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The Isopoda of Departure Bay and Vicinity, with Descriptions of New Species, Variations, and Colour Notes

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The following paper on the Isopoda of Departure bay and vicinity is an attempt to fill in one more of the gaps in the taxonomic literature of the Pacific coast Biological Station. At the same time another purpose has been in view, that of compiling a short and concise key, in order to facilitate the identification of the Isopoda found in British Columbia, for those who are not intimately acquainted with the group. To further this end a short description of the salient features of each species is given, together with local variations and colour notes whenever possible. In all thirty species were found, of which three are new to science. A new variety is also described.

The wood borer, or gribble (*Limnoria lignorum*), is the one Iposod on this coast which is very important economically, due to its ravages on any submerged wooden structures. This form was found in large numbers at all points visited. *Sphaeroma pentadon*, another very destructive Isopod, was not found, although a constant search was made for it. Atwood and Johnson (1924) state that *Exosphaeroma oregonensis* was reported as a timber borer from the Marine Biological Station at Departure bay. This is, no doubt, a misinterpretation of the non-committal statements made by Fraser (1923) concerning the destructiveness of *Exosphaeroma oregonensis*. This species is constantly found among the debris on piles and in crevices, but in no case was any evidence found which would justify the term timber borer.

Three species are found parasitic on fish: *Livoneca californica* on the shiner, *Cymatogaster aggregatus*; *Rocinela belliceptis* on the rock cod, *Sebastes maliger*; and *Rocinela propodialis* on the halibut, *Hippoglossus hippoglossus*. In all cases the above forms were found in the gill-cavity. The different species of commercial shrimps are often heavily parasitized by members of the *Bopyroidea*, and in the case of the abdominal parasites this undoubtedly influences the rate of reproduction of the hosts.

A large proportion of the material worked upon was sorted out from the Station museum, and any Crustacea which were likely hosts for the parasitic forms were also examined. In addition fresh material was collected during the summers of 1923 and 1924, which duplicated the majority of specimens found in the museum, besides yielding other species and new records for the ones previously found. The field work also enabled the colour notes to be made from fresh specimens.

Of the thirty species found, two, *Porcellio scaber* and *Ligidium gracile*, were terrestrial, and one, *Asellus tomalensis*, was a fresh water form. The remaining twenty-seven were marine.

Of the marine forms, one, *Tunais loricatus*, has been recorded from Esquimalt harbour (Spence Bate, 1866), but was not found in any of the material examined.

Eighteen species had already been reported from the Pacific coast: namely, *Tanais normani*, *Rocinela belliceps*, *Rocinela propadialis*, *Livoneca californica*, *Limnoria lignorum*, *Exosphaeroma oregonensis*, *Idothea fewkesi*, *Pentidotea resecata*, *Pentidotea wosnesenskii*, *Phryxus abdominalis*, *Ione brevicauda*, *Munidion parvum*, *Pseudione galacanthae*, *Phyllodurus abdominalis*, *Argeia pugettensis*, *Bopyroides hippolytes*, *Ligyda pallasii*, and *Trichoniscus papillicornis*.

Five species had not been previously recorded from the Pacific coast: namely, *Leptocheilia filum*, *Leptocheilia dubia*, *Leptognathia longiremis*, *Janira maculosa*, and *Munna krøyeri*. A species of *Munna* had been found by the Harriman Alaskan Expedition, but in so mutilated a condition as to render specific identification impossible.

The species and the variety new to science are: *Heterotanais melacephala*, *Paratanais nanaimoensis*, *Idothea rufescens*, and *Cirolana chiltoni* var. *van-couverensis*. All types and co-types are in the museum of the Pacific coast Biological Station at Departure bay.

The monograph on the North American Isopoda, by Richardson (1905), was the work upon which the majority of identifications was based, and the compilation of this paper has been, in no small measure, influenced by that monograph.

In conclusion I would like to thank Dr. C. McLean Fraser and Dr. W. A. Clemens for their advice and assistance, the various workers at the Station for collecting any material that came to their notice, and the Biological Board for granting me the facilities of the Station.

ANALYTICAL KEY TO THE SUPER-FAMILIES OR TRIBES (After Sars)

- A. Legs of the first pair cheliform, uropoda terminal, pleopoda, when distinctly developed, exclusively natatory. TANOIDEA.
- B. Legs of the first pair not cheliform.
 - 1a. Uropoda lateral.
 - 2a. Uropoda forming with the terminal segment of the abdomen a caudal fan. CYMOTHOIDEA.
 - 2b. Uropoda valve-like, inflexed over the pleopoda, which are to a great extent branchial. IDOTHEOIDEA.
 - 1b. Uropoda terminal.
 - 2a. Pleopoda not fitted for air breathing, exclusively branchial
 - 3a. Free living forms. ASELOIDEA.
 - 3b. Parasitic forms. BOPYROIDEA.
 - 2b. Pleopoda fitted for air breathing. ONISCOIDEA.

Tribe TANOIDEA

Head fused with the first thoracic segment and sometimes also with the second thoracic segment. The following five or six segments distinct, with inconspicuous epimera. First antenna with one or two flagella. First maxilla with a backwardly directed palp. Maxilliped with a palp of four articles.

Uropod terminal, with one or two branches. Abdomen consisting of five or six segments. Pleopoda when present exclusively natatory.

- A.... Body not narrowed posteriorly. First antenna with only one flagellum or none. Flagellum rarely well-developed in the female, but usually well-developed in the male. Mandible lacking a palp.....TANAIDAE.
 B.... Body narrowed posteriorly. First antenna with two flagella. Mandible with a three-jointed palp.....APSEUDIDAE.

ANALYTICAL KEY TO THE GENERA OF TANAIDAE

- A.... Eyes present.
 1a.... Uropoda biramous; five pairs of pleopoda present.
 2a.... Inner branch of uropod bi-articulate.....*Paratanais* Dana.
 2b.... Inner branch of uropod multi-articulate.
 3a.... Gnathopods of the male extensively developed, with tuberculate processes on the cutting margins
*Leptocheilia* Dana.
 3b.... Gnathopods not extensively developed in males
*Heterotanais* Sars.
 1b.... Uropoda uniramous; three pairs of pleopoda present.
*Tanais* Adouin & Edwards.
 B.... Eyes lacking.....*Leptognathia* Sars.

Genus PARATANAIS Dana.

Body of female more or less elongated, body of male shorter and stouter. First antenna of female consisting of three articles; of the male consisting of a peduncle of two articles and a flagellum of four articles. Eyes distinct, larger in the male than in the female. Gnathopods normal and similar in both sexes. Pleopoda well-developed, larger in the male than in the female. Uropod small, with two bi-articulate branches. Incubatory pouch normal.

Paratanais nanaimoensis sp. nov.

FEMALE.

Length 1.75 to 2 mm.; over four times as long as broad.

The head is as wide as long and is tapered anteriorly. A slight projection is present between the first antennae. The eyes are prominent in the anterolateral margins of the head, and are composed of a small number of large facets.

The first antennae are slightly longer than the head, and each consists of three articles. The first article comprises over one-half the total length of the antenna, and the second article is a little over one-half the length of the third. One or more spines are present near each joint, and there are five spines at the tip of the terminal article. The basal article has a single spine near the middle of its outer margin.

The second antenna is composed of five articles. The basal one is the shortest, the second and third are successively longer, and the fourth is over

twice the length of the third, the fifth is shorter again and is almost equal in length to the third.

The first free thoracic segment is extremely short, the second about twice the length of the first, and the third still longer than the second. The fourth and fifth free segments are the largest and are equal, each being equal in length to the first three segments together. The sixth segment is smaller than either the fourth or fifth, but larger than the third.

The abdomen, if anything, is slightly narrower than the thorax, and consists of six segments, of which the first is a little longer than the following four. The terminal segment is wider than any of the others and is rounded posteriorly.

The pleopoda are well developed.

The uropod is biramous and each branch is bi-articulate, the articles being subequal. The basal article is stout, and is as wide as long. The inner branch of the uropod is stouter and a little longer than the outer branch. The total length of the uropoda slightly exceeds that of the terminal segment of the abdomen.

