4. On the Morphology and Classification of the *Asellota*-Group of Crustaceans, with Descriptions of the Genus *Stenetrium* Hasw. and its Species. By H. J. Hansen, Ph.D., F.M.L.S.

[Received October 17, 1904.]

(Plates XIX.–XXI *.)

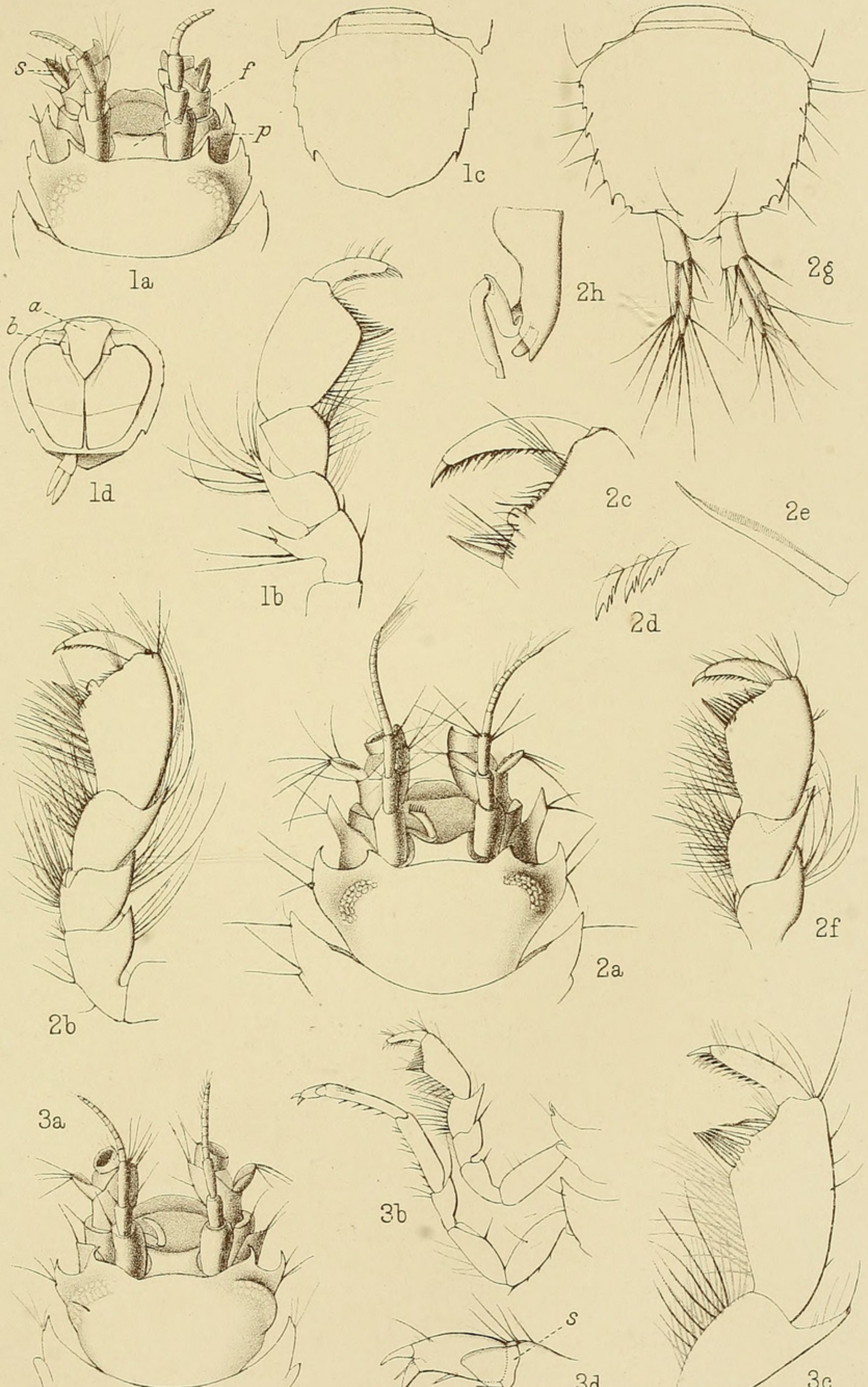
I. *Introductory Remarks.*

The tribe or suborder Asellota is in some respects one of the most varied and, as to the number of species, probably by far the richest of all groups of pre-eminently marine Isopoda. A perusal of the portion in question of Beddard's account of the 'Challenger' Isopoda (Zoology, vol. xvii.), and of G. O. Sars's 'An Account of the Crustacea of Norway,' vol. ii. Isopoda, 1896–99, conveys a fair idea as to the striking differences in general aspect and in some structural features between the numerous genera, among which we find such types as *Asellus* Geoff., *Ianira* Leach, *Munna* Kr., *Dendrotion* G. O. S., *Macrostylis* G. O. S., *Ischnosoma* G. O. S., *Desmosoma* G. O. S., *Munnopsis* M. Sars, *Eurycope* G. O. S. In the work named, Sars describes 42 species referred to 21 genera; Beddard has established 32 species referred to 15 genera, and 8 of these genera are not found in Norway. In order to furnish an instance showing how much remains to be known, I may perhaps state here that from the seas around Greenland, Iceland, and the Färoe Islands, the Copenhagen Museum possesses more than 90 species, of which at least 60 are new to science; the major part of these new forms were secured by the 'Ingolf' in depths between 300 and 1870 fathoms.

Sars refers his 21 genera to five families, but it will be shown below that four of these are almost artificial, as really good characters for their separation are wanting. But this distinguished author has produced a vast number of good figures—with useful descriptions—of all his forms and of details of their dermo-skeleton; moreover almost all really important genera hitherto established of Asellota have been incorporated in his fine work. For these reasons I can often, in the following discussion, refer the reader to his figures as proofs and illustrations for my remarks.

Among the genera not represented in the Norwegian fauna, *Stenetrium* Haswell is the most aberrant and important. Of this genus five species have been established by four authors, but our knowledge of several essential points of its structure, especially of the pleopoda, is still imperfect. Most of the figures of *S. antillense*, sp. n., were drawn by me more than fifteen years ago, but publication was, however, postponed, which proved to be fortunate, as new and interesting species have been received in

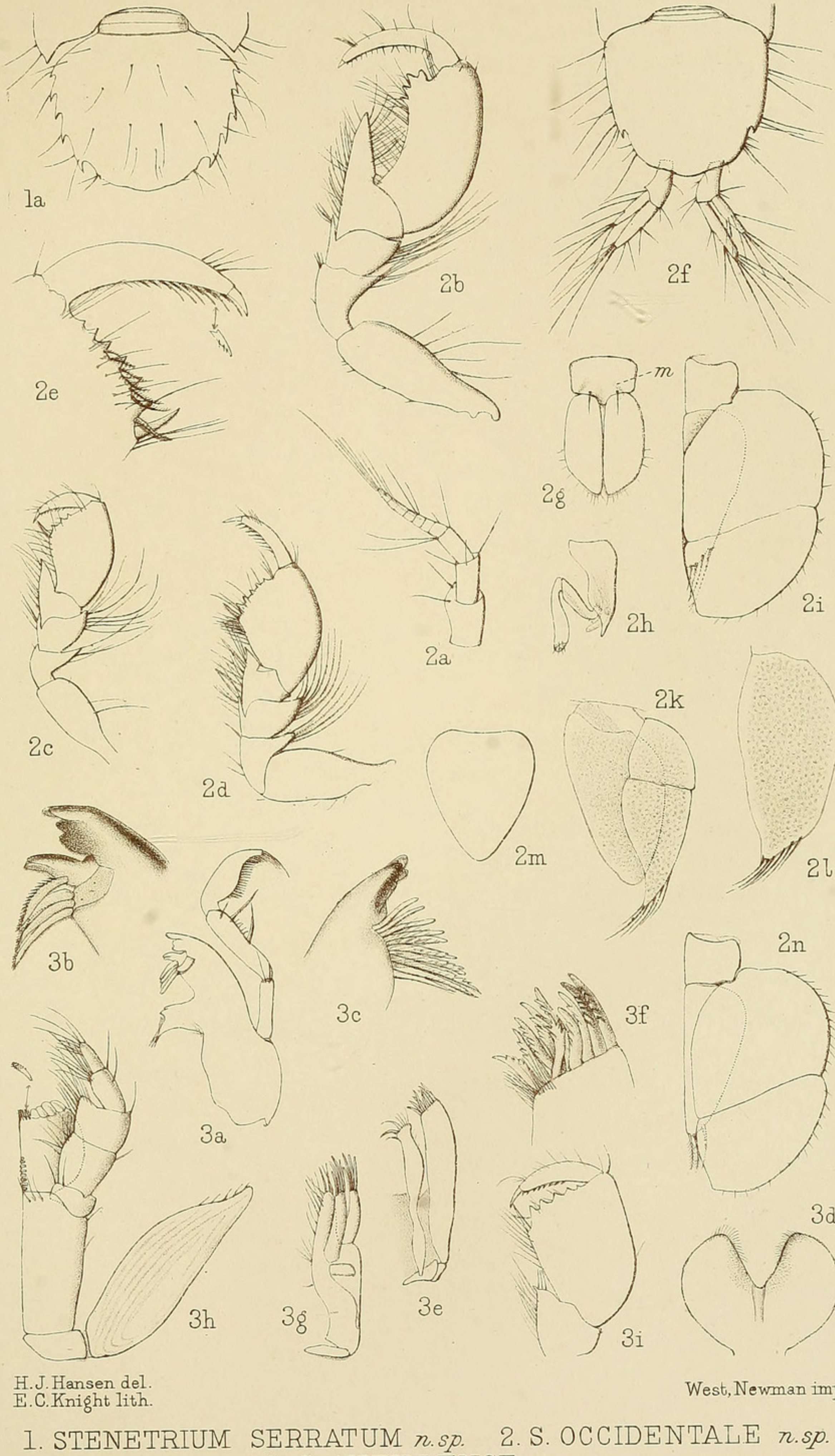
* For explanation of the Plates, see p. 330.



