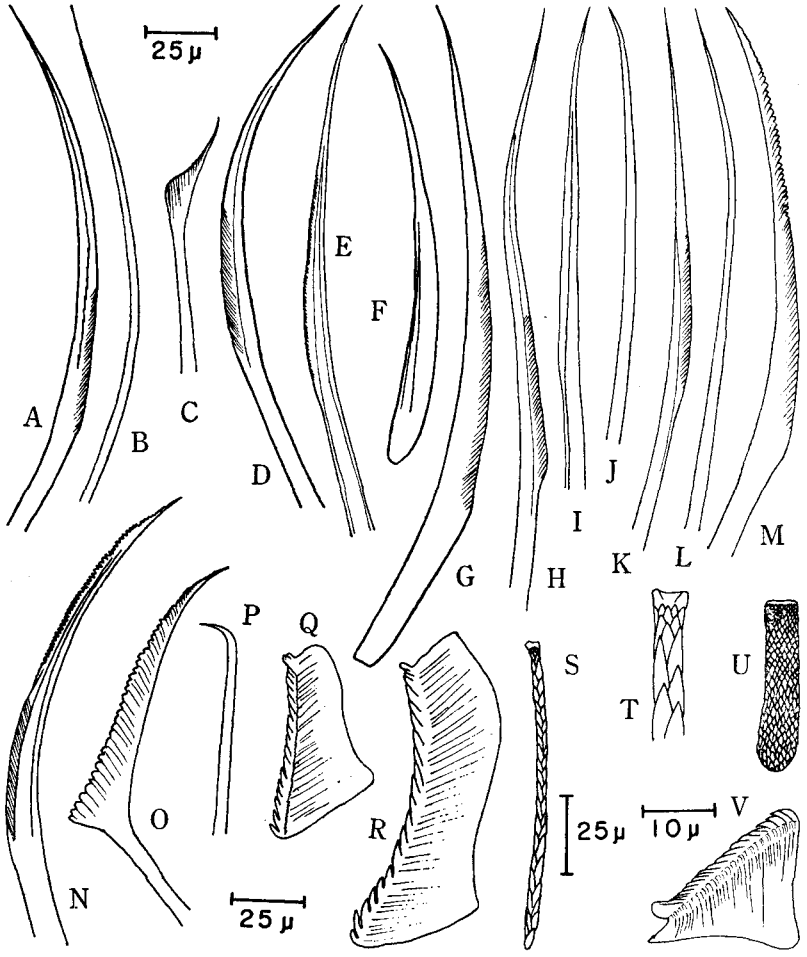


Fig. 4. *Leodora coronata* Zachs. A. Right collar bordered seta; B. Right collar capillary seta; C. Left collar winged seta; D. Left collar bordered seta; E. Left third thoracic bordered seta; F-G. Right collar non-developed bordered setae; H-I. Right second thoracic bordered setae; J. Right second thoracic capillary seta; K. Right third thoracic bordered seta; L. Right third thoracic capillary seta; M. Right third thoracic sickle-shaped seta; O. Abdominal geniculate seta; P. Abdominal hook-like seta; Q. Right third thoracic uncinus; R-S. Left second thoracic uncini; T. Anterior part of the same uncinus; U-V. Abdominal uncini.

narrow and with smooth edge (Fig. 4, B). There are no differences between both sides of collar setae.

Second thoracic setae are of two kinds, bordered and capillary. Bordered

setae same as in collar fascicles. Capillary setae with narrow limbate part more quickly tapered in distal part than that in collar fascicles.

Third thoracic setae are of three kinds, bordered, capillary and sickle-shaped. Bordered setae almost same as that in collar and the second thoracic fascicles, but with short blade (Fig. 4, E & K). Capillary setae same as that in the second thoracic segment. Sickle-shaped setae with dentation in the distal half of blade.

Thoracic uncini sub-rectangular with many teeth on their free edges in two longitudinal rows (Fig. 4, S). The thoracic setae are not different in their shape and size on both sides, but the thoracic uncini are different in size between both sides. The uncini in opercular (left) side is 90μ in length in the second and the third segments, but those in non-opercular side 65μ and 55μ each in the second and the third segment (Fig. 4, Q-R). Some small teeth arranged in the distal end. Gouge with flat edge and with two side teeth (Fig. 4, T).

Abdomen with about 30 setigerous segments, and orange in colour. Asetigerous region very wide. The numbers of setae and uncini on each segment are shown in Table 4.

Abdominal setae are of two kinds, geniculate and hook-like setae. Geniculate setae with great dentation on their free edge and the blade long triangular form (Fig. 4, O). Hook-like setae quickly curved and tapered in the distal end (Fig. 4, P).

Abdominal uncini sub-triangular with one large gouge and with eleven longitudinal rows of teeth (Fig. 4, U-V). Abdominal uncini almost as same thickness as the thoracic ones, but shorter than that in length.

Setation (Table 4): This species specifically possesses one peculiar winged geniculate seta in each collar fascicle, and the seta seemingly evolutes from a bordered seta in the same fascicle, because the collar fascicles usually consist of the same number of two kinds of setae in the most other species in Spirorbinae. Setation much symmetrical in thorax, except for the uncini which are much in opercular (left) side, and least in non-opercular side of the second thoracic segment. Each abdominal segment with one or two geniculate setae and one hook-like seta, but in posterior segments without geniculate setae. These two kinds of setae are arranged somewhat symmetrically. Abdominal uncini much in number in left (opercular) side but arranged in some symmetrically. The position of the torus with maximum number of uncini is at the third segment in the left side and 2–5th segments in the right side.

Incubation probably in the tube. Eggs in ovary pure orange in colour. Spawned eggs could not be observed. Breeding season perhaps relatively short and may be in August and September.

Habitat: On the rocks or stones in the tidal zone in rocky shore.

Locality: Oshoro, Muroran, Akkeshi.

Remarks

The species is easily identified by possessing the peculiar operculum. Imajima & Hartman (1964) described that the branchiae are eleven in number, but the all

specimens observed by the author are with ten branchiae same as the description by Zachs (1933). The distinct winged collar setae have never been described in every species belonging to the genus *Leodora*.

***Leodora multiplata* sp. nov.**

(Figs. 5–8. Tables 1, 5–6)

Tube sinistral chalky white with three distinct longitudinal ridges, among them middle one the strongest and outer one weak. Inner one somewhat weaker than the middle one. Many transversal growth lines. The opening with three remarkable projections continuing to the longitudinal ridges. Without central cavity. The tube sometimes coils irregularly, and sometimes grayish in colour due to the slime.

Branchiae of eight filaments, almost colourless or pale orange in colour, each short with 7–8 pairs of branches.