MALE.

The male is a little shorter than the female, but slightly stouter in proportion. The eyes are much larger and more conspicuous.

The first antenna has a peduncle of two articles, which is less than one-half the total length of the antenna. The basal article of the peduncle is longer than the distal one. There is a flagellum of four articles terminated by five spines, and bearing numerous spines on the under surfaces of the articles.

The second antennae, thorax, and abdomen, including the uropoda, are as described for the female. The pleopoda are better developed, however, and the hairs fringing their margins can be seen projecting beyond the sides of the abdomen in a dorsal view.

In both sexes the gnathopods are well developed and slender. Both the thumb of the propodus and the dactyl itself are but slightly curved. The former in the male is armed with two stout, blunt spines on its upper surface, just posterior to where the dactyl is inserted. In the female there is a small inconspicuous spine in a corresponding position.

NOTES.

One specimen was dredged from a depth of 15 to 20 fathoms in Departure bay, from a bottom of grey mud and sand. No others were found until a sponge bed off Snake island, in about 25 fathoms of water, was dredged. Here two males and thirty females were taken.

The colour of the animals is the usual translucent white of the Tanoideans. When the incubatory pouch of the female is filled with eggs it shows up as a dark grey patch in the centre of the animal.

Genus LEPTOCHELIA Dana.

Gnathopods of the male extensively developed, and tuberculate on the cutting edges; those of the female normal. Eyes present. First antenna in

the female composed of three articles, and sometimes a rudimentary flagellum; that of the male more elongated and with an extensive flagellum. Marsupium of the female consisting of eight lamellae arising from the first four free thoracic segments. Five pairs of pleopoda present. Uropod biramous, the inner branch being more than two jointed, the outer branch small, composed of one or two imperfectly divided articles.

Leptocheilia dubia (Krøyer).

FEMALE.

Length 3.75 to 4.5 mm.; body elongate.

Head narrowed anteriorly, with a small blunt process between the antennae. Eyes situated antero-laterally.

First antenna slightly shorter than the cephalothorax. First article one-half the total length of the antenna, second article shorter than the terminal one. A slender spine is about the middle of the basal article.

The second antenna has four articles; first elongated, second one-half the size of the first, third twice the size of the second, fourth one-half the size of the third. The first and second articles each have a stout spine on their ventral surface, and the third article has a similar spine on its dorsal surface.

The first free thoracic segment short, second and third equal and longer, fourth and fifth equal and the longest, sixth the same length as the first.

The first five segments of the abdomen are equal. The sixth is longer and rounded posteriorly, with a blunt projection between the uropods.

There are five pairs of well-developed pleopoda.

The uropod is biramous and longer than the terminal segment of the abdomen. The outer branch is composed of one article, the inner of five articles. The two distal articles of the inner branch are the longest and slenderest.

MALE.

Length 3.5 mm.; width .75 mm.

Head narrowed anteriorly, longer than wide. Eyes prominent in the antero-lateral margins of the head.

The first antenna has about nine articles in all, the first article being shorter than the head, and the rest gradually decreasing in size.

The second antennae do not reach to the ends of the basal articles of the first antennae.

The first free thoracic segment is the shortest, second and third equal but larger than the first, fourth and fifth the largest and equal, sixth shorter again and equal to the third.

Five subequal segments and a terminal somewhat triangular segment make up the abdomen. The uropoda are as in the female.

The gnathopods are very prominent. The carpus is slightly longer than the basal article of the first antenna. Propodus produced into a long thumb, armed on the inner side with two teeth. Dactyl long and narrow. Both the propodus and dactyl are strongly curved.

NOTES.

Two specimens, both females, were dredged from Departure bay in soft grey mud and sand, 15 to 20 fathoms. One male and two females were found near the surface on hydroids and algae in Degnan's bay, Gabriola pass. Two males were dredged from a sponge bed off Snake island, in 25 fathoms.

Although the females of this species are larger and more elongated than the *Leptocheilia incerta* described by Moore (1902), and have the characteristic spines on the second antenna, I have no doubt that these are only local variations, and do not give sufficient grounds for a new variety.

Leptocheilia filum (Stimpson).

Length 2.5 mm.; five times as long as broad.

Head longer than broad, narrowed anteriorly. Eyes in the antero-lateral margins of the head and distinct.

The first antenna has the first article long and stout, the second shorter, and the third slightly longer than the second.

The second antenna has the first article short and stout, the second longer and almost the same length as the third, fourth twice the length of the third, fifth shorter than the fourth, but longer than the third.

The first free thoracic segment is the shortest, the next four are sub-equal, and the sixth is equal in length to the second.

The sixth abdominal segment is longer than the preceding five and is rounded posteriorly.

There are five pairs of well-developed pleopoda.

The uropod is biramous, the inner branch being the longest and composed of four articles; outer branch small and imperfectly bi-articulate.

NOTES.

A few individuals were found with a tri-articulate outer branch to the uropod, while nearly all had the abdomen wider in the middle than anteriorly or posteriorly.

A peculiar circumstance noted in the case of this species was that although over a hundred individuals were collected during the months of May, June, and July for two successive summers, no males were found. The only possible explanations are that either the males only appear during a certain season, or else inhabit a different locality during the summer months.

According to Wallace (1919), the males are three-fifths the size of the females and equally elongated. The eyes are proportionally larger. The first antenna has a peduncle of three articles and a flagellum of five articles. The pleopoda are smaller than in the female, but have long hairs on their margins which project beyond the sides of the abdomen. On the inner side of the propodus there is a row of small spines running parallel with the joint of the dactyl. This row of spines is not present in the female.

Genus HETEROTANAIS Sars.

Gnathopods in the female normal, in the male imperfectly chelate. Eyes present. First antenna in female tri-articulate; in male more elongate, with a flagellum more or less developed. Incubatory pouch normal. Five pairs of pleopoda present. Uropod biramous, outer branch small, inner one four to five articulate. Abdomen with the six segments well defined.

Heterotanaïs melacephala sp. nov.

FEMALE.

2 mm. long; six times as long as broad.

The head is slightly longer than wide, and is tapered anteriorly. The eyes are conspicuous and are a little more than one-half the width of the base of the first antenna. They are situated in slight projections of the antero-lateral margins of the head.

The first antenna is not as long as the head and consists of three articles and a vestigial flagellum, indicated by a minute terminal article. The first article is at least one-half the total length of the antenna, and bears a conspicuous spine on the middle of its outer margin. The second article is not as long as the third one. Spines are present near all the joints, and the minute terminal article bears a tuft of spines at its tip.

The second antenna is not as stout as the first and reaches a little beyond the tip of the second article of the first antenna. It is composed of five articles. The first two articles are subequal, the third and fourth equal and longer than the second, fifth, if anything, shorter than the fourth.

The first free thoracic segment is the shortest, the second and third longer and equal, fourth the largest, fifth nearly as large as the fourth, sixth smaller than the fifth and equal to the second.

The abdomen tapers slightly posteriorly, and is composed of six segments, of which the first five are equal in length. The sixth is longer and has a blunt process bearing two spines, in the middle of the posterior margin.

The uropod is biramous, with a stout basal article. The outer branch is the shortest, consisting of a short proximal article and a longer distal one. The inner branch is much longer, being two-fifths of the length of the abdomen. It is composed of four articles of which the first three gradually decrease in length, and the last is abruptly smaller.

There are five pairs of pleopoda, which are biramous. The posterior pair are smaller than the rest.

The dactyl and the propodus of the gnathopods are small and slightly curved.

NOTES.

A large number of this species was present in mud and fine sand dredged from Gabriola pass, 10 fathoms. No males were present among them. A characteristic feature of the animal, which is very striking in the living state, is the white body contrasted with the pigmented head.

Genus *TANAIS* Adouin & Edwards.

Eyes present. Abdomen composed of five or six segments. Only three pairs of pleopoda present, all fully developed. Incubatory pouch formed of two lamellae arising from the bases of the fifth pair of legs. Uropod simple, uniramous.

