Nordenstam, 1933

MARINE ISOPODA

OF THE FAMILIES SEROLIDÆ, IDOTHEIDÆ, PSEUDIDOTHEIDÆ, ARCTURIDÆ, PARASELLIDÆ AND STENETRIIDÆ MAINLY FROM THE SOUTH ATLANTIC

ACADEMICAL DISSERTATION

BY

Åke Nordenstam
Fil. Lic., Smål.

BY DUE PERMISSION OF THE PHILOSOPHICAL FACULTY OF UPSALA
TO BE PUBLICLY DISCUSSED IN THE ZOOLOGICAL INSTITUTE
ON MAY 29TH, 1933, AT 10 O'CLOCK A. M. FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY.

STOCKHOLM 1933
KUNGL. BOKTRYCKERIET. P. A. NORSTEDT & SÖNER

CONTENTS.

Preface.

The following work deals with the bulk of the very abundant material of marine Antarctic and subantarctic Isopoda preserved in the Swedish State Museum (Riksmuseum) at Stockholm. It treats of the sub-orders *Asellota* and *Valvifera* and within the sub-order *Flabellifera*, the family *Serolidae*. The other families within the sub-order *Flabellifera* and the entire sub-order *Epicarida* have thus not been included.

By far the larger part of the material investigated is derived from the Swedish Antarctic Expedition (1901—1903) under the direction of Professor O. NORDENSKJÖLD and was collected by K. A. ANDERSSON, Ph.D., Director of the Department of Fisheries at Stockholm. Moreover, I have included the material preserved at the Riksmuseum collected by the following expeditions:

The Swedish »Eugenie» Expedition (1851—1853): material collected by I. G. H. KINBERG Ph.D.

The Swedish Expedition to Tierra del Fuego (1895—1897): material collected by A. OHLIN Ph.D. and Mr. H. ÅKERMAN.

The Swedish Magellanian Expedition (1907—1909) under the direction of Professor C. SKOTTSBERG: material collected by Professor SKOTTSBERG.

In addition, some scanty material has been included which was collected by G. C. WESTERGREN Ph.D. ('Gefle Expedition') 1866, material from South Georgia collected by Mr. E. SÖRLING (1905), as well as material collected by Captain LARSEN (1894), and by Captain E. G. HÖGBERG (1890?)

With a view to securing a more thorough investigation of the distribution of the species examined. I have included some finds made by S. VALLIN Ph.D. in 1923—1924 from the Campbell Islands. This latter material belongs to the Zoological Museum of Lund, and I desire to express my cordial thanks to Mr. VALLIN and the directors of the Museum in question for kindly placing it at my disposal.

For the purpose of comparative study I have procured material of Isopoda, partly consisting of type specimens, from the Museums at Paris, Berlin and Hamburg. I take this opportunity of expressing my gratitude to the directors of these Museums for kindly supplying me with this material. I have also paid a short visit to the British Museum in order to study type specimens.

In addition to a systematic investigation of the material, my treatise also contains a morphological investigation of setae and scale-processes, mainly performed on specimens of the genus *Serolis*.

I desire to express a general debt of gratitude to all those who have facilitated and encouraged this work by the kind assistance they have rendered or the friendly interest which they have displayed.

My special thanks are due to the late Professor A. WIRÉN, who introduced me to the study of Zoology, and to the late Professor A. APPELLÖF, who directed my attention to carcinological research.

I also wish to express my cordial thanks to my esteemed teachers Professor N. V. HOFSTEN and Professor S. EKMAN for their valuable instruction. Professor N. V. HOFSTEN, under whose direction my studies have been pursued, has followed my investigations with unflagging interest, has provided special accommodation for me at the Zoological Institute at Uppsala, and has enabled me to obtain grants in aid of my researches.