Operculum trumpet-shaped, colourless with short stalk. 3–7 calcareous plates piled each other connected by the button-hole. Only two basal plates covered with the cellular membrane, and upper plates are corpses. Calcareous plate with many radially arranged spines just under the flat plate and a short shaft with a button-hole (Fig. 6, D-E). The spines are arranged radially almost around the plate, but in the region near the shaft these are shallow and become wavy rim, and it is almost smooth in the opposite side of the most spined region. The spined region is at least over a half of all around the rim (Fig. 6, E). In the small specimens, the spined region is more wide and over three quarters of all around the rim (Fig. 6, D). The short shaft is connected with the plates each other forming a cylinder with one edge on its outer side (Fig. 6, D), and its hole is the same form as the shaft. Most basal plate has a hole and a pair of arms from the both sides of the plate for fixation of upper plate (Fig. 5, E-F, Fig. 6, A-B). The spines are not developed in the most basal plate, and those in the next plate not so numerous and not so large (Fig. 6, C), but distal to the third plate with the well developed spines and the distances between the flat plate and spined plate widened (Fig. 5, D). When the operculum possesses the embryos, it is somewhat cylindrical.

Thorax composed of three setigerous segments, orange in colour, thoracic membrane short and narrow and attaining the second abdominal segment. One pair of brown nephridia between the first and the second thoracic segments and one pair of white opaque shell glands (?) just above them are clearly observed (Fig. 5, B). Thoracic setae and uncini are shown in Figs. 7 and 8, and Tables 5 and 6.

Collar setae are of two kinds, winged and capillary. Winged setae with broad blade and with serration on almost all the region of their blade, and the serration with a weak notch on the semi-basal part of the edge same as those observed in *L. verruca* and *L. evoluta* by Bush (1904). The blade of winged setae in non-opercular side fascicle longer a little than that in opercular side fascicle. Notch of those setae in non-opercular side also a little stronger than those in opercular side (Fig.

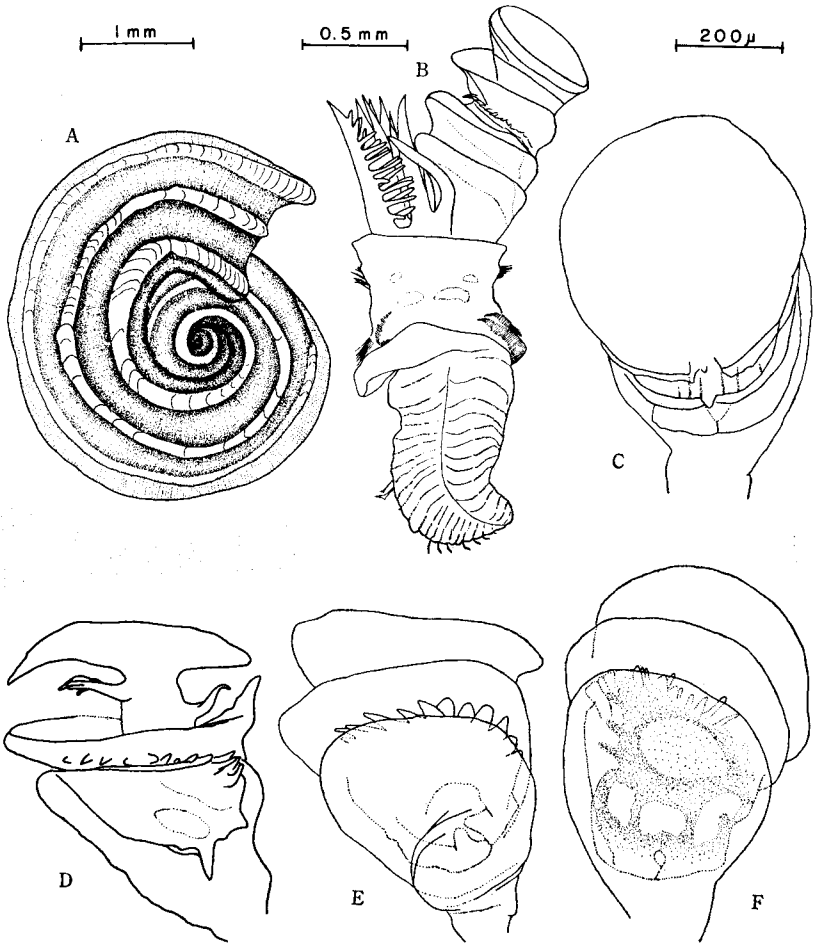


Fig. 5. *Leodora multiplata* n. sp. A. Tube; B. Worm much contracted in abdomen (branchial branches are not shown); C. Operculum with three plates in upper view; D-E. Side view of the same; F. Under view of the same.

7, B & E). Capillary setae slender and with fine dentation on their edges (Fig. 7, C & F. Fig. 8, C & F).

Second thoracic setae are of two kinds, bordered and capillary. Bordered setae with narrower blade than winged setae in collar fascicles, and the blade immediately tapered, but the blade of those setae about same as long as those of collar winged setae. The serration was observed only in the basal part. Capillary setae slender with smooth edge. The blade of bordered setae in non-opercular side a little longer than that in opercular side.

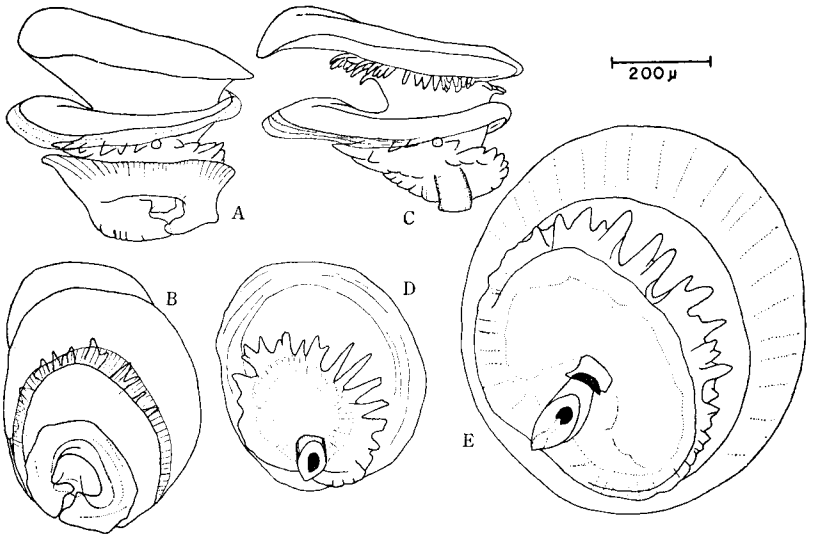


Fig. 6. *Leodora multiplata* n. sp. A. Calcareous plates in the operculum; B. The same in under view; C-D. The plates removed the posterior plate; E. Opercular plates in larger specimen.

Third thoracic setae are of three kinds same as those of the other species belonging to the genus *Leodora*. Bordered setae same as those in the second thoracic segment. Capillary setae also same as those in the second thoracic fascicles but tapered more immediately than them. Sickle-shaped setae have gradually tapered blade with dentation in distal two-thirds. Teeth low, and the blade of dentated part narrow. Non-dentated basal part of blade with serration. Small specimen with short blade and more immediately tapered than those of large ones (Fig. 7, P & S). No differences in every kinds of setae in the third segment between two sides.

Thoracic uncini sub-rectangular with many teeth in the free edge in three longitudinal rows. The gouge juts out in the distal end with two side-teeth (Fig. 7, U). Uncini in opercular side (75μ) larger than those in non-opercular side (40μ).

Abdomen pale orange in colour, consisting of 20–30 segments. Remarkable hepatic pigments were not observed. The numbers of setae and uncini on each segment are shown in Tables 5 and 6. Asetigerous region between thorax and abdominal setigerous segments very narrow (Fig. 5, B).