Tanaïs loricatus Spence Bate.

"The only specimen on the collection is imperfect. The first segment of the pereion appears to be imperfectly fused with the cephalon; inferior antennae scarcely half the length of the superior. First pair of gnathopoda having the propodus ovate; dactylus short and tumid, shorter and less pointed than the digital process of the propodus. Periopoda having the first three joints short and broad, being affixed like plates of mail; they terminate in short, pointed dactyli, and have the propodi armed with two lateral rows of strong, black, pointed teeth.

"This species was taken from the hollow of a sponge dredged in Esquimalt harbour, at the depth of about ten fathoms."—Spence Bate (1866).

Tanaïs normani Richardson.

Average length 2.5 mm.; body elongate.

Head as broad as long, narrowed anteriorly. Eyes conspicuous in the antero-lateral margins of the head.

First antenna composed of three articles, basal one the longest, second one-half as long as the first, third shorter than the second.

Second antenna composed of five articles. The fifth or terminal article is the shortest, and the second the next shortest.

The first free thoracic segment is the shortest, the second and third are equal, the fourth and fifth longer and equal, the sixth shorter than the fourth and fifth but longer than the first. It is almost equal in length to the third.

The abdomen is composed of six segments. The anterior three are equal to one another in length and breadth; the last three are one-half as wide as the first three and are not so long, with the exception of the sixth which is the longest of all.

There are three pairs of pleopoda on the three anterior segments.

The uropod is composed of a peduncle and five articles.

NOTES.

Specimens were found on Polyzoa and Hydroida on the reef in False narrows, and on a small red alga in Nanoose bay. All individuals found were smaller than the type described by Richardson, but agreed in every other respect.

Genus *LEPTOGNATHIA* Sars.

Eyes wanting. Pleopoda in the female small, sometimes lacking; those in the male well developed. Abdomen composed of six segments. Uropod biramous, inner branch larger, bi-articulate; outer one composed of one or two articles. Incubatory pouch normal. Mandible small and feeble, cutting part narrow, molar expansion with a small lappet at its tip, which bears a few hairs.

Leptognathia longiremis (Lilljeborg).

FEMALE.

Maximum length 4 mm.; body elongated.

Head longer than wide, narrowed anteriorly. The first antennae are set in excavations of the anterior margin. Eyes lacking.

The first antenna has the basal article one-half the total length of the antenna; the second is one-half the length of the third, and the fourth slightly longer than the third.

The second antenna is much slenderer than the first antenna and reaches to the end of the third article. It is composed of six articles, of which the fourth and fifth are the largest.

The first and last free thoracic segments are equal in size and smaller than the rest.

The abdomen is slightly wider than the thorax. The last segment is longer than the rest and is rounded posteriorly.

There are five pairs of small pleopoda.

Uropod biramous, possessing an inner branch and outer branch of two articles. The inner branch is about twice the length of the outer branch.

NOTES.

No males of this species were found. Females were taken from sandy mud in Departure bay, 15 to 20 fathoms; from grey mud in Pylades channel, 30 fathoms; and from sponge beds off Snake island, 25 fathoms.

According to Sars (1899) the male is smaller than the female and much broader in proportion. All the segments of both the thorax and abdomen are nearly equal in length. The first antennae are one-fourth the length of the body, the first two articles being large and expanded, and the two outer articles of the flagellum longer than the inner two. Hand of gnathopod also smaller. Inner branch of uropod in the male tri-articulate.

Tribe CYMOTHOIDEA

Legs of the first pair not cheliform. Uropoda lateral and forming with the last segment of the body a caudal fan. Pleopoda for the most part natatory.

ANALYTICAL KEY TO THE FAMILIES OF CYMOTHOIDEA. (Mod. after Richardson.)

A... Abdomen consisting of six segments.

1a... Uropod with both branches well developed; lamelliform.

2a... Maxillary palps free; margins of the last two articles more or less setose..... CIROLANIDAE.

2b... Maxillary palps embracing distal ends of the mouth parts; inner upper margin and apex never setose.

- 3a... Antenna with well-defined peduncle and flagellum
 AEGIDAE.
- 3b... Antenna reduced; peduncle and flagellum indistinguishable..... CYMOTHOIDAE.
- 1b... Uropod with one branch lacking or rudimentary; not lamelliform
 LIMNORIDAE.
- B... Abdomen consisting of less than six segments..... SPHAEROMIDAE.

Family 1. CIROLANIDAE.

Genus CIROLANA Leach.

First antenna with the basal article not extended straight in front at right angles to the second article. Peduncle of the second antenna composed of five articles. Plate of the second article of the maxilliped furnished with hooks. Abdomen with all six segments distinctly defined. The peduncle of the uropod has the inner angle strongly produced. First and second pairs of pleopoda similar to one another, the inner branch being membranaceous.

Cirolana chilloni var. *vancouverensis* var. nov.

Length 7 mm.; about three times as long as broad.

Head shaped similarly to *Cirolana linguifrons* (Richardson 1905), only the frontal process is not so extensive and the posterior margin of the head is broadly rounded. Eyes conspicuous.

The first antenna has the first and third articles equal in length, the second being slightly smaller. The flagellum is composed of thirteen articles.

The second antenna has the first two articles short, the third longer, and the fourth at least twice as long as the third. The flagellum of thirteen articles reaches to the middle of the fifth thoracic segment. The number of articles in the flagella of both the first and second antennae is not constant, the number varying between ten and fifteen.

The first, fourth, fifth, sixth, and seventh thoracic segments are equal; the second and third are slightly shorter than the others.

There are six abdominal segments. The first is partially hidden by the last thoracic segment. The next four are equal. The posterior segment is the largest and is divided into an anterior raised portion and a posterior portion by a distinct carina. This carina is in the shape of three lobes, of which the median one is truncate. The posterior margin of the segment is broadly acute and is finely serrated.

The basal article of the uropod is wide with the inner angle produced posteriorly. The inner branch is triangular, the anterior angle being obliquely truncate. The outer branch is narrow and posteriorly rounded, and extends to the posterior angle of the inner branch.

The posterior margin of the terminal segment and the margins of the uropods are fringed with long hairs.

NOTES.

Specimens of this variety were found in the Station museum, having been collected at Long Beach on the west coast of Vancouver island, presumably from the sandy beach in that locality.

The distinctive features of the last abdominal segment and the uropods, and the difference of the first antennae from those of *Cirolana chiltoni* justify the erection of a subspecies for this form. The relative sizes of the thoracic segments is also another distinctive feature.

The colour of the preserved specimens was a light brown profusely dotted with darker brown spots.

Family 2. AEGIDAE.

Genus ROCINELA Leach.

Body depressed. Abdomen not much narrower than the thorax. Eyes present, well developed. First two articles of the peduncle of the first antenna not expanded. Frontal lamina small and narrow. Mandible with a linguiform lamella. Palp of the maxilliped composed of two articles. First three pairs of legs with the propodus more or less expanded, and armed with spines; dactyl forming a large evenly curved hook. The four posterior pairs with the propodus short.

Rocinela belliceps (Stimpson).

20 mm. long; more than twice as long as wide; oblong-ovate.

Head somewhat triangular, wider than long, with a slight obtuse projection on the anterior margin. Eyes large, compound, in the postero-lateral margins of the head.

First antenna with a peduncle of three articles and a flagellum of four articles.

Second antenna with a peduncle of five articles and a flagellum of usually fourteen articles.

Maxilliped with a palp of two articles.

First thoracic segment the longest, second, third, and fourth equal; fifth, sixth, and seventh progressively shorter. Epimera on all but the first segment. The posterior extremities of the anterior segments are not as pointed as the same extremities of the posterior segments.

There are six abdominal segments, the first being almost hidden by the last thoracic segment. The last segment is rounded posteriorly, and has a faintly scalloped margin.

The uropod is biramous, and the inner article is longer than the outer one. The margins are fringed with hairs. The basal article of the uropod has a projection reaching to the end of the outer article or branch.