H. J. Hansen del.
E. C. Knight lith.

West, Newman imp.

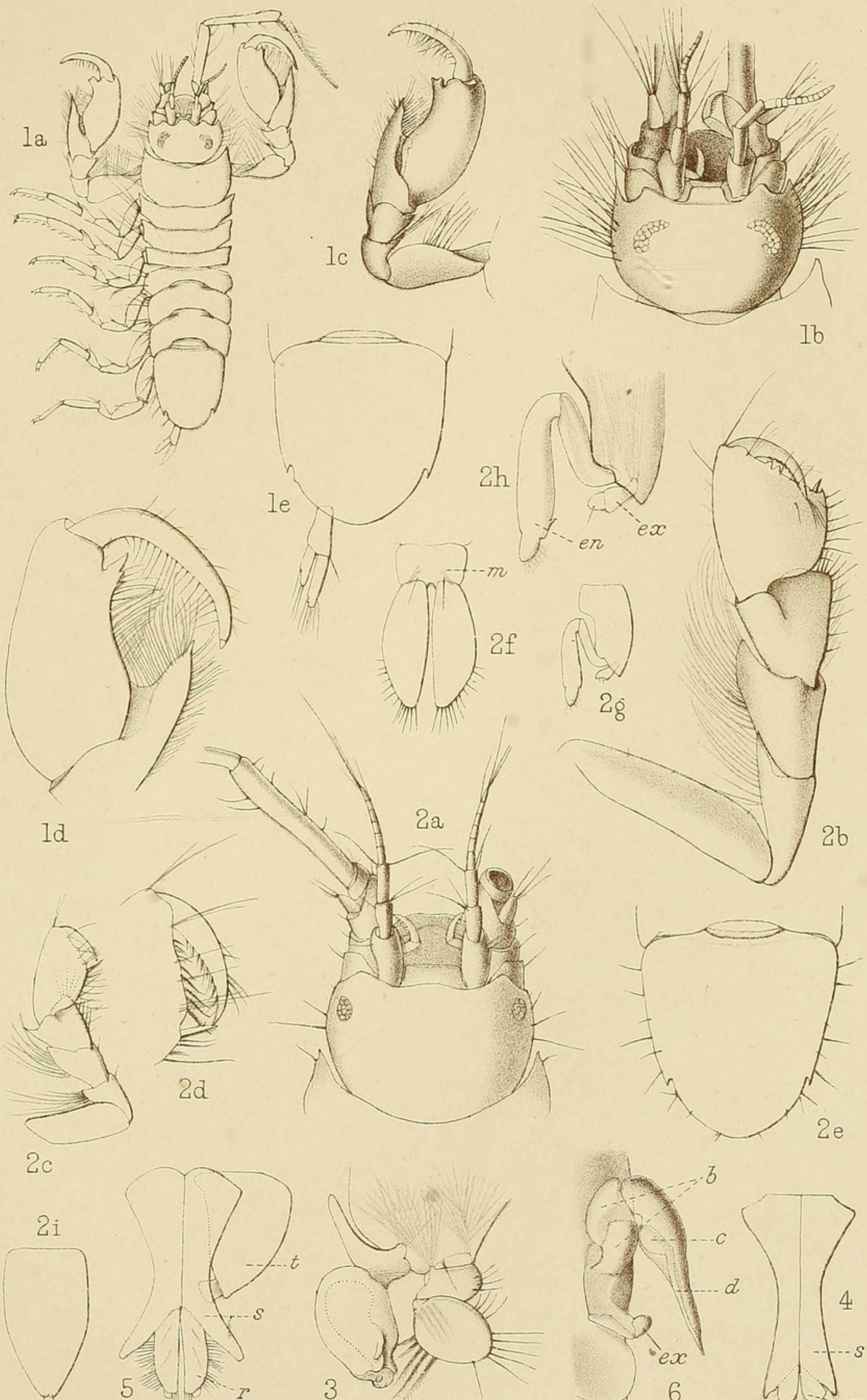
1. STENETRIUM ARMATUM *Hasw.* 2. S. MEDITERRANEUM *n. sp.*
3. S. SERRATUM *n. sp.*



H. J. Hansen del.
E. C. Knight lith.

West, Newman imp.

1. STENETRIUM SERRATUM *n. sp.* 2. S. OCCIDENTALE *n. sp.*
3. S. ANTILLENSE *n. sp.*



H. J. Hansen del.
E. C. Knight lith.

West, Newman imp.

1. STENETRIUM ANTILLENSE *n. sp.* 2. S. SIAMENSE *n. sp.*
3-6. VARIOUS ASELLOTA.

later years. In the following pages I describe six species examined by myself of this type, five of which are considered new to science. Having now such a rich material of an important and imperfectly known genus at my disposal, I thought it appropriate to work it out; besides, I seize the opportunity of elucidating some points of the morphology of the pleopoda in other Asellota, and discussing the classification of the whole group.

II. *Description of the Genus* Stenetrium *Hasw.*

Body oblong, three or four times as long as broad, rather depressed, shaped nearly as in *Ianira*.

Head with the dorsal surface much broader than long; in advance of the anterior margin is seen a transverse area, the frontal plate (Pl. XIX. fig. 1 *a*, *f*), between the insertions of the antennulæ. When the head is stretched forward a large, sloping, anteriorly rounded part is seen in advance of the frontal plate; this area is clypeus and labrum, and when the mandibular palps are in their natural position the distal part of their second joint and the whole third joint are observed on the surface of the clypeus. Eyes always distinct, but varying much as to shape, size, and situation.

Antennulæ from somewhat shorter to a little longer than the breadth of the head. Peduncle three-jointed; basal joint oblong but rather thick, longer and much thicker than any of the two others. Flagellum varies much in length and number of joints.

Antennæ nearly as long as or a little longer than the body, very similar to those in *Ianira*. The peduncle consists of four short and two long joints: the first joint is always well developed (and shows excellent specific characters); third joint on the outer side with an exopod which is a subtriangular, oblong, setiferous plate, with the lateral parts bent inwards.

Mouth-parts essentially as in *Ianira*. Mandibles (Pl. XX. fig. 3 *a*) moderately long; lacinia mobilis of the left mandible (fig. 3 *b*) consists of a thick, long, movable process and a few very broad, long, a little curved setæ, pectinate with exceedingly short teeth along their anterior margin; one of these setæ proceeds from the process itself near its base; the articulating membrane is broad on the lower side. Lacinia mobilis of the right mandible (fig. 3 *c*) shows a number (in *S. antillense* about ten) of very thick setæ, nearly all with saw-teeth. Mandibular palp well developed, three-jointed; terminal joint rather broad and long, with a comb of numerous fine setæ. Hypopharynx (paragnatha) (Pl. XX. fig. 3 *d*) rather deeply bifid; each half has the inner margin nearly straight and clothed with fine bristles on its distal part; the anterior angle rather rounded and the outer margin very convex.—Maxillulæ (fig. 3 *e*) slender; the inner lobe terminates in three curved, thick, plumose setæ; outer lobe (fig. 3 *f*) with a good number of very thick, curved spines, coarsely serrate along at least one margin. Maxillæ (fig. 3 *g*) nearly as long as the maxillulæ, rather slender; the lobe from the second joint oblong, as long as the two lobes from the third joint. Maxillipeds (fig. 3 *h*) large; second joint—the lobe not taken into consideration—very large, more than twice as long as broad, its lobe, which is marked off by a transverse suture, is large, longer than broad, with several small hooks at the inner margin, while the distal margin is cut off and furnished with several short setæ, some of which are very broad, scale-like; fourth and fifth joints rather expanded; the two distal joints slender. Epipod very long, about three times longer than broad. Basal joint in the adult female without any leaflet directed into the marsupium.