Abdominal setae are of two kinds, geniculate and hook-like. Geniculate setae with wide low and rectangular teeth on the free edge of semi-triangular blade (Fig. 7, V and Fig. 8, W). The first abdominal seta in non-opercular side in

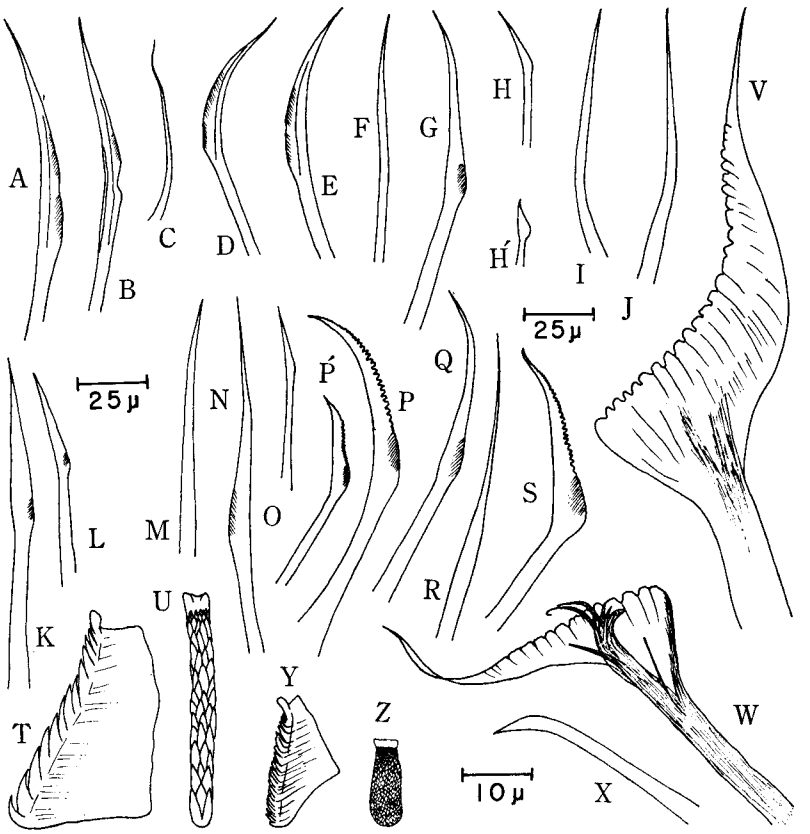


Fig. 7. *Leodora multiplata* n. sp. Young specimen with the tube 1.5–2.0 mm in diameter. A. Right collar bordered seta; B. Right collar bordered seta with a notch; C. Right collar capillary seta; D. Left collar bordered seta; E. Left collar bordered seta with a weak notch; F. Left collar capillary seta; G. Right second thoracic bordered seta; H-H'. Right second thoracic undeveloped bordered setae; I-J. Right second thoracic capillary setae; K-L. Left second thoracic bordered setae; M. Left second thoracic capillary seta; N-O. Right third thoracic bordered setae; P-P'. Right third thoracic sickle-shaped setae; Q. Left third thoracic bordered seta; R. Right third thoracic capillary seta; S. Left third thoracic sickle-shaped seta; T. Right second thoracic uncinus; U. Right third thoracic uncinus; V. Right 7th abdominal geniculate seta; W. Right first abdominal geniculate seta with the accessory fiber; X. Right 7th abdominal hook-like seta; Y-Z. Third abdominal uncini.

small specimen with a special geniculate seta, with the accessory fibers continuing to the shaft (Fig. 7, W). Hook-like setae geniculate in the distal end and immediately tapered (Fig. 7, X and Fig. 8, V).

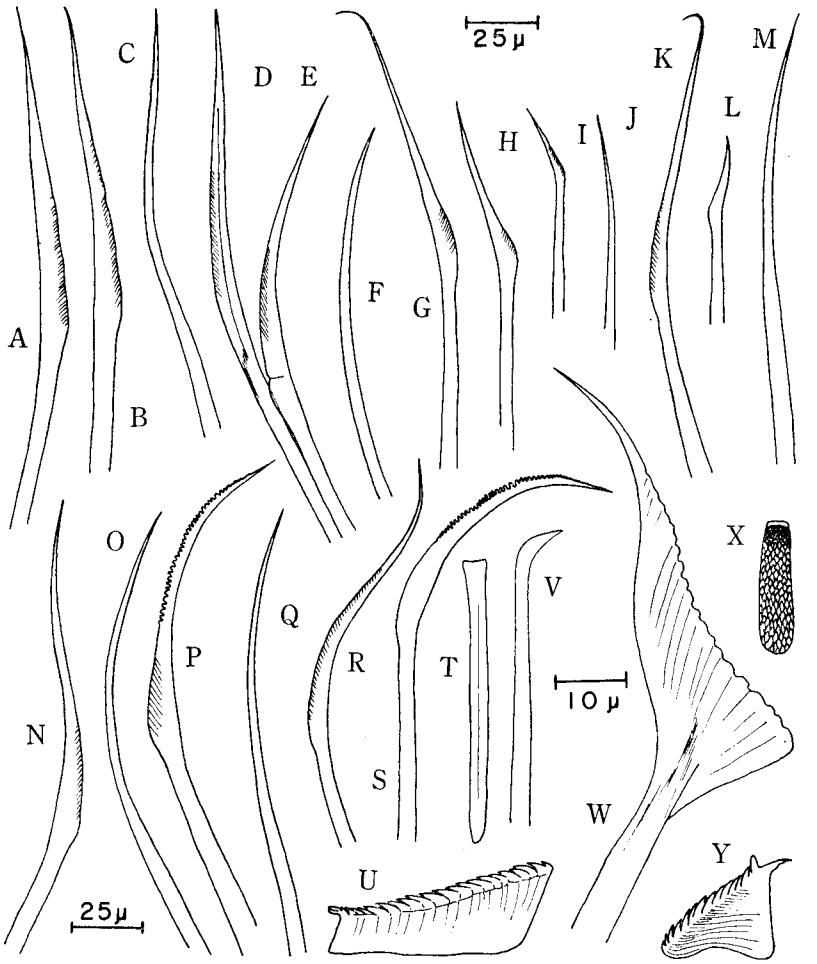


Fig. 8. *Leodora multiplata* n. sp. Well developed with the tube being 2.0–3.0 mm in diameter. A. Right collar bordered seta; B. Right collar bordered seta with a weak notch; C. Rigth collar capillary seta; D. Left collar bordered seta; E. Left collar bordered seta with a weak notch; F. Left collar capillary seta; G-I. Right second thoracic bordered setae; J. Right second thoracic capillary seta; K-L. Left second thoracic bordered setae; M. Left second thoracic capillary seta; N. Right third thoracic bordered seta; O. Right third thoracic capillary seta; P. Right third thoracic sickle-shaped seta; Q. Left third thoracic capillary seta; R. Left third thoracic bordered seta; S. Left third thoracic uncinus; T. Right third thoracic uncinus; U. Left third thoracic uncinus; V. Abdominal hook- like seta; W. 9th abdominal geniculate seta; X-Y. Abdominal uncini.