The first three pairs of legs are prehensile and have three spines on the merus and three on the propodus.

NOTES.

Specimens were found at the following places: Round island, 15 to 20 fathoms; Pylades channel, 40 fathoms; E. of Departure bay; Departure bay; N. of Thetis island; Trincomali channel; Gabriola pass, in the gill-cavity of *Sebastes maliger*.

The number of articles in the flagellum of the second antenna commonly varies from twelve to fourteen or sixteen, but fourteen is the usual number.

The basic colour is a light brown, with the postero-lateral angles and margins of the thoracic segments tinged with black. The last abdominal segment has a black line stretching across its base, which is interrupted in the median line. The anterior three-quarters of the same segment are also tinged with black. Some specimens were taken which had yellow borders to the customary black markings.

Rocinela propodialis Richardson.

Since this species is somewhat similar to *Rocinela belliceps* the following points will be given instead of a separate description.

The body is almost twice as wide as long, and the anterior process of the head is larger than in the preceding species. The flagellum of the second antenna has sixteen articles. Only the epimera of the last segment project beyond the posterior margin of the segment. Uropod with the projection of the basal article shorter than either branch. Outer margins of the branches fringed with long spines, inner margins fringed with long hairs.

NOTES.

One specimen was taken from the gill-cavity of a halibut *Hippoglossus hippoglossus*, at Ucluelet.

No living specimen was seen, but Richardson describes it as "Colour brown with small black dots."

Family 3. CYMOTHOIDAE.

Genus LIVONECA Leach.

Body sub-oval, more or less twisted. Head set in the first thoracic segment. First pair of antennae widely separate at the base, and rather compressed. Anterior margin of the first thoracic segment widely sinuated in the middle, more or less incised at the antero-lateral margins. Abdomen very little immersed, continuous with the thorax and as wide.

Livoneca californica Schoidte & Meinert.

Body slightly twisted, more than twice as long as wide.

Head somewhat triangular. Eyes large, placed in the postero-lateral angles of the head.

Both the first and second antenna consist of eight articles.

The first thoracic segment is the largest, the head being set in it, and the last is the shortest. The second and third are equal and are larger than the fourth, fifth, and sixth, which are also equal. Epimera are present on all but the first thoracic segment.

The abdomen consists of six segments, of which the last is the largest, and is rounded posteriorly.

NOTES.

Large numbers of these parasites were found in the gill-cavity of *Cymatogaster aggregatus*, at Crescent beach, Boundary bay.

The colour is a uniform slate-grey.

Family 4. LIMNORIDAE.

Genus LIMNORIA Leach.

Body oblong, partially depressed, contractile into a ball. Head short, blunt in front. Mouth parts normal. Mandible without a molar expansion, and with a small, three-jointed palp. Palp of the maxilliped consisting of five articles. Eyes lateral. Segments of the thorax distinct. Epimera on all but the first segment. Abdomen composed of six segments. Legs all ambulatory. Pleopods uniform in structure, both natatory and branchial. Inner plate of the second pair possessing a stylet in the case of the male. Uropods small, lateral; outer branch almost obsolete, inner branch linear.

Limnoria lignorum (Rathke).

Larvae are nearly always found associated with the adults.

The adult is between 3 and 4 mm. long; about one-third as wide as long.

Head wider than long, anterior margin rounded. Eyes prominent in the lateral margins of the head.

The first antenna has a peduncle of three articles and a flagellum of two articles. The last article is sometimes absent.

The second antenna is sometimes as described by Richardson (1905).

The mouth parts form a prominent buccal mass, and the maxilliped has a palp of three articles.

The first thoracic segment is longer than any of the rest. Epimera are present on all but the first segment.

The abdomen is composed of six segments. The last segment is rounded posteriorly.

Uropod lateral, consisting of an outer branch which is vestigial and an inner branch the length of the last segment.

The whole body is covered with long hairs and the pleopoda are bordered with similar hairs.

NOTES.

This is a very common form found boring in submerged wood. Specimens have been taken from the surface to about sixty fathoms, the greatest depth dredged.

The second antenna is usually composed of six articles, the flagellum being ill-defined.

The basic colour of the animal is a cloudy white, and the digestive tract shows through the thorax as a black line. -

An interesting colour noted in specimens dredged from Round island was found to be caused by a protozoan, *Folliculina ampulla*, which was epizoic upon the dorsal surface of the last abdominal segment. The cups of these animals gave the last segment the appearance of being irregularly blotched with ink-stains.

Family 5. SPHAEROMIDAE.

Genus EXOSPHAEROMA Stebbing.

Second, third, and fourth articles of the palp of the maxilliped produced into lobes.

The outer branch of the uropod is not denticulate on the exterior margin.

Characters are otherwise as in the genus *Sphaeroma*, i.e., body contractile, able to be rolled into a ball. Abdomen composed of two segments, the first of which is formed by the fusion of several segments. The terminal segment is somewhat rounded and entire. The branches of the uropod are similar, both being conspicuous. The outer branch is movable and capable of being folded under the inner branch. Legs all ambulatory in character.

Exosphaeroma oregonensis (Dana).

Largest ones about 1 cm. long; one-half as wide as long.

Head over twice as broad as long, with a small process in the centre of the anterior margin, bordered on either side by a slight excavation. Eyes small, in the postero-lateral margins of the head.

First antenna with a peduncle of three articles, of which the basal article is very large. The flagellum is composed of thirteen articles.

Second antenna with a peduncle of five articles. The first is very short, the second longer and equal to the third, the fourth still longer and equal to the fifth. Flagellum composed of thirteen articles.

The maxilliped has a palp of five articles, sprinkled with long hairs.

The first segment of the thorax is longer than any of the others, the lateral margins terminating acutely. The epimera are indicated by definite lines on all the thoracic segments.

The anterior segment of the abdomen consists of three partially fused segments. The posterior one is rounded at its free end. The outer branches of the uropoda are shorter than the inner ones.

NOTES.

Taken at Newcastle island, Margaret bay, Taylor bay, Pilot bay and Departure bay. An intertidal form found under loose stones and among the debris on old piles. Although specimens were taken from the entrances of uninhabited tubes of *Bankia*, and other cavities in wood, no evidence was ever found that this species bored in wood.

Most of the individuals found were of a varying shade of grey, but one specimen was found under a boulder in Departure bay which was a uniform light brown.

Tribe IDOTHOIDEA.

Uropoda lateral, forming a valve-like cover for the five pairs of pleopoda. Legs of the first pair not cheliform.

Family IDOTHOIDAE.

Genus IDOTHEA Fabricius.

Flagellum of the second antenna multi-articulate. Maxilliped with a palp composed of four articles. Epimera on all the segments of the thorax, with the exception of the first, and distinctly separated from them. Abdomen composed of three segments, with a suture line on either side at the base of the terminal segment, indicating another partially coalesced segment.

Idothea fewkesi Richardson.

Length 4 cm. down to a very minute size; five to five and a half times longer than broad.

Head wider than long, slightly hollowed out in front. Eyes placed laterally, half-way between the anterior and posterior margins of the head.

The first antenna has four articles, the basal one being enlarged.

The second antenna has the basal article short, the second and third longer and equal in length, the fourth and fifth still longer and equal. The flagellum consists of sixteen articles.

The maxilliped has a palp of four articles.

The first thoracic segment is narrower than the rest. Epimera distinct on all but the first thoracic segment; only the last pair of epimera occupy the total lateral margin of their respective segment.

The abdomen consists of two narrow segments, with a vestigial division in the last segment. The posterior segment terminates in a blunt tip.

NOTES.

This is a shallow water form which was found only at Nanoose bay, where it was in large numbers from the shoreline to a depth of five fathoms.

The general colour is very similar to that of *Pentidotea resacata*, but the dark line down the centre of the thorax is not so prominent. Small black dots replace

the blotches on the abdominal segments. The anterior part of the body is more of a brown than a green colour. The median line is free of pigment dots and is bordered on either side by lines of dots set closely together. Another pair of lines is situated half way between the inner lines and the lateral margins of the thoracic segments. These lines are not continuous, but slant outwards on each segment.