Thorax shaped nearly as in *Ianira*; anterior lateral angle of first segment always produced into a triangular, acute, flat process directed forward *. First pair of legs terminates in a prehensile hand, the sixth joint being large, compressed, with the palmar margin armed with processes or remarkable spines or setæ, while the seventh joint together with its short terminal claw is slender and claw-shaped; this hand shows sometimes rather little, but often a highly developed, sexual difference, being frequently not only much larger in the adult male than in the female, but of quite another shape. The six other pairs of legs essentially as in *Ianira*; seventh joint terminates in a claw, beneath which a spine of the same size is seen. Marsupial lamellæ four pairs, proceeding from first to fourth pair of legs.

Abdomen essentially as in *Ianira*; two rudimentary segments are observed in front of the large abdominal shield; the latter has at the end of each lateral margin a small notch, the outer margin of which is formed by a sharp triangular tooth.

Pleopoda are exceedingly characteristic †. In both sexes the third pair is only to a very small extent (Pl. XIX. fig. 1 *d*) covered by the first pair (in the female) or the two anterior pairs (in the male); its sympod is rather small, quadrangular (Pl. XX. figs. 2 *i* and 2 *n*); the two-jointed exopod is exceedingly large, scarcely respiratory, and covers the respiratory endopod, which is unjointed and several times smaller; the inner margin of each exopod is straight, and the two exopods touch each other along the mesial line, constituting together a kind of operculum which covers the lower surface of abdomen, with the exception of a moderately broad margin at the sides and behind, and a small portion in front occupied by the anterior pleopoda. In the female the pleopoda of the first pair are completely fused (Pl. XX. fig. 2 *m*; Pl. XXI. fig. 2 *i*), constituting a subtriangular more or less oblong operculum, which is at least three times smaller than an exopod of the third

* According to Haswell this process is wanting in *S. inerme* Hasw., but in the sequel it is shown that this species probably does not belong to the genus *Stenetrium*.

† In Section V. of this paper the comparative morphology of the pleopoda in the Asellota is discussed; in this account of *Stenetrium* and in Sections III. and IV. the structure of the pleopoda is described and the interpretations applied without explanations.

pair of pleopoda. Second pair is wanting, as in all Asellota. In the male the first pair (Pl. XX. fig. 2 *g*; Pl. XXI. fig. 2 *f*) is slightly longer and at the base narrower than the female operculum; the sympods of the two appendages are completely fused with each other, forming a short, transverse plate; each pleopod has one ramus, which is free, oblong, and between two and three times longer than the sympod; each ramus can be moved a little by a tiny muscle (*m.*) in the sympod. The second pair is a good deal smaller than the first; each appendage (Pl. XX. fig. 2 *h*; Pl. XXI. fig. 2 *g*) consists of an oblong subtriangular plate, the sympod, the inner margin of which is sinuate, and from the distal end of this margin arise the two rami. The exopod is very small, slender, a little curved, scarcely hook-shaped, one-jointed, but in *S. siamense* (Pl. XXI. fig. 2 *h*, *ex.*) a vestige of a division into two joints is observed. The endopod is rather long, very slender, two-jointed, and strongly geniculate in the articulation (Pl. XXI. fig. 2 *h*, *en.*); the proximal joint contains a muscle for the movement of the second, which has no internal cavity, while its end is obtuse and often furnished with a brush of exceedingly short bristles; especially in *S. antillense*, the terminal portion bearing this brush is distinctly marked off from the joint. The plate-shaped sympod contains muscles to the rami, two to the endopod, and at least one to the exopod. The two pleopoda of this pair touch each other at their base; they are covered by the first pair. In both sexes the pleopoda of the fourth pair (Pl. XX. fig. 2 *k*) are similar as to size and structure; each has a short, broad sympod and a two-jointed exopod, which is slightly longer and somewhat broader than the unjointed endopod, and adorned with plumose setæ along the distal part of the outer margin; both rami are lamellar and both seem to be respiratory. The fifth pair (Pl. XX. fig. 2 *l*) has no discernible sympod and only one ramus, which is large, unjointed, but otherwise shaped and adorned with setæ like the exopod of the preceding pair, and accordingly it is in all probability the exopod itself.

Uropoda consist of an unjointed sympod and two unjointed nearly styliform rami; the exopod is as long as or longer than the sympod, nearly as long as or somewhat shorter than the endopod.

III. *Comparison between the Genera* Stenetrium *and* Asellus.

Pl. 39 in Sars's work is filled with figures of *Asellus aquaticus* L. I can therefore refer to his good drawings, and give only a new figure of the second male pleopod.

The essential differences between *Asellus* Geoff. and *Stenetrium* Hasw. are found in the antennæ, the maxillipeds of the adult female, and some of the pleopoda. The peduncle of the antennæ shows the same number of joints in both genera, but in *Asellus* the exopod from the third joint is wanting. In *Asellus* the basal joint of each maxilliped possesses in the ovigerous female a rather large plate, bearing a number of bristles at the end and directed backwards; it has been mentioned and well drawn by Sars; its function is certainly to produce a current in the water of the marsupium.

The pleopoda show, however, some more interesting features. As in *Stenetrium*, the three posterior pairs in the male do not differ from those in the female; the very large two-jointed exopods cover, as in *Stenetrium*, not only the small respiratory endopods but almost the whole lower surface of the abdomen, and are freely exposed with the exception of a rather small basal portion. The fourth and fifth pairs are essentially alike, both consisting of a short sympod and two rami, viz. a two-jointed exopod, somewhat larger than the unjointed endopod; consequently we have here a well-marked difference in the fifth pair between *Stenetrium* and *Asellus*, as in the former genus the exopod—according to my interpretation above—is unjointed and the endopod wanting. In the female the pleopoda of the first pair are not fused as in *Stenetrium*, but independent and originate rather distant from each other; each pleopod consists of a nearly rudimentary sympod and a moderately large circular plate distally edged with plumose setæ. In the male each appendage of the first pair consists, as in *Stenetrium*, of a short sympod and a much longer suboval, movable ramus; but while in the latter genus the two sympods are completely fused, they are free in *Asellus*, but yet furnished with some hooks * along their inner margin, so that they can be coupled together nearly as the second joint of the maxillipeds. The second pleopoda in the male are interesting; the distal half of the left sympod with its rami is shown from below in Pl. XXI. fig. 3. The sympod is shortly oval, with both rami proceeding from its end and containing strong muscles for their movement. The exopod is oblong, nearly lamellar, only a little shorter than the endopod, two-jointed; the distal joint is somewhat larger than the basal one, obliquely oval, with marginal setæ and containing a good-sized muscle. The endopod consists of two movable joints; the proximal joint is short, but produced into a long, slender, curved process, turning inwards and forwards along the inner margin of the sympod; it contains a small muscle to the second joint. This is obliquely oval, its distal end rather rounded, but near the end a few minute teeth and irregular incisions and depressions are seen; the joint is besides inflated, and the major portion of its interior is occupied by a large pear-shaped sac, which opens at a short distance from the end of the joint; the wall of this sac is well chitinised. Having removed by dissection the major part of the wall of the joint itself, I was able to examine the wall of the inner sac. In the female second pleopoda are wanting.

Before attempting to decide as to the systematic importance of the differences between *Stenetrium* and *Asellus*, it may

* Each hook is a very thick and rather short spine, the end of which is broadly rounded, curved very slightly upwards, and the upper surface of its terminal portion is set with from seven to ten tiny, sharp, oblong teeth.

be appropriate to discuss the structure of the other Asellota, especially their pleopoda. It may be added that, according to descriptions given by S. I. Smith and A. S. Packard, the two genera *Mancasellus* Harg. and *Cæcidothea* Pack. are closely allied to *Asellus* in the structure of antennæ and pleopoda, the essential difference being that the endopod of the second male pleopod has no process from the basal joint.

IV. *On the Structure of the* Asellota, Asellus *and* Stenetrium *excepted.*

Some years ago A. Dollfus described and figured (Bull. Mus. d'Hist. Natur. Paris, 1898, no. 1, p. 37, figs. 2 & 2 *a*) a very curious animal, *Stenasellus virei* Dollf.; unfortunately he had only one minute and mutilated specimen from fresh water in the Cévennes. He refers the genus to the Asellota. His description together with the two figures are certainly sufficient for the recognition of the species, but not for deciding the question of the relationship of the genus. The uropods are as in the Asellota, and the four thoracic legs figured are, so far as can be seen, not very different from those in *Ianira*; but the animal differs from all Asellota in two features. The author says: "Cephalon intimement uni au premier segment pereial," which is not the case in any form of the Asellota hitherto known. The other feature is in the structure of the abdomen. Dollfus writes: "Pleon à trois premier segments très developpés"; this agrees well with his figures, which show the abdomen as consisting of an oblong "pleotelson" and three segments; these latter are slightly narrower than, and their sum at least half as long as, the posterior undivided portion. But this abdomen differs much from that met with in any of the Asellota or any other group of Isopoda. In Dollfus's description we find as to the pleopoda only the statement that they are "narrow," and they are nearly invisible in his figures; besides, he does not mention the mouth-parts. Judging from all these circumstances I thought that *Stenasellus* could not be referred to the Asellota, and in the manuscript despatched to London in October I added some further critical remarks. But at the end of November Dr. Armand Viré, the ardent explorer of French caves, most kindly presented me with three specimens of *Stenasellus virei* captured in August 1904. An examination of these specimens showed that the abdomen has only two free segments in front of the large "pleotelson," and that the animal, in spite of some differences, is rather allied to *Asellus* in the structure of the mouth-parts and the pleopoda. I communicated my conclusions to Dr. Viré, who allowed me to make the necessary corrections in the proof, for which I beg him to accept my sincere thanks. I will therefore state that *Stenasellus* differs from other Asellota in having the head fused with the first thoracic segment, in having the two anterior abdominal segments well developed, while these are rudimentary in the Asellota (for instance in *Stenetrium*), and in a few other points. It must, in my opinion, be established as a subfamily of the Asellidæ, but I will leave to my friends Dr. Armand Viré and Mr. Adrien Dollfus the further examination of the structure of this most interesting type.