Abdominal uncini sub-triangular and about twice as thick as the thoracic uncini, with 9–10 longitudinal rows of teeth. Gouge wide with jutting edge.

Setation (Tables 5 and 6): The setation in thorax much asymmetrical. Collar fascicles of fully grown individuals with the same numbers of winged and capillary setae, but non-opercular fascicle with more setae than the opposite fascicle. Those of small ones with almost the same components in both collar fascicles. The second thoracic fascicles with many bordered setae and a few capillary setae on both sides. The components of the setae are the same in both sides in fully grown specimens, but those in small ones a little more in opercular side. The third thoracic segment with almost same components of three kinds of setae in both sides, but the bordered setae much changeable of the degree of symmetry. The order of the numbers of uncini in the thoracic segments is remarkably constant. The most uncini are in the opercular side of the third segment, next in the same side of the second segment, next in the opposite side of the same segment, and the least uncini in the same side of the third thoracic segment. Each abdominal segment with one geniculate seta and one hook-like seta, but a few posterior segments without geniculate seta. The setation including of the uncini more or less symmetrical but with much uncini in opercular side. Both sides of the first abdominal segment with the uncini only. The position of the torus with maximum number of uncini is at the third or the 4th segment in both sides.

Incubation in the operculum. Eggs in the operculum orange in colour.

Larvae could not be observed, and the breeding season is perhaps relatively short, and seems to be from late June to early July.

Habitat: On the rocks in the lower tidal zone in rocky shore.

Locality: Daikoku Isle (Akkeshi).

Remarks

The species name, *multiplata*, is due to the operculum having many piled calcareous plates.

There have been known 12 species belonging to the genus *Leodora*. These species are divided into two groups. *Leodora perrieri* (Caullery & Mesnil 1897), *L. asperata* (Bush 1904), *L. media* Pixell 1912, and *L. coronata* (Zachs 1933) have the tube incubation style. *L. multiplata* n. sp. hold the incubation in the operculum same as the other 7 species in *Leodora*. *L. multiplata* n. sp. differs from *L. laevis* (Quatrefages 1865), *L. valida* (Verrill 1874), *L. verruca* (Fabricius 1780) and *L. knightjonesi* de Silva 1965 by the presence of sickle-shaped setae. Although the remaining three species, all described by Bush (1904), *L. abnormis*, *L. arguta* and *L. evoluta*, have no information about the setae in the third thoracic segment, *L. multiplata* n. sp. is the first one with the sickl-shaped setae in the thrid thoracic segment among the species with the opercular incubation style. *L. multiplata* is easily distinguishable from *L. arguta* (Bush 1904) and *L. evoluta* (Bush 1904) by the structure of opercular plate. *L. multiplata* n. sp. possesses the plate with many spines just under the main calcareous plate.

This species is closely related to *L. abnomis* (Bush 1904)[1]. The original description by Bush (1904) was very simple and imperfect, and other descriptions were of Annenkova (1934) (only the species name), and Uschakov (1955). Uschakov described only the distinctive point between *L. abnormis* and *L. varida* (Verrill), and redescribed the same figures of Bush (1904). But *L. multiplata* n. sp. differs from *L. abnormis* in the following points. 1) Tube not coiled upward, and opening not risen up in *L. multiplata*. 2) Tube with three distinct longitudinal ridges in *L. multiplata* but *L. abnormis* without any ridges (Bush 1904, p. 260). 3) The operculum with three plates in *L. abnormis*, but with 3–7 plates in *L. multiplata*. 4) The calcareous plate with the spines more than a half region of all around the rim in *L. multiplata*, but about a quarter in *L. abnormis*. 5) The calcareous plate of basal position with a pair of arms near from the both sides of the plate and dully bidentate in distal, and a short shaft with a button-hole in *L. multiplata*, but *L. abnormis* without such structures. 6) the collar setae in *L. abnormis* with rather steeply widened blade and without notch on the blade (Bush 1904, Pl. 39, Fig. 35), but those in *L. multiplata* with gradually widened blade and with a notch on the blade.

Key to species in the genus *Leodora*

1 Tube incubation 2
1 Opercular incubation 6
2 Operculum with coronal process..... *L. coronata*
2 Operculum without coronal process 3
3 Some collar setae with a weak notch 4
3 Collar setae with smooth blade 5
4 Talon with large wing-like expansions on both sides ..... ?*L. media*[2]
4 Talon massive with bifid end ..... ?*L. bidentata*[2]
5 Talon pen-shaped ..... *L. perrieri*
5 Talon ax-shaped..... *L. asperata*
6 Some of collar setae with shallow posterior notch 7
6 Collar setae with slender blade 8
7 Tube with one or two longitudinal ridges, operculum with a wide talon ..... *L. verruca*
7 Tube without longitudinal ridges, operculum with a long narrow bifid talon ..... *L. evoluta*
8 Opercular plate with many spines..... 9
8 Opercular plate without spines 10

1) *Spirorbis* (*Leodora*) *abnormis* in Chlebovitsch (1961) was described imperfectly. The figure shows the operculum without the spined calcareous plates. It seems to the author that his material is not *L. abnormis* and is similar to *L. perieri*.

2) *Spirorbis bidentatus* Bailey & Harris 1968 was refered to *Laeospira* (*Spirorbis* (*Spirorbis*) *bidentatus*) by Bailey 1969b. This species and *Spirorbis* (*Laeospira*) *medius* Pixell 1912 seem to be situated between *Leodora* and *Laeospira*, but nearer to *Leodora* by the reason that the collar setae with the fine serrated wing in the same degree as the blade.

Table 1. Several characters of species

Species	Tube	Tentacle	Operculum	Collar setae	Second setae
abnormis (Bush 1904)	Smooth (ridges in Chlebovitsch).	?	3 plates, with spines.	Finely serrated Blades.	
arguta (Bush 1904)	One ridge, central cavity, D=1–1.5 mm.	Many	Trumpet-shaped with long talon.	Simple tapered blades.	
asperata (Bush 1904)	Large, with growth lines, weak 1–3 ridges, mouth rising upward.	?	Flattened, cup-shaped plate with short stalk, ax-shaped talon.	Long narrow, tapered, finely serrated, blades.	
bidentata (Bailey & Harris 1968)	D=1–1.5 mm, 3 ridges, coiled upwards.	?	Talon massive, conical, bifid.	Winged setae with fine serrated proximal fin, capillary setae.	Bordered.
coronata (Zachs 1933)	D= 4–5 mm, one ridge.	10	Corona-like rime.	Bordered with fine serrated blades, smooth capillary setae.	
evoluta (Bush 1904)	Smooth.	?9	Long, with spreading talon.	Slender, long rounded at the base, some with weak notch.	?
knightjonesi de Silva 1965	D=1.5 mm, 3 ridges.	?	Conical to cylindrical, 2–3 plates.	Simple serrated capillary.	Bordered
laevis (Quatrefages 1865)	D=1.3 mm, smooth (Bush) or 3ridges (Pixell).	4	Cylindrical.	Simple blades.	
media (Pixell 1912)	D=2 mm, thick, weak 1–3 redges.	14	Talon with large wing-like expansions on both sides.	With shallow notch.	Blades.
multiplata n. sp.	D=3 mm, 3 longitudinal ridges.	8	3–7 plates, each with spined plates.	Bordered, some with weak notch, capillary.	Bordered, capillary.
perrieri Caullery & Mesnil 1897	D=1–2.5 mm, 1 ridge.	?	4 plates, pen-shaped talon.	Simple limbate.	

in the genus *Leodora*.