Idothea rufescens sp. nov.

Length, not including the antennae, 15 mm.; breadth 3 mm.

Head twice as wide as long, slightly excavated on the anterior margin. Eyes conspicuous, situated in the posterior half of the lateral margins of the head.

The first antenna is composed of four articles, and the basal one is very much enlarged, being almost three times the width of any of the others. The first antennae reach to the ends of the second articles of the second antennae.

The second antenna has a peduncle of five articles. The first article is very small and is concealed from a dorsal view, the second and third are equal in length, and the fourth and fifth a little longer and equal. The flagellum consists of twelve articles.

The first thoracic segment is the narrowest in the median line and the head is set in it a short distance. The second, third, and fourth are the longest and are equal in length. The last three segments gradually decrease in length.

There are no epimera on the first segment. Small triangular ones occupy the anterior half of the lateral margins of the second segment, and also the third. The epimera on the fourth segment take up three-quarters of the lateral margins. The total lateral margins of the last three segments are occupied by the epimera.

The abdomen is composed of three segments and a long posterior segment, which is broadly excavated on the posterior margin, and also has an indication of a coalesced segment.

The maxilliped has a palp of four articles.

NOTES.

Four individuals of this species were taken in Gabriola pass, at a depth of four fathoms, from red algae. Three were adults and one was immature. The basic colour of all was similar to the algae upon which they lived. One specimen was entirely red except for median white lines on each thoracic segment. Another was entirely white except for the head, fourth thoracic segment, abdomen, and the median line. The antennae on all were alternately banded red and white.

Genus PENTIDOTEA Richardson.

Flagellum of the second antenna multi-articulate. Maxilliped with a palp of five articles. Epimera on all but the first thoracic segment, and distinctly separate. Abdomen composed of three segments with a suture line near the base of the terminal segment on either side.

Pentidotea resecata (Stimpson).

Usual length 3.5 cm.; four and one-half to five times as long as broad.

Head almost as long as broad, slightly hollowed out in front. The eyes are laterally placed and are set in at an angle towards the anterior part of the head.

The first antenna consists of four articles of which the basal one is enlarged.

The second antenna has five articles in the peduncle. The basal article is very short, the second and third are nearly equal, the fourth and fifth are longer than the preceding ones, the fifth being shorter than the fourth. The flagellum may have as many as twenty articles.

The maxilliped has a palp of five articles.

The first and last thoracic segments are the narrowest. The epimera are well marked on all but the first segment, and occupy the whole lateral margin of the last three segments. The posterior tips of the first three epimera are rounded, and the same tips of the last three are pointed.

The first two abdominal segments are small and the last shows indication of being coalesced with another segment. It is rounded posteriorly.

NOTES.

A shallow water form, found mainly on *Zostera*. Newcastle island, Nanoose bay, Departure bay, Galiano island.

The usual number of articles in the second antenna is twelve, according to the type described by Richardson (1905), but in all the individuals found that were full grown the number of articles exceeded twelve.

The general colour of the adult is pale green, with a dark median line running down the head, through the thorax and one-third the distance into the last abdominal segment. The whole dorsal surface is covered with minute black dots visible only under the microscope. Eyes black, appearing to be set in a small white area. Last abdominal segment mottled. Younger specimens were a light brown tinged with green.

Pentidotea wosnesenskii (Brandt).

Varies in length up to a maximum of 4 cm.; one-third to one-quarter as broad as long.

Head narrowed anteriorly, hollowed out in front.

First antenna consisting of four articles, the basal one being large and flattened.

Second antenna having a peduncle of five articles. The basal article is small, the second and third equal in length, the fourth and fifth subequal and longer and slenderer. There is a flagellum of twelve to sixteen articles.

Maxilliped possessing a palp of five articles.

The thoracic segments are nearly all of equal dimensions. Only the lateral margins of the last three are completely occupied by the epimera.

The first two abdominal segments are small. The last, which shows indications of being fused with another segment, is very large and terminates in a large, blunt point.

The thoracic legs are similar and terminate in small, sharp claws. In the male the joints are covered with coarse hairs.

NOTES.

Taken at Departure bay, Newcastle island, Nanoose bay, reef in False narrows. A surface and shallow water form found on *Fucus*, red algae, and under loose stones between the tide lines.

Nearly all the specimens found were a light olive-green in colour; some, however, which were taken from red algae, were a dark red and were irregularly marked with grey spots and areas.

Tribe ASELOIDEA

Legs of the first pair not cheliform. Uropoda terminal, biramous. Pleopoda exclusively branchial, the first pair in the female generally transformed into a single operculum covering the succeeding pairs. Epimera very small, or obsolete. All the segments of the abdomen fused together, although one or two segments can be made out anteriorly. Pleopoda in the female reduced in number, only four pairs being present.

Family 1. ASELLIDAE.

Genus ASELLUS Geoffroy.

Mandible with a palp. Last six pairs of legs with dactyl unilingulate. Eyes present. Body broad, depressed. Head small, narrower and shorter than the first thoracic segment. Terminal segment of the body very broad, not longer than broad.

Asellus tomalensis Harford.

Body elongated, with large spaces between the thoracic segments. Margins of the body irregularly covered with spines.

Head nearly twice as long as wide, with the anterior margin slightly excavated. Eyes situated in the middle of the lateral margins of the head.

First antenna has the peduncle gradually merging into the flagellum. The first article is much wider than any of the others, and there is an average of twelve articles.

In the second antenna three short and two elongated articles make up the peduncle. The flagellum is composed of a number of small articles.

Small epimera are on all the thoracic segments. The first and fourth pairs are antero-laterally placed, the second and third are bilobed, the fifth and sixth are near the middle of the lateral margins, and the seventh is more posterior.

The abdomen is a large single segment, with a rounded lobe on the posterior margin.

The uropod has an elongated basal article which is not quite as long as either of the branches.

NOTES.

Found at Ischaschat, on a dead bird in a well; ponds and peat bog near the Station; Vancouver and vicinity.

Colour a light brown, slightly mottled.

Family 2. JANIRIDAE.

Genus JANIRA Leach.

Body oblong, depressed. Lateral parts of the head not produced, or but slightly produced. Eyes distinct, subdorsal. Front of head obtuse, or produced into a small rostrum. First antenna well developed, with the flagellum multi-articulate. Second antenna very much elongated, with a scale outside the third article of the peduncle. Maxilliped with the second and third articles of the palp not expanded. Segments of the thorax with lateral parts not produced into lappets. Uropoda largely developed. First pair of legs prehensile in both sexes; dactyl in all legs tri-ungulate. Terminal segment of the body rounded, not expanded laterally.

Janira maculosa Leach.

Body narrowed anteriorly and posteriorly; about 7 mm. long; one-third as wide as long.

Head with the anterior margin practically straight, wider than long. Eyes subdorsal.

The first antenna has a three-jointed peduncle, with the basal article expanded. There is a multi-articulate flagellum reaching to the end of the fifth article of the second antenna.

The second antenna is longer than the body. The first four articles of the peduncle are short, with a scale at the outer margin of the third article. The fifth and sixth articles are elongated and subequal. Flagellum multi-articulate.

The anterior four thoracic segments have the corners produced, and the epimera bilobate.

The abdomen consists of one segment whose margins are coarsely serrated.

The uropod is longer than the abdominal segment and biramous, the inner branch being slightly longer than the outer one.

NOTES.

Gabriola pass, 10 fathoms; Departure bay, 15 to 20 fathoms. Found among red algae growing on shelly bottom, and on sandy bottom respectively.

The one individual found in Departure bay was a light yellow, densely mottled with dark brown spots. Those found in Gabriola pass were either a dirty white, or the colour of the algae upon which they were found. In either case they were mottled with the same brown spots.

Family 3. MUNNIDAE.

Genus MUNNA Krøyer.