Having thus discarded *Stenasellus*, and omitting *Asellus* (*Mancasellus*, *Cæcidothea*) and *Stenetrium*, we shall now consider the remaining portion of Asellota, which comprises, I think, about thirty genera, twenty of which are found in Norway. Sars divides all Asellota into five equivalent families: Asellidæ, Ianiridæ, Munnidæ, Desmosomidæ, and Munnopsidæ. A perusal of Sars's account and of Beddard's 'Challenger' work will show that the genera which have been—or must be—referred to the four latter families present great differences in the shape of the body, in length and shape of the thoracic legs and their coating of spines or setæ, in the degree of development of the uropoda and similar features, but of more essential differences between these four families scarcely one is to be found. The peduncle of the antennæ is six-jointed; the exopod is sometimes rather large, sometimes rudimentary or absent. In the shape of the mandibles the differences between the genera decidedly allied to each other, and by Sars referred to his Munnopsidæ, are considerably larger than those which can be pointed out between the families. The other mouth-parts present no difference worth mention. The thoracic legs show frequently excellent generic characters, but the differences are so gradually developed that they are valueless as distinguishing characters between the families. I will refer the reader to the good figures given by Sars of the posterior pairs of legs and their development as natatory organs in *Echinopleura*, *Desmosoma*, *Pseudarachna*, and *Munnopsis*. The two former genera are referred to Desmosomatidæ, the two latter to Munnopsidæ; but the development of the legs as natatory organs is gradual, and the difference between these legs in *Pseudarachna* (with their seventh joint long) and *Munnopsis* (with seventh joint wanting) of the same family is conspicuously larger than between *Pseudarachna* and *Desmosoma*, which are referred to different families. The differences in the uropoda are only of generic value.—The pleopoda show great uniformity in the genera and families, but must be treated more in detail.

In the females of the four families recognised by Sars, the lower side of the abdomen, a more or less broad margin excepted, and the three posterior pairs of pleopoda are covered by a more or less vaulted operculum which does not show any suture; it is the first pair of pleopoda. The second pair is wanting. The third pair has always both rami; the exopod is sometimes small and unjointed, sometimes larger and two-jointed, in most cases it is situated along the margin of the endopod, but sometimes it overlaps a smaller or larger portion of this plate; furthermore, the difference in size between endopod and exopod is always at least considerably smaller than in *Asellus* or *Stenetrium*, and the two exopods do not constitute together a kind of operculum as in the two last-named genera. The fourth pair of pleopoda possesses, at least generally, perhaps always, both rami, while the fifth pair has never more than one ramus, in all probability the exopod. In the males of the same four "families" the two anterior pairs of pleopoda constitute together a kind of large operculum, which consists of three separate plates coupled together; generally this operculum covers completely the three posterior pairs of pleopoda, but in an undescribed form—rather similar to *Ianira*—from the Southern Atlantic it reaches beyond the hind margin of these pairs, but laterally the major portion of the exopod of the third pair is left uncovered; it may be added that this exopod is longer but narrower than the corresponding endopod, and does not cover half of its area. The central plate of the operculum (Pl. XXI. figs. 4 & 5) is long, of various breadth, with the lateral margins more or less concave; it has a conspicuous suture along the middle, and is more or less cleft at the end; each half consists of the same parts as in *Stenetrium*, viz., an unjointed sympod (*s.*) and an unjointed ramus (*r.*). The two sympods are very long and coalesced with their inner margins; each of them has the posterior lateral angle produced so that a triangular more or less deep incision is seen between their distal parts. The ramus mentioned is attached to the oblique or sinuate posterior margin of this produced portion, often, as in *Ianira*, rather well marked off from it, sometimes, as in *Eurycope gigantea* G. O. S., fused with it so completely that a limit between them can be traced only at their distal end. The rami are not coalesced with each other, but are at most united by membrane in their proximal part. Each lateral part of the operculum consists of a large plate with the outer margin convex, the inner nearly straight or somewhat concave: this plate is the distal joint of the sympod, which has the two movable rami attached to the distal part of the inner margin, and contains muscles for their movement; in *Ianira* I found, besides, a very short part which, I think, must be a proximal joint of the sympod. The endopod is rather slender, strongly geniculate, typically two-jointed; the basal joint is directed forwards, contains a muscle to the second joint, and at least sometimes, as in *Eurycope gigantea* G. O. S. (Pl. XXI. fig. 6, *b.*) it is divided again into two joints. The distal joint is directed backwards, curved and always produced into a point; often it is long, with the distal part extremely slender; in *Munnopsis typica* M. Sars it is even more than half as long as the whole animal, reaching far beyond the abdomen, and this uncovered portion is setiform, The joint contains a pear-shaped or very oblong cavity (Pl. XXI. fig. 6, *c.*), which continues into a narrow duct (*d.*) opening at the end of the joint. The exopod (*ex.*) is very short, two-jointed; the distal joint is shaped as a hook, the function of which is to couple the appendage with the sympod of the first pair of pleopoda; on the upper (posterior) side of the sympod an impression and a ridge is formed for the reception of this hook. The three posterior pairs of pleopoda in the male are exactly as in the female.

Before concluding this account an apparent exception may be mentioned. In Sars's work pl. 50 is filled with drawings of *Nannoniscus oblongus* G. O. S. The author figures two animals which he believes are female and male of the same species. On the figure representing the male abdomen from below is seen a large undivided operculum. In the text he says (p. 120): "It is a very remarkable fact, that the operculum in neither of the two specimens examined showed any trace of the usual transformation, though the male character of the specimens otherwise could easily be demonstrated, both by the greatly projecting sexual prominence, and by the presence of well-developed testes shining distinctly through the integuments in their usual place. In the Caspian species, on the other hand (of which as yet only a solitary male specimen is known), the sexual characters were quite normally displayed." But such differences between the males of species belonging to the same genus do not exist; the second pair of pleopoda with its complex organisation for copulation is not wanting in the male of one species, and highly developed in the male of another species of the same genus. What Sars considers to be the male of *N. oblongus* is in reality a female of another species: I cannot account for the nature of the structure interpreted by him as testes, but the large spine in front of the operculum has nothing to do with the "sexual prominences" of the seventh thoracic segment in a male. I may add that I am very well acquainted with the genus *Nannoniscus*; chiefly from the 'Ingolf' our Museum possesses examples of about ten species, all with the globular or ovate organ at the end of the antennulæ also found in the two species described by Sars as *N. oblongus* G. O. S.

V. *Morphological Interpretation of the Pleopoda in* Asellota.

In the three preceding sections the pleopoda and their parts are mentioned as if the names applied had been generally used or accepted by carcinologists, but it is far from being so. Some of the interpretations are new, others not generally accepted; for these reasons it may be useful to give a comparative review of this subject.

I must admit that I have not looked through many of the descriptions of pleopoda scattered in the literature of the last fifty years or more in order to be able to point out that an author, in the description of a genus or a species, might have proposed one or another of my interpretations; but I am sure that the major part of them are either new or set forth in some of my earlier papers. In the account of the Crustacea in 'Dijmphna-Togtets zoologisk-botanisk Udbytte,' Kjöbenhavn, 1887*, I gave a detailed description (with figures) of *Eurycope gigantea* G. O. S.; on p. 202 I stated that the three parts of the male operculum are respectively the fused first pair and the endopods of the second

* I had received and distributed separate copies of my paper in this work by the middle of July 1886.