Third setae	Thoracic uncini	Abdominal		Incubation	Larval glands	Substratum
		setae	uncini			
	?	?	?	Operculum.	1	Rock.
	Narrow.	?	?	Operculum.	?	Red algae.
Bordered, fringed (=sickle shaped).	?	Geniculate tapered graduarly, hooks.	?	Tube.	?	Rock, shell, *Crucigera* tube.
Sickle-shaped.	7 rows, flat gouge, 25μ.	Capillary, geniculate with short blade and round teeth.	7 rows, 13μ.	Tube ?	?	Stone, rock.
Bordered, capillary, sickle-shaped.	2 rows 55–90μ.	Geniculate with short blade and round teeth, hooks.	11 rows, 25μ.	Tube ?	?	Rock.
?	?	?	?	Operculum ?	?	*Sipho* shell.
setae.	40μ.	Geniculate with long blade as in *Dexiospira*.	?	Operculum.	?	Dead coral.
	?	Geniculate with rather long blade.	?	Operculum.	?	Sabellid tube, *Cidaris*.
Blades, sickle-shaped.	?	Geniculate.	?	Tube.	?	?
Bordered, capillary, sickle-shaped.	3 rows, 40-75μ.	Geniculate with short blade and round teeth, hooks.	9–10 rows, 20μ.	Operculum.	?	Rock.
Sickle-shaped.	32–47μ.	?	?	Tube.	?	*Echinus margaritaceus*, *Goniocidaris*

Table 1.

Species	Tube	Tentacle	Operculum	Collar setae	Second setae
varida (Verrill 1874)	D<3 mm, smooth, coiled upwards.	13–15	Large triangular talon.	Some with weak notch.	Simple blade.
verruca (Fabricius 1780)	D=2.5–3.5 mm, small central cavity, 1–2 ridges.	<12	Wide large triangular talon.	Some with weak notch.	?

9 Tube with three distinct longitudinal ridges.....*L. multiplata* n. sp.
9 Tube without longitudinal ridges .....*L. abnormis*
10 Tube with distinct longitudinal ridges 11
10 Tube without ridges 12
11 Tube with one median longitudinal ridge, opercular stalk long and slender .....*L. arguta*
11 Tube with three longitudinal ridges, opercular stalk bulky ....*L. knightjonesi*
12 Abdominal geniculate setae rather same as the collar setae of *Dexiospira spirillum*.....*L. valida*
12 Abdominal geniculate setae rather same as sickle-shaped setae ....*L. laevis*

Laeospira rosepigmentata sp. nov.

(Figs. 9, 10. Tables 7–9)

Tube sinistral, opaque white with three distinct longitudinal ridges, which sometimes discontinuous in some parts (Fig. 9, B). Among them, median ridge the strongest, and its projection to the opening of the tube well developed. 2–2.5 mm in diameter.

Branchiae seven in number, orange in colour, each thick and short with 8–9 pairs of branches and with rather short abranched region.

Operculum bean-shaped rather than cylindrical, with a weakely bilobed dome-like calcareous plate which is sharrow in one side (Fig. 9, D). Stalk very short, orange in colour. Operculum colourless, but calcareous plate semi-opaque. Embryos in operculum reddish brown. Operculum in non-breeding season trumpet-shaped, with a cup-shaped calcareous plate. Under the plate, there is a wide part which is somewhat flat dorso-verntraly with some wrinkles (Fig. 9, E-F). This part is thought to be used for the brood-pouch in breeding season.

Thorax composed of three setigerous segments, orange in colour, with many red and white pigments on almost two thirds region of the ventral surface. So that the region looks pink in colour. The pigmented region is more clear when the materials

(continued)

Third setae	Thoracic uncini	Abdominal		Incubation	Larval glands	Substratum
		setae	uncini			
Simple blades, sickle-shaped.	?	Geniculate as the collar setae in *D. spirillum.*	?	Operculum.	?	?
?	?	Geniculate, hooks.	?	Operculum, tube ? (in Fauvel 1914).	?	*Nothria* sp. *Chlamys iskandicus* *Neptunea* sp.

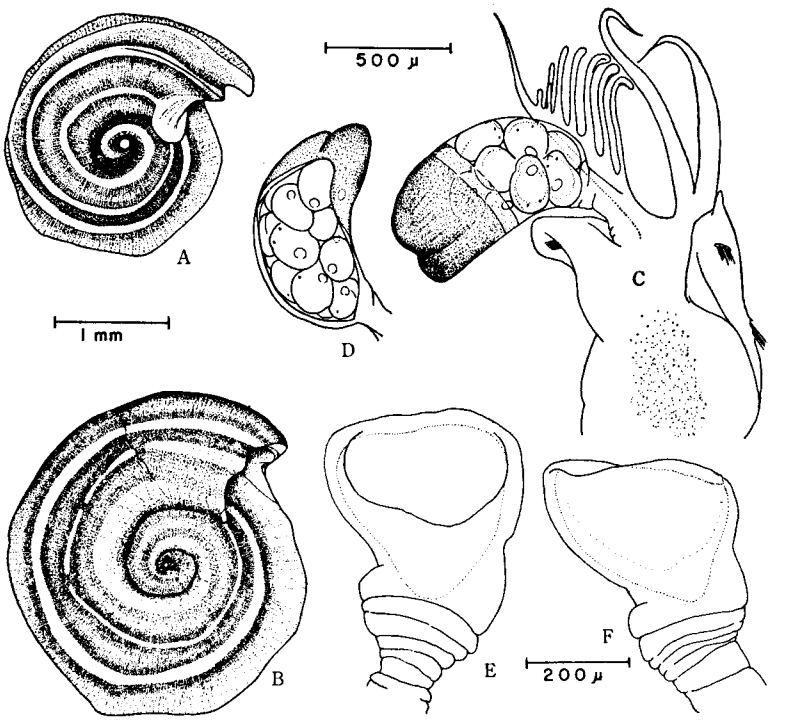


Fig. 9. *Laeospira rosepigmentata* n. sp. A-B. Tubes; C. Anterior part of the worm (almost every branchiae are not shown, and dotations at thorax are shown pink pigments); D. Operculum of oposite side to that in C.; E-F. Non-breeding opercula.