Body sub-pyriform, vaulted, with the last three segments of the thorax very small. Terminal segment of the body narrow, sub-pyriform. First antenna short. Second antenna very much elongated, with the last two articles of the peduncle long and slender. First pair of legs sub-cheliform, comparatively small in the female, but well developed in the male. Last six pairs of legs ambulatory and rapidly increasing in length. Dactyl bi-unguiculate. Uropod small.

Munna krøyeri Goodsir.

Length 1 to 2 mm.; longer than broad.

Head with anterior margin broadly rounded. Eyes set upon short lateral prolongations of the head. The male usually has a slenderer body than the female.

The first antenna is short with a flagellum of three articles, the terminal one being very small.

The second antenna is not as long as the body. Flagellum shorter than the peduncle.

The first thoracic segment is not as large as the second, third, or fourth, which are the largest. The fifth, sixth, and seventh are very small and have their lateral margins turned towards the posterior part of the animal.

There is one abdominal segment, which is somewhat ovate, and from which the uropods extend as postero-lateral processes. The anterior part of the segment has three spines on its lateral margins.

NOTES.

Taken at False narrows on the reef, associated with *Tanais normani* among Polyzoa. From dredge material in the same locality at a depth of 10 fathoms. In Gabriola pass, 10 fathoms to the surface. Horswell point at low tide on *Polysiphonia*.

The colour of this species depends a great deal upon its environment. Usually, however, it is a translucent white with very minute pigment spots upon its back.

Tribe BOPYROIDEA.

Ectoparasites, their hosts being other Crustacea. Sexual dimorphism is very marked. Female often asymmetrical; segmentation is sometimes entirely lost. Head usually carries two pair of vestigial antennae. Mouth parts reduced, only the mandibles and maxillipeds being developed. Vestiges of the second maxillae sometimes present. Pleopoda, in adult, all branchial in character. Uropoda simple, usually very small and terminal. Male, when compared to female, is of diminutive size, and different in appearance to the female. Development is in the form of a retrogressive metamorphosis; there are two and sometimes three larval stages.

ANALYTICAL KEY TO THE GENERA OF THE FAMILY BOPYRIDAE. (Modified after Richardson).

- A.... Body of female with one side greatly swollen. Abdomen composed of only five segments. Only the first leg present on the larger side
 Genus *Phryxus* Rathke.
- B.... Body of female with neither side swollen. Abdomen usually composed of six segments. All legs of both sides present.
- B1.... All six segments of the abdomen with the lateral parts elongate. Same parts of the male also elongate. Genus *Ione* Latreille.
- B2.... Lateral parts of the abdomen not elongated in the female.
- b1.... Lateral parts of abdomen of female produced lamellarly.
- bb1.... Uropoda in female double branched. Abdomen in male with segments fused. Genus *Munidion* Hansen.
- bb2.... Uropoda in female single branched. Abdomen in male with segments distinct
 Genus *Pseudione* Kossmann.
- b2.... Lateral parts of abdomen in female rudimentary or absent.
- bb1.... Pleopoda present in female, and uropods simple, single branched.
- bbb1.... Both sexes with a pair of dorsal papillae on the first abdominal segment. Male with abdominal segments distinct.
 Genus *Phyllodurus* Stimpson.
- bbb2.... Pair of dorsal papillae not on the surface of the first abdominal segment. Male with abdominal segments fused.
 Genus *Argeia* Dana.
- bb2.... Pleopoda wanting in female.
 Genus *Bopyroides* Stimpson.

Genus PHRYXUS Rathke.

Abdominal parasites. Body of female very asymmetrical. Segments of the thorax distinct on the dorsal surface. Lateral parts of the thoracic segments defined on the dorsal surface only. The terminal segment is small and bifid at the tip. Palp of the maxilliped wanting. Incubatory plates of the large side extensively developed, those of the small side very small. Legs of the large side of the body wanting with the exception of the first pair. There are four pairs of single branched pleopoda, the lamellae of the longer side of the body being larger than those of the shorter side. Male with all the segments of the thorax distinct; and those of the abdomen fused, though more or less indicated at the sides. Uropoda and pleopoda wanting.

Phryxus abdominalis (Krøyer).

Body of female very asymmetrical, the left side being much larger than the right one; a little longer than wide. The male is much smaller than the female and is symmetrical. Female 5 mm. long; male 2 mm. long.

FEMALE.

Head triangular, with the lateral processes near its anterior end. Eyes absent.

On the larger side the thoracic segments fuse with the incubatory pouch, and only the first thoracic leg is present on that side. On the smaller side the segments are distinct and all the legs are present. Ovarian bosses are also developed on the first four segments of the smaller side.

The five abdominal segments of the female are distinct, the terminal segment being slightly biramous, indicating a vestigial set of uropoda. A pair of double branched pleopoda are present on each of the first four segments.

MALE.

Anterior border of the head widely rounded; eyes present; first and second antennae consisting of three and five articles respectively. Thoracic segments distinct, with conspicuous epimera. Segments of the abdomen fused, tapering to a point posteriorly. Lateral convolutions on the abdomen mark the original segmentation.

NOTES.

Abdominal parasite upon *Spirontocaris barbata*, *S. prionota*. Taken at Departure bay; Ruxton pass; Cowichan gap, 16 to 25 fathoms; Nanoose bay between the tide lines.

The covers of the incubatory pouches are an uneven chocolate brown in colour, and the abdomen and pleopoda are white. The whole animal stands out in marked contrast to its host. The male is transparent, with the eyes dark black, and the centre of the thorax and abdomen dark brown, bordered by irregular dark areas on either side, about half way between centre and side. To the naked eye the female appears as a dark brown spot among the abdominal appendages of the host, and the male, which is nearly always on or beside the female, is a translucent brown.

The specimens examined differ from the description given by Richardson (1905) in that vestigial uropoda are visible on the terminal segment of the female.

Genus *IONE* Latreille.

Female with the lateral parts or pleural lamellae of the abdomen elongated, digitate. There are usually five pair of double branched pleopoda. The uropoda consist of two elongate, simple, curved processes, with the margins smooth, not digitate. Segments of the abdomen in the male narrow, elongated processes. Branchial parasites.

Ione brevicauda Bonnier = *I. cornuta* Spence Bate.

Length of female 18 mm.; of male 7 mm.

Head slightly broader than long.

The first four segments of the thorax have rounded pleural bosses on the

lateral margins of the dorsal surface. The pleural lamellae are on the lateral margins of all the segments and are fairly regular in their size.

The pleural lamellae of the abdomen are made up of distinct articles, and give off arborescent branches on their posterior margins. The size of the abdominal lamellae also increases posteriorly.

The uropoda are unbranched processes about 3 mm. long and curve outward at their extremities.

A male is commonly found accompanying each female. It is one-third the size of the female; all the segments of the abdomen are fused, and the pleural lamellae of the abdomen are unbranched.

NOTES.

Two examples of this species, which had been collected in British Columbia, were procured by Dr. Fraser from the United States National Museum.

The specimens corresponded exactly with the descriptions of *Ione brevicauda*, with the exception that the actual sizes of the male and female were close to the measurements of *I. cornuta*, and that the female was relatively larger than the male. Since these individuals were found parasitic upon *Callianassa longimana*, at Crescent Beach, Boundary bay, it is entirely probable that the *I. cornuta* of Spence Bate can be classified as a local variation of *I. brevicauda*, in which the female is relatively larger than the male, and both sexes attain a larger size.

Genus MUNIDION Hansen.

Body of the female somewhat asymmetrical. Ovarian bosses present on all the thoracic segments, in the form of petiolated processes. Epimera very large occupying the entire lateral margins of all the segments. Abdomen with the segments distinctly defined; lateral parts of the first five segments lamellarly expanded into elongated lobes. Sixth or terminal segment small, not expanded. Five pairs of double branched, well-developed pleopoda; a pair of double branched uropoda. Five pair of incubatory lamellae, not quite overlapping in the median ventral line; the first lamellae have the distal part produced into a small lobe. Seven pairs of legs present. Male usually has the thoracic segments distinct. Segments of the abdomen fused. Uropoda and pleopoda wanting. Branchial parasites.