pair of pleopoda; the latter interpretation is not correct, each lateral plate being not the endopod but the sympod, bearing its two rami; furthermore, I described the three-jointed copulatory organ and the two-jointed hook, but did not perceive that they are the rami of this appendage. In 'Isopoden, Cumaceen und Stomatopoden der Plankton-Expedition,' 1895, I wrote (p. 6):—"Ich habe *Ianira* Leach, *Iolanthe* Bedd., *Iaera* Leach, *Munna* Kr., *Pleurogonium* G. O. S., *Macrostylis* G. O. S., *Munnopsis* M. Sars und *Eurycope* G. O. S., welche Sars in seinen 3 Familien vertheilt, sammt *Asellus* Geoffr. und eine vermuthlich zu *Stenetrium* Hasw. gehörende westindishe Form, untersucht. Alle die erstgenannten 8 Gattungen weichen nun gründlich in dem Bau der Pleopoden von den zwei letztgenannten ab, die sich ziemlich nahestehen. Bei den ersten 8 Gattungen findet man folgenden Bau: Bei dem Männchen bildet das 1. und 2. Paar Pleopoden zusammen einen grossen, festen, aus drei Theilen bestehenden Deckel, der vollständig die drei folgenden, zum Athmen eingerichteten Paare bedeckt (der Deckel entsteht dadurch, dass das 1. Paar zu einer schmäleren Mittelplatte zusammen gewachsen ist, während das 2. Paar die breiten, mit Paarungsorganen versehenen Seitenplatten bildet); bei dem Weibchen bildet das 1. Paar einen mächtigen, ungetheilten Deckel für das 3. bis 5. Paar, während das 2. Paar gänzlich fehlt. Bei *Asellus* und *Stenetrium* wird der Deckel bei beiden Geschlechtern von ganz andern Elementen gebildet, nämlich von den Aussenästen der 3. Paare von Pleopoden; diese Aussenäste sind nämlich zu mächtigen Platten entwickelt, die in der Mittellinie zusammenstossen und vollständig den kleinen Innenast und die beiden folgenden Pleopodenpaare decken; bei dem Männchen befinden sich vor diesem Deckel 2 kleine, freie Pleopodenpaare, das 2. Paar mit den Paarungsorganen; bei dem Weibchen fehlt das 2. Paar, während sich das 1. Paar in Form von 2 kleinen, freien Platten vorfindet." The last sentence in this quotation is erroneous as to *Stenetrium*; otherwise the whole passage is correct, so far as it goes.—In his recent work on the Isopoda G. O. Sars says (p. 96):—"A closer examination of this compound operculum [in the males of most Asellota] will, however, soon show, that the suggestion at first put forward by Dr. Hansen is quite correct." He then gives an abstract of my results, already quoted here, and continues: "By such an explanation, indeed, more uniformity is obtained, as to the number of appendages of the metasome, which, in fact, is the very same in all Asellota, viz., 4 pairs in the female, and 5 pairs in the male, the additional pair constituting the copulative appendages." Sars is thus inclined to follow me as to these questions, but on the plates (39 and 40) with figures of *Asellus* and *Ianira* he names the third pair of pleopoda plp^2, the fourth pair plp^3; he goes even so far that on the plates (43 and 44) with *Iaera* and *Munna boecki* he marks the third pair plp^1, the fourth pair plp^2, &c., but this is inconsistent and rather confusing.

It cannot be denied that in all Asellota we have five pairs of pleopoda in the male, but only four pairs in the female. Furthermore, the third pair in the male is shaped exactly as that pair which in the female follows the operculum; the penultimate pair in the male is exactly like the penultimate in the female, but differs from the preceding and from the last pair. We must therefore conclude that the three posterior pairs in both sexes are homologous. That the undivided operculum found in all genera, *Asellus* excepted, in the female is homologous with the first pair in the male, must be concluded from the fact that in all these genera the two appendages constituting this pair in the male have their sympods coalesced or, as in *Stenetrium*, completely fused. The second pair, which in the male bears the copulatory organs, is therefore wanting in the female.

Next, the interpretation of the parts constituting the two anterior pairs in the male must be considered. *Asellus* presents the best starting-point. That the two joints of the first pair in this animal are respectively the distal joint of the sympod—its two proximal joints having disappeared—and one of the rami must, I think, be admitted, and is easily seen from comparison with *Cirolana*, *Æga*, &c., but it is impossible to decide whether the distal joint, the ramus preserved, is the endopod or the exopod. The second pair in *Asellus* is easy to interpret: each appendage consists of the sympod with the two two-jointed rami proceeding from its distal end; no other interpretation is possible, but the result is that it is the endopod itself which is transformed as a kind of copulatory organ, with a cavity in the interior of its distal joint.

Let us, then, look at the first pair of the male in other Asellota. In *Stenetrium* (Pl. XX. fig. 2*g*) the sympods are fused, and the plate thus formed bears two unjointed rami, but, as in *Asellus*, it is impossible to decide whether they are the endopods or the exopods. Comparing this structure with that in *Ianira* (Pl. XXI. fig. 5), and especially in the undescribed genus (Pl. XXI. fig. 4), it must be admitted that the distal pair of lobes marked off by oblique lines from the long proximal plate must be the rami found in *Asellus* and *Stenetrium*.

Finally, we must consider the second pair of the male in *Stenetrium* and other Asellota. As in *Asellus*, we find a sympod with two rami, the essential difference being that these rami proceed not from the end but from the inner margin of the sympod. The most distal ramus, which in all genera, *Stenetrium* excepted, is shaped as and performs the function of a hook, is therefore the reduced exopod; as in *Asellus* it is always two-jointed, *Stenetrium* excepted, but even in a species of this genus a vestige of a division into two joints is discernible. The copulatory organ is the endopod; as in *Asellus* it is two-jointed—in *Eurycope* I found the basal joint divided again into two joints (Pl. XXI. fig. 6)—and the distal joint has an internal cavity, *Stenetrium* excepted. (Beddard, in his 'Challenger' Isopoda, has already correctly interpreted the rami as endopod and exopod in *Stenetrium* and *Ischnosoma*.) It can be added that we have now found the key to the interpretation of the endopod of the second pair of pleopoda in the male of other Isopoda. In *Idothea*, *Sphæroma*, *Cirolana*, *Cymothoa*, &c., this endopod is generally described as an undivided plate with an "appendix masculina" articulated at its inner margin: *this plate is the first, the "appendix" the second joint of the endopod.* This endopod is therefore two-jointed in all Isopoda, Epicaridea and Gnathiidæ excepted; but in most forms only the second joint is transformed, the first being large and lamellar like that of the first or the third pair, while in Asellota and Oniscidæ both joints are narrow.

VI. *The Classification of the* Asellota.

The tribe or suborder Asellota is very sharply defined from all other Isopoda, but its subdivision into families is a matter of considerable difficulty. As already stated, G. O. Sars in 1897 divided the Asellota into five families, but four of these are far from distinct from each other; moreover, other objections can be raised. His family Desmosomatidæ is in reality a rather mixed company: such genera as *Macrostylis* and *Ischnosoma* differ strongly from each other in most features; *Nannoniscus* and especially *Ischnosoma* are far from being closely related to *Desmosoma*, &c. I have, for the rest, already, on p. 308, pointed out several difficulties as to these four families; it may be added that from the 'Ingolf' we have several new forms which differ rather or very considerably from the genera of Sars, so that an attempt at arranging them within his families will aggravate the state of things. When nature has not worked out groups well-defined from each other we can of course subdivide a tribe or suborder into families, founding them on some points in the general aspect of the animals, but their number and limitation must then be a matter of personal opinion, and many other authors will propose the establishment of other or of new families not better than those first erected. It is, in my opinion, *to be preferred to keep a very large group of genera in the same family, a large number of species in the same genus, than to subdivide respectively the family or genus into families and genera with new names, when sharp lines of distinction are not to be found in nature.*

It is well-known that differences in the structure of the abdominal appendages are among the most important characters for dividing the order Isopoda into tribes or main-families. That considerable importance must be ascribed to the above-named differences in the structure of the pleopoda in *Asellus*, *Stenetrium*, and other Asellota, will probably be admitted, these differences being much sharper than those met with in any other external organ. In the Plankton paper I wrote in 1895 the long passage quoted above on differences in the pleopoda between *Asellus* and *Stenetrium* on one side, and several other genera of Asellota on the other, and continued:—"Es ist anzunehmen, dass alle existirenden Gattungen in die eine oder die andere dieser zwei nach äusserst scharfen Kennzeichen getrennten Gruppen eingefügt werden können, welche also die 2 Familien bilden, in welche die

Asellota am besten getheilt werden können." But two years later Sars added very much to our knowledge of numerous genera of Asellota; furthermore, in 1895 I saw a very large number of undescribed forms—among which several new genera—unknown to me, and received and studied more closely many examples of *Stenetrium*. The question as to the classification of the Asellota can therefore now be reconsidered on a broader base.

Putting *Stenetrium* aside, it will probably be admitted that the differences in the pleopoda between *Asellus* (with *Mancasellus* and *Cœcidothea*) and other Asellota would justify the division of the Asellota into two families. But the structure in *Stenetrium* gives rise to considerable difficulty. Both in *Stenetrium* and *Asellus* the two anterior pairs of pleopoda in the male and the first pair in the female are quite small, and overlap only a small proximal portion of the following pair, the exopods of which are very large and constitute a complete covering for the respiratory lamellæ; furthermore, in the second pair of the male the end of the endopod is blunt and the exopod not developed as a hook for coupling together the two anterior pairs.