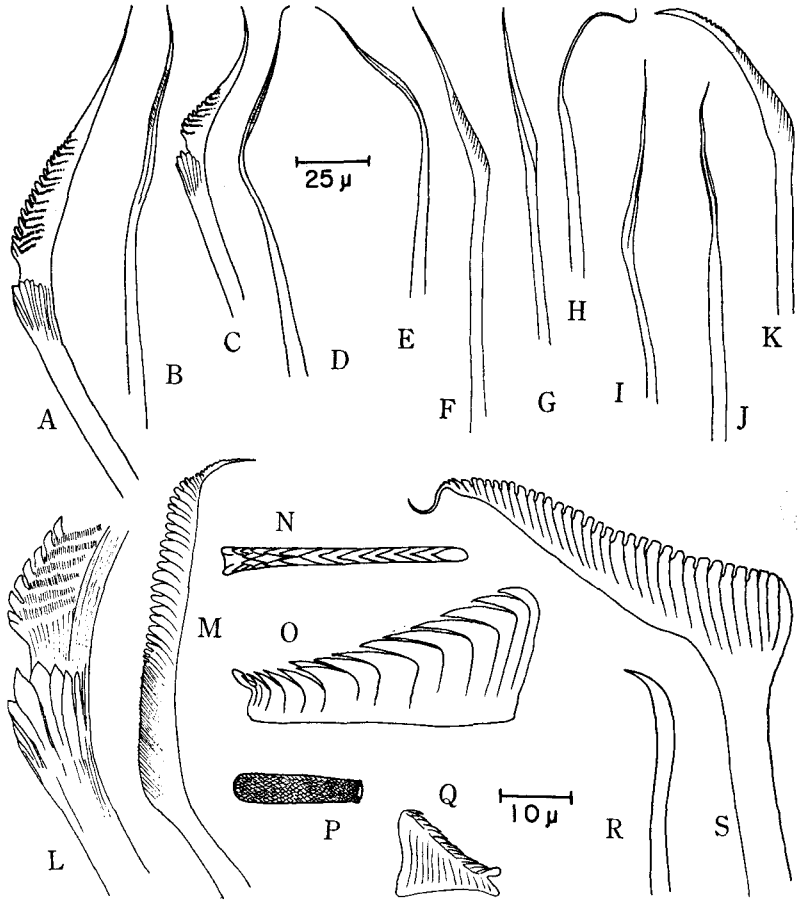


Fig. 10. *Laeospira rosepigmentata* n. sp. A. Right collar winged seta; B. Right collar capillary seta; C. Left collar winged seta; D-E. Left collar capillary setae; F-G. Left second thoracic capillary setae; H. Left second thoracic capillary seta; I. Right third thoracic bordered seta; J. Right third thoracic capillary seta; K. Right third thoracic sickle-shaped seta (oblique view); L. Wing part of right collar winged seta; M. Right third thoracic sickle-shaped seta; N-O. Right third thoracic uncini; P-Q. Abdominal uncini from middle part of abdomen; R. Abdominal hook-like seta from the last abdominal segment; S. Abdominal geniculate seta.

are removed to the formalin solution. Thoracic setae and uncini are shown in Fig. 10 and Tables 7–9.

Collar setae are of two kinds, winged and capillary. Winged setae with large dentation on its basal to middle part of the blade, and with remarkable cross-

striation. Its fin is much distinct, with about 7–10 teeth. Capillary setae slender tapered with merely narrow blades on its both sides. The winged setae different in size from each side, the blade of that on the right (non-opercular) side twice as long as that on the left side (Fig. 10, A & C). Capillary setae not different on both sides (Fig. 10, B, D-E).

Second thoracic setae are of two kinds, bordered and capillary. Bordered setae with long slender blade having fine serration, and no differences on both sides (Fig. 10, F-G, I). Capillary setae almost same as in collar fascicles, but the blades narrower (Fig. 9, H & J).

Third thoracic setae are of three kinds, bordered, capillary and sickle-shaped. The bordered setae and capillary setae are the same as that in the second thoracic fascicles. Sickle-shaped setae with same widened blade and with dentation of round-head teeth on distal half of the free edge (Fig. 10, K, M). All three kinds of setae are not different between two sides.

Thoracic uncini sub-rectangular, 30–40μ in length, with one or partly two rows of teeth on the free edge. Anterior teeth in 3—4 rows, and the last second frequently with two teeth. The width is very small (2μ) and the arrangement of the teeth are difficult to observe. Gouge with flat edge and two side teeth same as in the species belonging to the genera *Laeospira* and *Leodora*.

Abdomen orange in colour except for the brown ovary and the brown hepatic pigments, with short asetigerous region and 12–20 setigerous segments. The numbers of setae and uncini on each segment are shown in Tables 7–9.

Abdominal setae geniculate with rather tapered blade with rectangular large teeth on all the part of the free edge (Fig. 10, S). Last one or two segments with a hook tapered and geniculate on the distal part (Fig. 10, R).

Abdominal uncini sub-triangular and almost twice as thick as that in thorax, with about 12 longitudinal rows of teeth on its free edge. Gouge same structure as that in thoracic uncini.

Setation (Tables 7–9): In the collar fascicles there are 5–7 winged setae on both sides and almost same number of capillary setae. The weak tendency to possess much setae in right (non-opercular) side is present (Table 8). The second fascicles with 5 capillary and 7–8 bordered setae. There are almost same number of capillary setae and sickle-shaped setae (4 or 5) in the third thoracic segment, and two bordered setae. Thoracic uncini much variable in number, but usually there are most uncini in the left side of the third thoracic semgent, and other three rows almost same number of uncini. The setation in abdomen is very characteristic, almost all segments with one or two geniculate setae and only posterior 2 or 3 segments with a hook-like setae. The position of the torus with maximum number of uncini is around the middle segments (7–11th segments), much unlike to many other species in Spirorbinae in which the position is in an anterior segment.

Incubation in the operculum. Embryos in the operculum reddish brown with $170\times140\times140\mu$ just before hatching.

Larvae pale orange in colour, with brown hepatic pigments, one white opaque

larval gland, and two pairs of red eye-spots, anterior ones very small. Larvae just hatched out $240\times120\times120\mu$ and the larval gland is in the thorax and of ellipse-form with $100\times50\times50\mu$. There is a large groove on the dorsal side between thorax and abdomen.

Habitat: On the rocks or stones in lower tidal zone in rocky shore. Breeding season from May onward.

Locality: Oshoro, Muroran, Akkeshi (Daikoku Isle).

Remarks

The species name, *rosepigmentata*, is due to the pink pigments on the ventral surface in the thorax.

Uchida (1971, p. 650) enumerated eleven species of *Laeospira* with opercular incubation which have the winged collar setae with the cross-striation. In addition to them two species have recently described, *Spirorbis* (*Pileolaria*) *quasimilitaris* Bailey 1970 and *Pileolaria grandis* Pillai 1970. Among these 13 species, *L. militaris* (Claparède 1870), *L. papillata* Pixell 1913, *L. psudomilitaris* Thiliot-Quiéverux 1965, *L. regaris* (Bailey & Harris 1968), *L. qusaimilitaris* (Bailey 1970), and *L. grandis* (Pillai 1970) have the similar opercular plate. The calcareous plate has many papilla or spines on its upper surface or ridge in the six species above mentioned.

L. berkeleyana Rioja 1943 and *L. helenpixelli* Rioja 1943 are easily distinguishable from *L. rosepigmentata* n. sp. by possessing the remarkable frill around the edge of the operculum.