Munidion parvum Richardson.

Female asymmetrical, male symmetrical; former over twice as long as the latter. Female 9 mm., male 4 mm.

FEMALE.

Head wider than long, bilobed.

First thoracic segment narrower than the rest, all of the segments distinct. Ovarian bosses on all in the form of small projecting processes. Epimeral plates are on all the segments and occupy the entire lateral margins, gradually

increasing in size posteriorly. Lateral leaf-like processes are also on the segments. The last segment of the body is rounded and possesses a pair of biramous uropoda, whose branches are similar to the lateral branches of the anterior abdominal segments.

MALE.

Eyes present. The thoracic segments are distinct, and the abdomen consists of a single egg-shaped segment which is wider anteriorly than posteriorly.

NOTES.

The abdomen differs from the description given in Richardson (1905) in that it is more regular in outline.

Genus *PSEUDIONE* Kossmann.

Body of female oval, somewhat asymmetrical. Segments of the abdomen distinct. Epimera well defined, not contiguous. Lateral parts of the abdominal segments lamellar, more or less projecting. Terminal segment of the abdomen small, with the sides not lamellarly produced. Incubatory plates meeting in the middle of the ventral line, concealing the incubatory pouch and eggs; first pair with the distal portion usually produced into a lobe. All seven pairs of legs present. Pleopoda well developed, double branched. Uropoda simple, consisting of a pair of lanceolate lamellae. Male with the segments of the thorax and abdomen distinct. Pleopoda present in the form of five pairs of small, rudimentary, sac-like bodies, a pair for each of the first five segments. The uropoda are wanting. Branchial parasites.

Pseudione galacanthae Hansen.

Female about 8 mm.; more than twice as long as broad. Slightly asymmetrical.

Head as long as broad. Eyes absent. First antenna consisting of three articles, second antenna consisting of five.

The thoracic segments are distinct, with ovarian bosses on the anterior portion of the first four. The anterior four segments are notched, the posterior lobe so formed being smaller than the anterior one. Epimera not distinct, occupying the posterior lobes on the first four segments and the whole lateral margin on the last three segments.

Of the six abdominal segments the first five have lateral lamellae, besides the pleopoda, which are double branched. Uropoda single branched.

MALE.

Male less than one-half the size of the female, eyes distinct. The seven segments of the thorax and the six segments of the abdomen are distinct.

NOTES.

Parasitic upon *Munida quadrispina*, 15 to 25 fathoms, Ruxton pass.

Genus PHYLLODURUS Stimpson.

Body of female nearly symmetrical. Ovarian bosses present. Posterior portion of the lateral margins of the segments not produced. Epimera present on all the segments, not clearly separated on the last two, and occupying the anterior part of the lateral margin of the first four segments; on the fifth they occupy the central portion; and on the sixth and seventh the posterior portion. Abdomen distinctly segmented, narrowing posteriorly; lateral parts of the segment not developed. On the dorsal surface of the first abdominal segment near the anterior margin are two papillose processes, one on either side of the median line. There are five pairs of double branched pleopoda, the branches being in the form of long, narrow lamellae issuing from the sides of the segments. Uropoda simple, in the form of two long, narrow lamellae. All seven pairs of legs are present. The abdomen of the male is segmented, with the papillose processes on the anterior segment as in the female. The terminal segment is produced posteriorly into a long pointed process. There are five pairs of narrow sac-like pleopoda. Uropoda small simple processes attached on either side of the sixth segment. Abdominal parasites.

Phyllo durus abdominalis Stimpson.

Female 17 mm. long; male 9 mm. long.

FEMALE.

About one and one-half times longer than wide; roughly ovate.

Head slightly wider than long, more or less bilobed. Eyes lacking.

The anterior margins of the thoracic segments are occupied by ovarian bosses. Epimera are distinct, but are not separated on the last two segments.

The abdomen has six segments. The first one is the largest and has the dorsal processes characteristic of the genus. Biramous pleopoda are present on each abdominal segment, each set decreasing posteriorly. The last segment terminates in a pointed process and has a pair of simple uropoda resembling the pleopoda.

MALE.

A little less than one-half the size of the female. Twice as long as wide. Eyes very small. Thoracic segments tapering gradually posteriorly, and also becoming narrower. Segments of the abdomen distinct, single branched pleopoda being present. Uropoda very small and laterally placed. There are no lobed processes on the first abdominal segment.

NOTES.

A widely distributed parasite upon *Upogebia pugettensis*, the sand shrimp.

No lobed processes were found on the first abdominal segment of the male as stated by Richardson.

Genus ARGEIA Dana.

Body of female asymmetrical. Ovarian bosses present on the first four segments. Epimera present on all the segments, and on the first four segments

are lateral to the ovarian bosses, taking the form of narrow plates. The posterior portion of each segment is produced, the length of the processes varying in each individual. The segments of the abdomen are distinctly defined, becoming rapidly narrower posteriorly. The terminal segment is somewhat bilobed. Pleopoda in five pairs; double branched. The outer branches are laterally placed and have the form of long, narrow lamellae; the inner ones are rounded and decrease in size posteriorly. Uropoda simple, similar to the outer branches of the pleopoda. Seven pairs of thoracic legs present. The male has all the segments of the abdomen fused. Pleopoda and uropoda wanting. All seven segments of the thorax distinct. Branchial parasites.

Argeia pugettensis Dana.

Adult female about 8 mm long; over one-half as broad as long; one side usually being better developed than the other.

Head almost as wide as long, slightly bilobed, anterior margin rounded. Eyes lacking.

First antenna possessing two articles; the second four articles. Neither set of antennae are visible from the dorsal surface.

Ovarian bosses on the first four segments; all segments divided into anterior and posterior lobes. The latter are usually irregular and produced into finger-like processes. Epimera present as small plates on all the segments, and on the first four are lateral to the ovarian bosses.

The abdomen has six segments distinct from one another. The anterior five bear double branched pleopoda, of which the outer branches are more elongated than the inner branches and are visible from the dorsal view. There are no lateral projections of the abdominal segments. Uropoda simple, resembling the outer branches of the pleopoda.

NOTES.

No males were found, but according to Richardson (1905) they are narrow, elongate, and symmetrical in outline. Eyes present. The anterior margin of the head is rounded. First antenna has three articles, the second four. Thoracic segments distinct, with the lateral margins straight. All seven pairs of legs prehensile. A single abdominal segment narrower than the thorax and tapering posteriorly is present. Uropoda and pleopoda absent.

Branchial parasites on *Crangon stylirostris* and *C. munita*.

Genus BOPYROIDES Stimpson.

Body of female broad, flattened, somewhat asymmetrical. Abdomen distinctly segmented; lateral parts of segments not developed. Palp of maxilliped well defined. Incubatory plates widely separated, not concealing the entire incubatory cavity and not fully covering the eggs. Distal segment of the first pair not produced into a lobe posteriorly. All seven pairs of legs present. Pleopoda wanting and replaced by fleshy ridges. Uropoda lacking. Male with the segments of the thorax distinct, and those of the abdomen fused. Pleopoda and uropoda lacking. Branchial parasites.

Bopyroides hippolytes (Krøyer).

FEMALE.

Body slightly asymmetrical, quite wide in proportion to length.

Head wider than long, anterior margin very slightly rounded, posterior one much more so. Slight antero-lateral lobes present.

First and second antennae not visible from a dorsal aspect.

Ovarian bosses on the first four thoracic segments, the epimera being very small and lateral to the bosses. On the last three segments the epimera are situated on the anterior portion of the segment.

There are six abdominal segments with straight lateral margins and no lateral projections. The last segment is inconspicuous. Pleopoda rudimentary. Uropoda lacking.

MALE.

Three times as long as broad. Head with the anterior margin rounded. Thoracic segments distinct. Segments of the abdomen fused, bearing no pleopoda or uropoda. First antenna three articles, second four articles.

NOTES.

Cowichan gap upon *Spirontocaris brevisrostris*; Departure bay host unknown.

Tribe ONISCOIDEA.