In all other Asellota the first pair in the female is very large and covers the following pairs completely; in the male the two anterior pairs constitute together a large operculum formed by coupling of three plates, which cover the following pairs in their whole length and, with a single exception, also in their whole breadth; the exopods of the third pair are, therefore, generally invisible, in the instance alluded to partly visible from below at the side of the operculum, but in this animal (Plate XXI. fig. 5) they are yet of moderate size, and their inner margin rather distant from the mesial line; furthermore, in the second pair of the male the end of the endopod is acute, the exopod hook-shaped and adapted for coupling. On the other hand, *Stenetrium* differs from *Asellus* and agrees rather well with other Asellota in some particulars, viz.: in the male the sympods of the first pair of pleopoda are fused with each other, and the rami of the second pair are attached to the inner margin of the sympod; in the female the pleopoda of the first pair are fused with each other, in both sexes the last pair has only one ramus. The genus is distinguished among all other Asellota by the curious feature that the endopod of the second pair in the male is without an internal cavity in its distal joint.

That *Stenetrium* differs less than *Asellus* from the other Asellota is thus easily seen, and the question arises as to the systematic importance of the differences and similarities. Ought *Stenetrium* to be placed together with *Asellus* or established in a family of its own? Considering all particulars, I am now inclined to prefer the latter alternative. The Asellota will therefore be divided into three families—Asellidæ, Stenetriidæ, n. fam., and Parasellidæ, n. fam.

The first-named family comprises the genera *Asellus* Geoffr., *Mancasellus* Harg., and *Cœcidothea* Pack.; the second family only its single genus; the Parasellidæ all the other genera of Asellota.

Diagnoses of these three families may now be given :—

A. Asellidæ.

First pair of pleopoda in the male small, the sympods free, very short, together much broader than long, with coupling-hooks along their inner margins; rami (only a single pair) movable, much longer than the sympods.—Appendages of same pair in the female attached rather far from each other, each consisting of a minute sympod and a circular ramus of moderate size and edged with setæ.—In both sexes this pair overlaps only a small basal portion of third pair.

Second pair in the male small, situated above and not coupled with the first pair. Rami attached to the distal margin of the sympod; endopod not geniculate, its distal joint inflated, containing a large cavity and its end obtuse; exopod nearly as long as the endopod, its distal joint movable, lamellar, with marginal setæ.

Third pair in both sexes has the exopods very large, touching each other along the mesial line, and constituting a complete covering for the endopod and the following pairs ; this operculum is freely exposed except at the base.

Fifth pair with endopod and exopod well developed.

B. Stenetriidæ.

First pair of pleopoda in the male small, the sympods completely fused with each other, very short, together much broader than long; rami movable, much longer than the sympods.—Appendages of same pair in the female completely fused, constituting a small oblong operculum without suture or marginal setæ.—In both sexes this pair overlaps only a small basal portion of third pair.

Second pair in the male small, situated above and not coupled with the first pair. Rami attached to the distal part of the inner margin of the sympod; endopod strongly geniculate, its distal joint rather narrow, without internal cavity, and with the end obtuse ; exopod very short, several times shorter than the endopod, unjointed (at most with a vestige of a division into two joints), narrow, scarcely hook-shaped, at most with a single seta.

Third pair in both sexes has the exopods very large, touching each other along the mesial line, and constituting a complete covering for the endopod and the following pairs ; this operculum is freely exposed except at the base.

Fifth pair with only one ramus, in all probability the exopod.

C. Parasellidæ.

First pair of pleopoda in the male large ; the sympods coalesced with each other, together longer than broad, with the lateral margins concave ; rami immovable, much shorter than the sympods.—Appendages of same pair in the female completely fused, constituting a very large operculum without suture or marginal setæ.—In the female this pair covers completely the following pairs; in the male it reaches beyond the distal margin of the following pairs, the lateral portions of which are generally completely covered by the second pair.

Second pair in the male large; the major portion of the sympods situated outside and coupled with the first pair. Rami attached to the distal half of the inner margin of the sympod; endopod strongly geniculate, its distal joint slender, containing an internal cavity and distally produced into a point; exopod very short, many times shorter than the endopod, two-jointed, narrow, hook-shaped, without setæ.

Third pair in both sexes has the exopods of moderate size, not touching each other in the mesial line, generally completely covered by the first pair (in the female) or by the two anterior pairs (in the male); only in the male of a single form their exterior portion is uncovered.

Fifth pair with only one ramus, in all probability the exopod.

VII. *The Species of the Genus* Stenetrium.

The genus was established in 1881 by A. Haswell on two species, *S. armatum* Hasw. and *S. inerme* Hasw. The first-named must be regarded as the type for the genus; besides it will be proved below that according to Haswell's description and figures of *S. inerme* this species, in all probability, cannot be referred to the same genus.

Though I have examined only one of the five species referred to *Stenetrium* by previous authors, I have deemed it useful to incorporate them in the analytical key, and to describe them as well as possible, applying some of the characters found in the descriptions of the authors, and adding others drawn from their figures, hoping that these are tolerably correct as to the details in question. It has not been my intention to mention features showing differences of slight or no value for the determination of the species.

*Conspectus of the Species**.

A. Basal joint of antennulæ, seen from above, anteriorly at the outer side produced into an oblong acute process, or at least (in *S. haswellii*) with a conspicuous tooth marked off from the oblique front margin by an indentation.

a. First thoracic legs with the upper distal corner of fifth joint † not produced into a process.

α. Hand of first legs in both sexes conspicuously more than $\frac{3}{2}$ as long as deep...... 1. *S. armatum* Hasw.

β. Hand of first legs in the male (?) less than $\frac{4}{3}$ as long as deep (only one specimen known) .... 2. *S. fractum* Chilton.

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* In the key *S. inerme* Haswell is omitted; this species is mentioned below after the descriptions of the other forms.

† First joint of these legs is fused with the thoracic segment; the following long joint, which apparently is the first, is here and in the sequel regarded as the second, according to the morphological interpretation of these legs; in the six other pairs of thoracic legs the first short joint is, as in all Asellota, not fused with the thorax but movable.

b. First thoracic legs with the upper distal corner of fifth joint produced into a long process.

α. Basal joint of antennulæ, seen from above, anteriorly at the outer side produced into a long process reaching considerably beyond the distal margin of second joint. 3. *S. mediterraneum*, sp. n.

β. Basal joint of antennulæ, seen from above, without any real process, but at the outer distal angle with a conspicuous sharp tooth, well marked off from the oblique front margin by an indentation, and far from reaching to the distal end of second joint .... 4. *S. haswellii* Bedd.

B. Basal joint of antennulæ, seen from above, with the exterior half of the distal margin transverse, outer angle at most rectangular and acute, but without process or tooth.

a. Lateral corner of the head, seen from above, produced into an acute process. Eyes rather large, oblong.

α. Abdominal shield on each lateral margin with about five sharp teeth. First thoracic legs with the upper distal angle of fifth joint produced into a long process... 5. *S. serratum*, sp. n.

β. Abdominal shield on each lateral margin with only the tooth at the notch. First thoracic legs with the upper distal angle of fifth joint rectangular, without process.

† In the male the lower margin of the hand has its proximal half concave, and at the distal end a low broad process with three or four teeth nearly equal in size placed in a convex line. In the female the angle between the palmar and the lower margin of the hand measures about 110°; the hand is a little more than $\frac{2}{3}$ as long as deep .... 6. *S. occidentale*, sp. n.

†† In the male the lower margin of the hand has its proximal half convex, and at the distal end two processes separated by a rather deep incision; each process terminates in two teeth. In the female the angle between the palmar and the lower margin of the hand measures about 125°; the hand is twice as long as deep*.................... 7. *S. stebbingii*, H. Richardson.

††† In the male the lower margin of the hand has its proximal half convex, and at the distal end a narrow, moderately long process, with the end bifurcate, and sometimes besides a feeble tooth on its proximal margin. In the female the angle between the palmar and the lower margin of the hand measures less than 100°, and the hand is a little more than $\frac{2}{3}$ as long as deep ... 8. *S. antillense*, sp. n.

b. Lateral corner of the head, seen from above, without any process. Eyes small, subcircular .... 9. *S. siamense*, sp. n.

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* All these characters have been derived from the figures given by Miss Harriet Richardson.

1. Stenetrium armatum Hasw. Ovigerous female (and adult male, after Haswell*). (Plate XIX. figs. 1 *a*–1 *d*.)

1881. *Stenetrium armatum* Haswell, Proc. Linn. Soc. New South Wales, vol. v. p. 479, pl. xix. fig. 1 [*teste* Haswell].
1882. *Stenetrium armatum* Haswell, Catal. Austral. Stalk- and Sessile-eyed Crust. p. 308.
1884. *Stenetrium armatum* Haswell, Proc. Linn. Soc. New South Wales, vol. ix. pp. 1009–1010, pl. li. figs. 1–12 [*teste* Zool. Rec. and Beddard].

Head has its upper surface—the frontal plate excluded—more than twice as broad as long; the lateral part is expanded and flattened, the anterior corner produced into a rather long acute process with a minute tooth on the outer margin ; the front margin outside the base of each antennula produced into a rather large, triangular, very acute process. Eyes semilunar, long, oblique, with the posterior outer margin rather close to the lateral margin of the head.