Three species, *L. langerhansi* Caullery & Mesnil 1897, *L. tuberculata* (Bailey & Harris 1968) and *L. clava* (Harris 1968), resemble each other, and all have the cup-shaped calcarous plate, especially a long stick-like talon in *L. clava*. Although the operculum of these three species is similar to that of non-breeding specimens of *L. rosepigmentata* n. sp., these species may be the non-breeding forms of other certain species, especially *L. clava* Harris 1968a from Naples has much possibility of the synonym of *L. mörchi* in Harris (1968a) which was referred to *L. heteropoma* Zibrowius 1968 by Zibrowius (1969). On the other hand *L. langerhansi* Caullery & Mesnil 1897 has less possibility of the non-breeding specimen of other species, because Caullery and Mesnil (1897) clearly described the incubation style of *L. langerhansi* (the incubation is held in the operculum), so that they observed the breeding specimens. The calcareous plate with much foraminated in *L. langerhansi* differes from that of other similar species.

We have still two species, *L. mörchi* Levinsen 1884, and *L. heteropoma* Zibrowius 1968, which resemble this new species, *L. heteropoma* is destitute of the cross-striation in the collar winged setae in the original figure (Zibrowius 1968, Pl. 11, Fig. 10), but it seems that the winged setae of *L. heteropoma* have cross-striation, and he did not write it in his figure. Because the winged seta of *L. militaris* which has the most remarkable cross-striation in these group of *Laeospira*, has no sign of cross-striation in Zibrowius' description (Pl. 12, Fig. 3). Another reason is that he referred *L. mörchi* in Harris 1968a to the synonym of *L. heteropoma*,

and Harris' *L. mörchi* has the clearly cross-striated winged collar setae (Harris 1968a, Fig. 10d). *L. rosepigmentata* n. sp. differs from *L. heteropoma* in the following points: 1) Tube smaller than 1mm in diameter in *L. heteropoma* but 2–2.5mm in *L. rosepigmentata*. 2) Eggs red in *L. heteropoma* but brown in *L. rosepigmentata*. 3) Branchiae consisting of 8 filaments in *L. heteropoma* (7 in *L. rosepigmentata*). 4) Non-breeding operculum with long stick-like talon in *L. heteropoma*. 5) Breeding operculum 250–300×200μ (400×250μ in Harris 1968a) with a pointed calcareous plate in *L. heteropoma*, but almost twice as large (800×400μ) with bilobed plate in *L. rosepigmentata*. 6) Asetigerous region wide in *L. heteropoma*. 7) Thoracic uncini with 2 and 3 longitudinal rows of teeth in *L. heteropoma*, but one and sometimes two rows in *L. rosepimgentata*.

L. mörchi Levinsen 1884 was described by several authors (Caullery & Mesnil 1897, Bush 1904, Pixell 1912, Berkeley 1930, Rioja 1942, 1963). But all differ in some respects each other as discussed by Harris (1968a, p. 203). The original description by Levinsen (1884) was imperfect, and with no figures of operculum. The collar winged setae of *L. rosepigmentata* with fin of large teeth, and some distance from the blade. The tips of teeth in the fin down against the shaft (Fig. 10, L) to the opposite side of the free edge. *L. rosepigmentata* has no central cavity, but *L. mörchi* has complex surface and one ridge, and has the central cavity. The descriptions by Caullery & Mesnil (1897) and Berkeley (1930) are the simplest. Rioja's (1942) materials with one median ridge in the tube, and with the rounded frill on the edge of the operculum. *L. rosepigmentata* n. sp. is most related to *L. mörchi* in Bush (1904, Pl. 44, Fig. 20, 21) and Pixell (1912, p. 801). But Bush's description shows the smooth tube and the central cavity. The teeth of the fin on collar winged setae are almost in parallel with the blade in Bush's description. The collar winged setae by Pixell have no cross-stration, and the tube has smooth surface standing erect in its opening part. The branchiae consist of 8 filaments.

L. rosepigmentata differs from all the other species of the genus by having the pink pigments on the ventral surface of thorax. Such phenomenon have never been known in any species of Spirorbinae except for *L. pseudomilitaris* Thiriot-Quiéveux 1965.[1)]

The setation in the abdomen of this species is much peculiar than the other species in Spirorbinae. The setation of the abdomen was described in some species (Gee 1964, Harris 1968a, 1968b, Bailey 1969, and Uchida 1971). According to these results the same tendency was observed in some species in *Laeospira* (*L. cuneata* in Gee 1964, *L. clava*, *L. militaris*, *L. mörchi* in Harris 1968a, and *L. regaris*, *L. infundibulum*, *L. pseudomilitaris* in Bailey 1969). In these species in maximum number of uncini is found in a more posterior segment (*L. granulata* in Gee 1964 and *L. berkeleyana* in Harris 1968a). The position of the torus with maximum number of uncini is around the middle segments and same number of uncini on both sides in *L. rosepigmentata* n. sp. These facts were observed only in

1) According to her description (1965), the pink colouration is due to the pigments inside of the body surface.

L. cuneata, but this species has the tube incubation style. In *L. heteropoma* (Harris 1968a as *L. mörchi*) and *L. clava* Harris 1968a which are rather related species this species in the morphology of the operculum and setae, the position is in a more posterior (2/3) segment.

The polymorphism of opercula in one species has been described by some authors (Zibrowius 1967, 1968, Bailey & Harris 1968). Although the species with opercular incubation possess different opercula in breeding and non-breeding season as mentioned above, the description must be given about the non-breeding operculum together with the breeding one.

Modification of the key in Uchida (1971) for the genus *Laeospira* adding the new species described by Pillai (1970) and Bailey (1970).

⋮

7 Abdominal geniculate setae with a row of teeth at the top of the stalk ..... *L. heteropoma*
7 Abdominal geniculate setae without teeth at the top of the stalk.... 7–1
7–1 Thorax with pink pigments ..... *L. rosepigmentata* n. sp.
7–1 Thorax without pink pigments ..... *L. mörchi*

⋮

9 Spines on the upper plate 9–1
9 Spines on the rim of operculum ..... *L. papillata*
9–1 Papillated edge conspicuous ..... *L. militaris*
9–1 Spines few and papillated edge disappeared 9–2
9–2 Tube spiral, normally with 3 weak longitutinal ridges .. *L. quasimilitaris*
9–2 Tube straightened out with no longitudinal ridge ..... *L. grandis*

⋮

14 Without talon 14–1
14 With talon 15
14–1 With pitted operculum ..... *L. gelasinifera*
14–1 Without pitted operculum ..... *L. nordenskoildi*

⋮

The following tables illustrate the distribution of setae and uncini in each segment of the four species described here. The types of setae are denoted by the column heading as follows: Wgd. – winged setae, Cap. – capillary setae, Bdd. —bordered setae, Skl. – sickle-shaped setae, Unc. – uncini, and Gen. – geniculate abdominal setae. The numbers in parentheses refer to length of thoracic uncini in micra.