Legs all ambulatory in character. Uropoda terminal, styliform and composed of a peduncle and two uni-articulate branches. Pleopoda fitted for air breathing, and in the male the inner plate of the first pair, and sometimes of the second pair is modified. There are six distinct segments to the abdomen. First antenna never having more than three articles. Mandible lacking a palp. Maxilla possessing two masticatory lobes. Marsupial pouch consisting of four plates arising from the bases of the second, third, fourth and fifth pair of legs.

Family 1. ONISCIDAE.

Genus PORCELLIO Latreille.

Body oval, slightly depressed, and very slightly contractile. Head with the antero-lateral lobes well developed, and the median-frontal lobe noticeable. Eyes present dorsally placed. Second antenna well developed with a flagellum of two articles. The abdomen has six segments, and the third, fourth, and fifth segments have the lateral margins well developed and produced posteriorly. The terminal segment is produced posteriorly into a pointed process. The inner branch of the uropoda is inserted on the peduncle at, or near the inner antero-lateral angle of the peduncle.

Porcellio scaber Latreille.

Maximum length about 20 mm. The whole dorsal surface is raised into small rounded projections.

Head wider than long, the anterior margin bearing one marked median lobe and two antero-lateral lobes. Eyes small, compound, situated at the bases of the antero-lateral lobes.

First antenna very small and composed of two joints.

Second antenna has a peduncle of five articles; the first is short, the second and third twice as long as the first, fourth twice as long as the third, and fifth longer than the fourth. Flagellum composed of two articles, the basal one being the shorter.

The maxilliped has a palp of three articles.

The segments of the thorax are subequal and there is no indication of epimera.

Abdomen composed of six segments, the lateral angles of the first two being covered by the last thoracic segment. The extension of the terminal segment is rounded posteriorly. The abdomen is not abruptly narrower than the thorax.

The uropoda are longer than the terminal segment of the abdomen, the outer branches extending beyond the posterior end of the body, the inner ones just reaching it.

NOTES.

This form is exceedingly common in the Coast region wherever there is decaying vegetable matter of any kind.

The basal colour is a slate-grey.

Family 2. LIGYDIDAE.

Genus LIGYDA Rafinesque.

Body oval or oblong-oval; abdomen not abruptly narrower than the thorax. Terminal segment broad, with the lateral parts well developed. First pair of antennae with the terminal joints rudimentary. Second pair of antennae strong and elongated; flagella multi-articulate. Maxillary palp with the articles expanded near the joints. Uropod with the basal article not produced at the inner post-lateral angle. Branches subequal, with a single terminal spine on each.

Ligyda pallasii (Brandt).

Usual length 2 to 3 cm. In smaller specimens about one-third as broad as long; in the older ones one-half as broad as long.

Head twice as wide as long, the anterior margin rounded. Eyes large, occupying nearly all of the lateral margin of the head.

First antenna small, consisting of two articles.

Second antenna quite long, with a peduncle of five articles. Of these the first three are quite short, the fourth twice the length of the third, and the fifth one-half the length of the fourth. Flagellum consisting of from twelve to fifteen articles.

The maxilliped has a palp of five articles, which have a ring of bristles near each joint.

The epimera are quite wide, and take up the lateral margins of the last six segments.

The abdomen consists of six segments, of which the third, fourth, fifth, and sixth have their lateral projections well developed and projecting posteriorly.

The uropoda have a flattened basal article from which two stylets are given off.

NOTES.

An intertidal form found on the large rocks on Jesse island at low tide.

The colour varies through all shades of grey to nearly black. Uneven spotting in light yellow is not uncommon. Often specimens which have begun to moult are found with the anterior part of the body distinctly lighter than the posterior part of the body, due to the fact that the anterior covering has been already shed.

Genus *LIGIDIUM* Brandt.

Body more or less oblong, attenuated behind. First antenna small projecting in front, the terminal article being very minute and set in at one angle of the middle joint. Mandible lacking a ciliated lappet behind the cutting surface. Articles of the maxillary palp but little expanded. Abdomen abruptly narrower than the thorax. The lateral margins of the terminal segment not developed. Peduncle of the uropod produced at the inner postero-lateral angle into a process to which the inner branch of the uropod is attached. Branches unequal in length. The inner branch is provided with two slender terminal bristles.

Ligidium gracile (Dana).

Usual length about 12 mm.

Head wider than long, rounded anteriorly.

First antenna consisting of three articles, of which the terminal one is very small.

Second antenna has a peduncle of five articles. First article short transverse, second and third articles longer and equal, fourth equal in length to the third and second together, fifth slightly narrower than the fourth and a little longer. Flagellum consisting of about thirteen articles and equal in length to the last two articles of the peduncle.

Thoracic segments smooth, sub-equal; the postero-lateral angles of the last three segments are pointed and produced backwards. The same angles of the first four segments are rounded.

The abdomen consists of six segments and is narrower than the thorax, gradually tapering posteriorly.

The uropod is over one-half the length of the abdomen and the inner branch is the longer and slenderer. The basal joint of the uropod has a long, slender spine on the outer margin.

The thoracic legs are long and plentifully supplied with spines and setae, their lengths increasing posteriorly.

NOTES.

Vancouver and vicinity, Victoria; under decaying matter and logs in moist places.

Colour a uniform glossy brown.

Family 3. TRICHONISCIDAE.

Genus TRICHONISCUS Brandt.

Body oblong. Head with small lateral lobes. Eyes small composed of three ocelli. Second pair of antennae generally long. Palp of the maxilliped with the four articles confluent. Abdomen abruptly narrower than the thorax. Legs long, slightly increasing in length posteriorly; joint furnished with spines. Inner branches of the pleopods greatly produced and bi-articulate in the male. Basal article of the uropod broad and flattened, each branch terminating in a bunch of hairs.

Trichoniscus papillicornis Richardson.

5 mm. long; 1.25 mm. wide; dorsal surface covered with low tubercles.

Head with large antero-lateral lobes; front produced triangularly, emarginate at the tip. Eyes in the lateral margins of the head at the bases of the antero-lateral lobes.

First antenna rudimentary, not visible dorsally.

Second antenna with a peduncle of five articles; the first three short, and the fourth and fifth longer and equal. The third, fourth, and fifth have numerous hair-tipped tubercles on their inner margins, and the fifth article is produced distally into an acute point. The flagellum consists of five ill-defined articles, terminated by a tuft of hairs.

Buccal mass prominent.

Thoracic segments nearly equal in length, the postero-lateral margins of all but the first being produced backwards. The second, third, and fourth do not show this noticeably, but the margins of the last segment are markedly produced.

Abdomen not as wide as the thorax, and none of the segments are obscured by the thorax. Posterior segment produced into a triangular process with a rounded apex.

Uropod biramous, styliform; basal article enlarged. Outer branch stouter and a little longer than the inner one. Both branches are sparsely tipped with hairs.

NOTES.

As far as could be determined, this specimen is the second individual to be found, the first having been collected by the Harriman Alaskan Expedition at Seldonia, Cook inlet. This specimen had five joints in the flagellum of the second antenna, instead of the seven in the type specimen. Moreover, the branches of the uropods were more slender than illustrated. Apart from the minor differences the descriptions coincide. Only one individual was found in a tide pool at the lagoon in Hammond bay.

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EXPLANATION OF PLATE I.

Paratanais nanaimoensis Sp. Nov.

1. Dorsal view of female. $\times 28.3$.
2. First antenna (female).
3. Second antenna.
4. Gnathopod.
5. Uropod.
6. First antenna (male).

Heterotanaïs melacephala Sp. Nov.

7. Dorsal view of female. $\times 31.6$.
8. First antenna.
9. Second antenna.
10. Uropod.
11. Gnathopod.

Idothea rufescens Sp. Nov.

12. Dorsal view. $\times 4.4$.

Cirolana chiltoni var. *vancouverensis* Var. Nov.

13. Dorsal view of head. $\times 14.2$.
14. Last abdominal segment and uropods. $\times 14.2$.

PLATE I