Antennulæ have the second joint of the peduncle slightly shorter than the third and rather thick; flagellum of the female is much shorter than the peduncle, with about seven joints.

Antennæ have the basal joint, seen from above, anteriorly at the outer side produced into a rather long acute process reaching slightly beyond the end of the second joint and with a small saw-tooth on the outer edge.

First thoracic legs.—In the female the distal half of the upper part of third joint is expanded, compressed, and produced into a long curved process ; nearly the whole upper side of fourth joint is expanded, compressed, and produced into a long process directed forwards ; fifth joint with upper distal angle subrectangular and without process, lower angle rounded. The hand not fully twice as long as deep ; upper margin rather convex, lower margin at least as long as the depth, straight, with many long setæ ; the angle between the lower margin and the palmar edge measures nearly 110°, is somewhat rounded, with a long strong spine ; palmar edge nearly straight, with several thick setæ serrated along their upper margin. Seventh joint with the short claw claw-shaped ; the lower margin of this joint armed with a close row of short spines with a few saw-teeth along the lower margin.—In the male third, fourth, and fifth joints in all probability as in the female, the hand is, according to Haswell's figure, oblong as in the female, but it has two deep incisions in the palmar edge, and the process between them is bidentate ; the "claw" reaches a little beyond the palm.

Abdominal shield is somewhat broader than long. Each lateral margin has about four obscure saw-teeth, besides the usual rather long tooth at the notch. The posterior margin is strongly convex and a little sinuate.

* Mr. R. I. Pocock has kindly traced for me the figures given by Haswell in his first paper.

Uropoda considerably less than half as long as the abdominal shield; the endopod somewhat longer than the exopod.

Length of a female with marsupium 5·2 mm.; Haswell gives the length $\frac{1}{4}$ inch.

Occurrence. According to Haswell this species has been captured on the south-eastern coast of Australia: Port Jackson, Port Stephens, Griffiths' Point (Victoria). Of a specimen in the British Museum (from Griffiths' Point) I have figured the abdomen from below; two specimens (from Port Jackson), belonging to the Museum in Dundee, have kindly been forwarded me, and my three other figures of this species were taken from one of these specimens, an almost full-grown female.

Remarks. This species is easily distinguished from all following forms, *S. fractum* Chilt. excepted, by the shape of the head and basal joint of antennæ, together with the joints of first thoracic legs. Its differences from *S. fractum* are mentioned in the following description of this species.

2. Stenetrium fractum Chilton.

1887. *Stenetrium fractum* Chilton, Transact. and Proc. New Zealand Institute, 1883, vol. xvi. p. 249, pl. xviii. figs. 3 *a–f*.

Chilton described and figured a single specimen, the body of which had been "much crushed." Unfortunately, he says nothing as to the shape of the head; but judging from the antennæ and the shape of abdomen, I think that the species must be related to *S. armatum* Hasw. Most of the characters given below have been selected among his statements, other characters have been derived from his figures*.

Antennulæ.—"First joint of the peduncle large, as broad as long; second equal in length to the first, but more slender; third rather longer than the second, ... flagellum about half as long again as the third joint of peduncle, consisting of about five joints ...."

Antennæ have the basal joint "produced acutely at its extero-distal angle"; according to fig. 3 *b* the process does not reach the end of second joint.

First thoracic legs.—Fourth joint much expanded above and its upper corner produced into a rather long triangular process, which seems to be a little shorter and thicker than in *S. armatum*. Fifth joint shaped about as in the last-named species. Hand very deep, about $\frac{4}{3}$ as long as deep, thus proportionately considerably deeper than in the female of *S. armatum*; upper margin as in that species; lower margin seems to be a little convex; the angle between this margin and the palmar edge almost 120°; palmar margin straight, armed with thick setæ pectinate along their upper margin and a spine of very moderate length at the lower angle. Seventh joint and claw as in the female of *S. armatum*.

* My friend Dr. W. T. Calman has kindly sent me a copy of Chilton's description and tracings of his figures.

Abdominal shield.—Lateral margins "irregularly serrate," "ending posteriorly in a sharp point followed by a small concave indentation"; the posterior margin almost as in *S. mediterraneum*; its middle portion is somewhat produced, so that a rather low rounded lobe or protuberance is formed, and almost each lateral half of the margin is somewhat concave.

Uropoda, according to fig. 3 *f*, much less than half as long as the abdominal shield; endopod considerably longer than exopod.

Length "about $\frac{1}{6}$ inch."

Occurrence. Lyttelton Harbour, New Zealand.

Remarks. Chilton supposes that his specimen was a female; judging from the extreme depth of the prehensile hand, I think it was a male. It is distinguished from *S. armatum* Hasw. by a shorter process from the basal joint of the antennæ, by the serration of the lateral margins and the shape of the posterior margin of abdomen, and by the extreme depth of the prehensile hand in the sex described.

3. Stenetrium mediterraneum, sp. n. Adult male and ovigerous female. (Plate XIX. figs. 2 *a*–2 *h*.)

Head has its upper surface—the frontal plate excluded—not fully twice as broad as long; the lateral part is strongly expanded and flattened, the lateral corner produced into a rather long acute process without distinct tooth on the outer margin; the front margin outside the base of each antennula produced into a moderately small, triangular, acute process. Eyes long, oblique, rather narrow but broader behind than in front; their outer margin is strongly convex, the inner concave; posterior part of their outer margin rather close to the lateral margin of the head.

Antennulæ have the second joint of the peduncle moderately slender and a little shorter than the third; flagellum in the male somewhat shorter than the peduncle, with eleven or twelve joints, in the female considerably shorter than the peduncle, with about nine joints.

Antennæ have the basal joint, seen from above, at the outer side produced into a long, rather narrow, acute process reaching far beyond the distal end of second joint; external margin of the process with a couple of long setæ inserted at a minute saw-tooth in front of the middle.

First thoracic legs rather similar in both sexes, of moderate length. Third, fourth, and fifth joints with the upper part strongly expanded, compressed; the expansion begins rather near their base, and is in front produced into a triangular acute process, which is rather broad and moderately long on third and fourth joints, somewhat longer and much narrower on the fifth. In the male the hand is somewhat less than twice as long as deep; upper margin somewhat convex, with a few shorter setæ; lower margin as long as the depth, straight, with numerous very long hairs; the angle between lower margin and palmar edge measures about 120°; palmar edge is a little sinuate, with a moderately large, rounded tubercle below its middle and a couple of minute tubercles or denticles above the large tubercle; the edge is besides furnished with some robust setæ, increasing much in length downwards and pectinate along their upper margin; lower end of palmar edge armed with a strong long spine, the structure of which is shown in fig. 2 *e*; seventh joint with its short claw claw-shaped, reaching slightly beyond the palmar edge, along its lower margin with fine setæ and a row of small strong spines adorned with a few saw-teeth on their lower margin.—In the female the hand is a little smaller and a little shorter in proportion to the depth than in the male, but it differs especially in the palmar edge, which is feebly convex and quite without tubercles; seventh joint and claw as in the male.

Abdominal shield a little broader than long. Each lateral margin with four or five minute spines placed at rather long intervals, and terminating in the usual triangular tooth at the conspicuous notch; behind this notch a minute indentation is observed. Posterior margin has its middle portion produced so that a rather low rounded lobe is formed, and almost each half of the margin is moderately concave.

Uropoda considerably more than half as long as the abdominal shield; exopod slightly longer than sympod, but considerably shorter than endopod.

Distal joint of the endopod of second male pleopoda unusually slender and not widened at or beyond the middle; a short terminal portion only half as broad as the remainder, with the end cut off transversely and without any brush.

Length of the largest male 5·5 mm., of an ovigerous female 6 mm.

Occurrence. Some specimens were taken by the author at Siracusa, Sicily, in depths from 12 to 25 fathoms; four specimens were secured by the Danish botanist, Dr. Börgesen, at Ajaccio, Corsica.

Remarks. This fine species is easily distinguished by the very long process on the basal joint of antennæ, by first thoracic legs in both sexes, and by the shape and armature of abdomen.—None of the forms mentioned in Carus's 'Prodromus Faunæ Mediterraneæ' can be referred to *Stenetrium*, and the present species seems to be new, though it is probably widely distributed in the western half of the Mediterranean.

4. Stenetrium haswellii Bedd.

1886. *Stenetrium haswelli* Beddard, Proc. Zool. Soc. London, 1886, p. 103.

1886. *Stenetrium haswelli* Beddard, Isopoda ii. in 'Challenger' Rep. vol. xvii. p. 9, pl. iv. figs. 1–8.

The only specimen hitherto known is a male described and figured by Beddard. From his long description most of the characters given below have been selected; some of my statements have been derived from his figures, and from two sketches kindly drawn for me from the type specimen in the British Museum (Natural History) by Dr. W. T. Calman.

Head.—The lateral part is exceedingly expanded and anteriorly produced into a very large, broad and long, triangular, acute process, reaching forward nearly as far as the front margin of second joint of the antennæ; the front margin outside the base of each antennula produced into a rather broad, moderately long, triangular acute process. Eyes long, very narrow, feebly curved, oblique but essentially transverse, with their posterior end rather far from the lateral margin of the head.