Table 2. *Dexiospira nipponica* Okuda 1934

	Seg.	Left					Right				
		Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	—	10	10	—	—	—	10	10	—	—
	2	—	10	23	—	28	—	10	23	—	51
	3	—	10	23	—	52	—	10	23	—	60
		Gen.		Unc.			Gen.		Unc.		
Abdomen	1	—		—			2		21		
	2	2		—			1		24		
	3	2		22			1		21		
	4	2		19			2		18		
	5	1		16			1		15		
	6	2		10			2		11		
	7	1		9			2		9		
	8	2		8			1		7		
	9	1		7			1		7		
	10	2		6			2		6		
	11	1		6			1		5		
	12	1		5			1		5		
	13	1		5			1		5		
	14	—		4			1		3		
	15	—		4			—		3		

Table 3. *Dexiospira nipponica* Okuda 1934

	Seg.	Left					Right				
		Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	—	9	9	—	—	—	9	9	—	—
	2	—	9	18	—	25	—	9	18	—	53
	3	—	9	18	—	53	—	9	19	—	60
		Gen.		Unc.			Gen.		Unc.		
Abdomen	1	—		—			—		17		
	2	1		—			1		19		
	3	1		17			2		15		
	4	2		19			3		13		
	5	2		12			2		13		
	6	2		9			3		7		
	7	1		7			1		6		
	8	2		5			2		5		
	9	1		5			2		5		
	10	1		5			1		5		
	11	1		5			1		5		
	12	1		5			1		4		
	13	1		4			1		3		
	14	—		3			—		3		

Table 4. *Leodora colonata* Zachs 1933

	Seg.	Left					Right				
		Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	1	14	13	—	—	1	14	13	—	—
	2	—	24	24	—	92(90)	—	24	24	—	76(65)
	3	—	14	13	14	90(90)	—	14	13	14	85(55)

		Gen.	Unc.	Gen.	Unc.
Abdomen	1	—	26	—	—
	2	2+1[1)]	54	1+1	47
	3	2+1	56	2+1	46
	4	3+1	54	2+1	47
	5	2+1	52	2+1	47
	6	2+1	54	3+0	40
	7	2+1	50	2+1	42
	8	2+1	47	2+1	40
	9	2+1	48	2+1	40
	10	2+1	46	2+1	39
	11	2+1	42	2+1	37
	12	2+1	39	2+1	38
	13	2+1	35	2+1	33
	14	2+1	34	2+1	30
	15	2+1	31	2+1	28
	16	1+1	26	2+1	26
	17	1+1	25	1+1	25
	18	1+1	23	1+1	23
	19	1+1	20	1+1	20
	20	1+1	21	1+1	19
	21	1+1	17	1+1	16
	22	1+1	15	1+1	15
	23	1+1	13	0+1	13
	24	1+1	12	0+1	12
	25	0+1	10	0+1	10
	26	0+1	8	0+1	8
	27	0+1	6	0+1	5
	28	0+1	3	0+1	3

1) Formulae of abdominal setae illustrate the geniculate dentate setae in the former and smooth setae (hooks, Fig. 4, P) in the latter.

Table 5. *Leodora multiplata* n. sp.

	Seg.	Left					Right				
		Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	—	7	7	—	—	—	7	7	—	—
	2	—	7	10	—	31(50)	—	6	9	—	36(35)
	3	—	5	5	4	71(60)	—	5	5	4	31(35)

		Gen.	Unc.	Gen.	Unc.
Abdomen	1	—	13	—	13
	2	1+1	21	1+1	12
	3	1+1	23	1+1	12
	4	1+1	23	1+1	16
	5	1+1	24	1+1	14
	6	1+1	18	1+1	14
	7	1+1	15	1+1	14
	8	1+1	12	1+1	12
	9	1+1	10	1+1	8
	10	1+1	9	1+1	6
	11	1+1	9	1+1	4
	12	1	2	1	2
	13	1	2	1	1

Table 6. *Leodora multiplata* n. sp.

		Left					Right				
	Seg.	Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	—	13	13	—	—	—	18	18	—	—
	2	—	12	24	—	103(75)	—	12	24	—	63(40)
	3	—	10	16	10	140(75)	—	10	12	10	59(40)

		Gen.	Unc.	Gen.	Unc.
Abdomen	1	—	50	—	29
	2	1+1	62	1+1	41
	3	1+1	50	1+1	52
	4	1+1	61	1+1	54
	5	1+1	56	1+1	49
	6	1+1	48	1+1	45
	7	1+1	46	1+1	47
	8	1+1	45	1+1	49
	9	1+1	40	1+1	45
	10	1+1	44	1+1	43
	11	1+1	36	1+1	43
	12	1+1	35	1+1	40
	13	1+1	38	1+1	37
	14	1+1	38	1+1	37
	15	1+1	35	1+1	31
	16	1+1	32	1+1	30
	17	1+1	27	1+1	29
	18	1+1	23	1+1	27
	19	1+1	23	1+1	24
	20	1+1	19	1+1	20
	21	1+1	17	1+1	17
	22	1+1	15	1+1	15
	23	1+1	14	1+1	13
	24	1+1	12	1+1	13
	25	1	10	1	10

26	1	8	1	8
27	1	5	1	6
28	1	5	1	5
29	1	2	1	3

Table 7. *Laeospira rosepigmentata* n. sp. from Oshoro

		Left					Right				
	Seg.	Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	6	6	—	—	—	6	6	—	—	—
	2	—	5	8	—	43(42)	—	5	8	—	31(32)
	3	—	5	2	5	56(42)	—	5	2	5	40(37)
		Gen.			Unc.		Gen.			Unc.	
Abdomen	1	1			5		1			8	
	2	1			8		1			11	
	3	1			8		1			9	
	4	2			7		1			9	
	5	2			10		2			11	
	6	2			9		2			9	
	7	2			10		2			11	
	8	2			13		2			11	
	9	2			12		1			16	
	10	1			14		2			16	
	11	2			14		1			14	
	12	1			13		1			14	
	13	2			11		1			11	
	14	1			8		1			10	
	15	1			7		1+1			7	
	16	1			6		1			6	
	17	1			3		1			3	

Table 8. *Laeospira rosepigmentata* n. sp. from Oshoro

		Left					Right				
	Seg.	Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	6	6	—	—	—	7	7	—	—	—
	2	—	6	7	—	37	—	4	7	—	37
	3	—	5	2	4	38	—	4	2	4	38
		Gen.			Unc.		Gen.			Unc.	
Abdomen	1	—			6		—			9	
	2	—			6		—			9	
	3	1			7		1			11	
	4	1			8		1			11	
	5	1			8		1			11	

6	1	8	1	13
7	1	10	1	13
8	1	13	2	14
19	1	13	1	17
10	1	14	1	17
11	2	14	1	15
12	2	12	1	12
13	1	9	1	10
14	1	8	2	7
15	1	7	1	6
16	1+1	5	1+1	6
17	1	2	1	2

Table 9. *Laeospira rosepigmentata* n. sp. from Muroran

		Left					Right				
	Seg.	Wgd.	Cap.	Bdd.	Skl.	Unc.	Wgd.	Cap.	Bdd.	Skl.	Unc.
Thorax	1	5	5	—	—	—	6	5	—	—	—
	2	—	5	7	—	29(45)	—	5	7	—	33(45)
	3	—	5	2	4	45(42)	—	4	2	4	29(42)
		Gen.		Unc.			Gen.		Unc.		
Abdomen	1	—		9			—		6		
	2	1		9			2		7		
	3	2		11			2		8		
	4	2		10			1		9		
	5	1		12			2		10		
	6	2		13			2		10		
	7	1		14			1		12		
	8	2		14			2		12		
	9	1		11			1		12		
	10	2		9			2		9		
	11	2		8			2		8		
	12	1+1		6			1		6		
	13	1		5			1+1		5		
	14	1		2			1		2		

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