Antennulæ have the second joint of the peduncle rather slender and somewhat shorter than the third; flagellum very much longer than the peduncle, consisting of numerous joints.

Antennæ have the basal joint, seen from above, rather small, somewhat oblique, without any real process, but at the outer distal angle with a conspicuous sharp tooth, well-marked off from the oblique front margin by an indentation, and far from reaching to the distal angle of second joint.

First thoracic legs elongate, slender, but widening distally, with a large hand. Third joint long, with the distal part of the upper side considerably expanded and produced into a rather long, oblong-triangular process directed essentially forward; fourth and fifth joints each considerably shorter than the third, but the distal half of the upper side is more expanded and produced into an oblong-triangular acute process, which is long on the fourth, very long on the fifth joint. The hand is (according to Beddard's fig. 4) large and very deep, not fully $\frac{4}{3}$ as long as deep; upper margin is strongly convex and furnished with very long hairs on its distal half; lower margin is straight, with long hairs; the angle between lower margin and palmar edge measures about 100°, but is somewhat rounded; palmar edge a little shorter than the lower margin, straight, with a "row of serrate spines, below which a few fine slender hairs," and at its lower end a stout but moderately short spine. The "claw" of normal size and shape, with serrate spines along its lower edge.

Abdominal shield nearly as long as broad; according to sketches and notes by Dr. Calman, the lateral margin, though "a good deal chipped and broken," "is very finely serrated, at least in places," and terminates behind in a small tooth at the usual notch; posterior margin shaped almost as in *S. serratum*.

Uropoda, according to Beddard's figure, more than half as long as the abdominal shield; rami, according to his text, "subequal in size."

Distal joint of the endopod of second male pleopoda slender and not expanded at or beyond the middle, terminating in a small brush.

Length of the single male specimen 16 mm.

Occurrence. 'Challenger' "Station 320, off the Rio de la Plata, February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; 600 fathoms."

Remarks. This deep-sea species is the largest form of the genus hitherto known; it is easily distinguished from all other species by the very large lateral processes of the head, the shape of the eyes, of the basal joint of antennæ, and of the first thoracic legs.

5. STENETRIUM SERRATUM, sp. n. Ovigerous female. (Plate XIX. figs. 3 *a*–3 *d*; Plate XX. fig. 1 *a*.)

Head has its upper surface (the frontal plate excluded) nearly twice as broad as long; the lateral part is somewhat expanded and flattened in front, and produced into a moderately large acute process; the front margin outside the base of each antennula produced into a rather large process, which is broad at the base, while its distal part is shaped as a narrow acute hook curved somewhat inward. Eyes large, oblong, very oblique, the outer margin extremely convex, the inner very concave; their posterior part overlaps the lateral margin of the head itself.

Antennulæ have the second joint of the peduncle moderately robust and somewhat shorter than the third; flagellum 9-jointed, as long as the sum of the two proximal joints of the peduncle.

Antennæ have the basal joint, seen from above, distally cut off transversely, its outer angle acute, but not produced into any process.

First thoracic legs rather short. Third joint distally widened but without process; fourth joint with the upper part nearly from the base strongly expanded, compressed and distally produced into a process of moderate length and breadth; fifth joint similarly expanded and distally produced into a long slender process. Hand a little more than twice as long as deep; upper margin rather feebly convex, with a few setæ; lower margin straight, only half as long as the upper, with numerous very long hairs; distal end as long as the lower margin; palmar edge very oblique, a little sinuate, furnished with six very stiff setæ, proportionately long and increasing in length downwards, pectinate along their upper margin, and at the end of the edge a moderately robust very long spine pectinate as the setæ; the angle between palmar edge and lower margin measures about 130°. Seventh joint with its claw claw-shaped, reaching a little beyond the lower end of the palmar edge; the joint is adorned below with serrated spines and fine curved setæ as in *S. mediterraneum*, but the spines are less numerous, only about ten.

Abdominal shield is somewhat broader than long; each lateral margin is adorned with five small nearly spiniform processes, increasing in size backwards and placed at regular intervals, the last of these processes being that at the usual notch. Posterior margin is rather evenly but moderately curved.

Uropoda wanting.

Length of the single adult female 6 mm.

Occurrence. West Indies: St. Thomas, one specimen (*Krebs*).

Remarks. This species is easily distinguished from *S. armatum*, *S. fractum*, and *S. mediterraneum* by the absence of a process from the basal joint of antennæ. The processes from the front margin of the head are more produced and much more curved, the processes or teeth on the lateral margins of abdomen conspicuously longer than in any other species hitherto discovered.

6. Stenetrium occidentale, sp. n. Adult male and ovigerous female. (Plate XX. figs. 2 *a*–2 *n*.)

Head shaped as in *S. antillense* (Pl. XXI. fig. 1 *b*); its upper surface (the frontal plate excluded) is considerably less than twice as broad as long; the lateral part, seen from above, is feebly expanded and produced into a small acute process; the front margin outside the base of each antennula produced into a broad but rather low process, with the end obtuse. Eyes of moderate length, oblong, somewhat curved, very oblique and considerably removed from the lateral margin of the head.

Antennulæ with the second joint slightly longer than the third, moderately robust; flagellum in the male 9-jointed and as long as the sum of the two distal joints of peduncle, in the female still shorter, with four or five joints.

Antennæ have the basal joint distally cut off transversely, its outer angle without process and measuring about 90°.

First thoracic legs very different in adult specimens of the two sexes, but in immature males nearly as in adult females.—In the male they are rather long, robust; third joint is distally much expanded above and produced into a triangular process directed upwards; fourth joint expands above gradually from the base, forming a broad but rather low process, a portion of the inner surface of which is furnished with numerous exceedingly long hairs. Fifth joint has the upper margin very short, without any process, but it expands below, its lower margin is several times longer than the upper, and besides it is produced into a very long oblong-triangular process, the inner side and both margins of which are closely set with long or very long hairs; the upper margin of the process is straight nearly to the insertion of the hand, and the distance from this insertion to the end of the process is longer than the distance from the insertion to the base of the joint. The hand is very large, a little broader near the end than at the base, two and a half times longer than deep; upper margin strongly convex, lower margin rather concave from the base to the distal process, which occupies the major portion of the short palmar edge; this process is low, broad, its margin more or less convex and divided into three or four teeth; the lower major portion of the inner surface of the hand is closely set with very long hairs. Seventh joint very long, much curved, especially at some distance from the base, claw-shaped, with fine simple hairs spread along both margins and on the inner side, but without spines; the claw itself is very short.—In the female the legs are much shorter than in the male, robust; process on third joint proportionately a little longer and broader, that on fourth joint a little longer than in the male; fifth joint much smaller than in the male, its lower process small. Hand much smaller than in the male, subtriangular, a little more than half as long again as deep; upper margin very convex, two and a half times longer than the lower, which is straight, with many long hairs; distal end somewhat longer than the lower margin; palmar edge feebly convex, with an angular notch at the lower end, so that the usual spine, which is strong and moderately long, is situated a little behind the edge; the edge from the "claw" to the notch is occupied by five or six saw-teeth gradually increasing in size downwards, and besides adorned with some stiff setæ pectinate along their upper margin; finally, the angle between lower margin and palmar edge measures about 110°. Seventh joint with the claw regularly claw-shaped, when extended reaching slightly beyond the notch mentioned; the major portion of the lower margin of the joint is adorned with rather slender spines, serrate along the lower margin, and some fine hairs.

Abdominal shield slightly broader than long; lateral margin unarmed, only with the usual tooth and notch at the end; posterior margin, reckoned from the notch, is strongly and rather evenly curved.

Uropoda considerably more than half as long as the abdominal shield; exopod slightly longer than the sympod and much shorter than the endopod.

Second joint of the endopod of second male pleopoda with the distal half considerably broader than near the base, the end very obliquely rounded, the lower surface at the end set with numerous very short hairs.

Length.—Both sexes similar in this respect, measuring about 3·3 mm.

Occurrence. West Indies: St. Thomas. Several specimens, among which five adult males, were taken, 12.II.1888, by H. Kiær, Captain in the Danish Navy.

Remarks. In the outline of the head, the position of the eyes, the short third joint in the antennular peduncle, the first pair of legs, and, above all, in the shape of the hand in the male, this form differs abundantly from the preceding species; it is closely allied to the two following species, and the differences are mentioned below.

7. STENETRIUM STEBBINGII H. Richardson.

1902. *Stenetrium stebbingi* Harriet Richardson, Trans. Conn. Acad. vol. xi. p. 295, pl. xxxix. figs. 46–49.

Of this species I have seen no specimens. According to the description and the figures published by Miss Richardson it is very closely allied to *S. occidentale* and *S. antillense*, but the figures representing the first thoracic leg in male and female show some differences which I hope really exist, and if so, they are sufficient for the separation of this form from *S. occidentale* and *S. antillense*.

The figure showing the head with antennulæ and four proximal