Especially it is both a duty and a pleasure to express my extreme gratitude to the superintendent of the Evertebrate Department of the Swedish State Museum (Riksmuseum), Professor S. BOCK. Both in Upsala and at the Riksmuseum in Stockholm I have enjoyed his valuable advice and guidance and benefited by his interest in my researches. In spite of shortage of accommodation, he provided me with comfortable quarters at the Riksmuseum, where this investigation was completed. He has moreover secured me a grant from the Museum funds to defray my expenditure for drawings, at the same time placing at my disposal the services of the Museum draughtsman and the photographer of the Evertebrate Department. I wish to place on record that without his kind efforts on my behalf the appearance of this work would have been considerably delayed.

I am particularly indebted to Mr. NILS ODHNER Ph. D. at the Evertebrate Department of the Swedish State Museum (Riksmuseum) and desire to express my great appreciation to him for a further grant from the Museum funds towards the expenses of my work. He has greatly promoted my work in many ways, especially by allowing me to benefit by his great experience and by putting before me his own interesting points of view.

I am furthermore indebted to the Royal Swedish Academy of Science for a grant from one of their funds.

I desire to acknowledge my indebtedness to Professor W. T. CALMAN, London and Professor M. DOELLO-JURADO, Buenos Aires, as well as to Mr B. BOHLIN, Ph. D., Peking, and Mr. O. NYBELIN, Ph. D., Inspector of Fisheries, Stockholm.

Most of the drawings reproduced in this treatise were first drawn in pencil by myself; for their execution in Indian ink and for some original drawings I am indebted to Mr. S. EKBLOM of the Swedish State Museum and Miss S. OLSSON, Upsala. For the photographs my thanks are due to Mr. S. SVEDÉN of the Swedish State Museum.

Mr. S. ALLWOOD, of the Swedish Board of Education, Mr. G. GROVE, of the British Legation in Stockholm, and Mr. S. J. CHARLESTON, Reader in English at »Stockholms Högskola» have helped me with the English text, and to these gentlemen I wish to express my appreciation of their ever-ready assistance.

SECTION I.

Historical.

The Antarctic and subantarctic Isopod fauna is as yet by no means so well known as the fauna of the corresponding northern latitudes. The Belgian Antarctic Expedition (1897—1899), whose collection of Isopods is the latest that has been elaborated (by MONOD, 1926) increased the known number of Isopods belonging to the families dealt with in this treatise by four, and moreover reported the occurrence of two additional species which, owing to the shortage of material, were inadequately described. »*Ianthopsis nasicornis*», one of the species dealt with in MONOD's work, must be regarded as a new species, for the reasons stated in the sequel. In the present study I have found it necessary to introduce no less than 19 new species, all of them obtained during the Swedish Antarctic Expedition (1901—1903). Most of the new species are of diminutive size. It may therefore be presumed that the Antarctic and subantarctic regions still contain many species which have escaped attention owing to their minuteness.

The first data regarding the Isopod fauna of these regions were given by FABRICIUS, (1775). Since then the most important contributions to our knowledge of the Isopod fauna of these regions have been obtained mainly by the elaboration of material collected by expeditions. The following studies deserve special mention: EIGHTS (1833), AUDOUIN and MILNE EDWARDS (1841), DANA (1852), STUDER (1884), BEDDARD (1884 and 1886), PFEFFER (1887), DOLLFUS (1891), OHLIN (1901), HODGSON (1902 and 1910), STEBBING (1900, 1914, 1919), RICHARDSON (1906, 1908, 1913), VANHÖFFEN (1914), TATTERSALL (1921), MONOD (1926 and 1931).

For the classification of Isopods the works of G. O. SARS[1] have been of fundamental importance. By his thorough researches, especially those reported in »Crustacea of Norway» (1899), SARS laid the foundation of the modern classification of Isopods. His system, in accordance with which the Isopods are divided into six tribes, distinguished mainly by differences in the uropods and pleopods, still holds good in essentials. Each of the tribes into which the Isopods were divided by G. O. SARS comprises a number of families, which he sharply defined.

SARS' classification of Isopods has been supplemented in connection with the extension of our knowledge and the discovery of new and interesting species. Considerable additions have thus subsequently been made to our knowledge of the sub-orders dealt with in this treatise.

[1] As regards the history of the classification of Isopods prior to SARS, vide GERSTECHER and ORTMANN, 1901: Crustacea, in BRONN: Klassen und Ordnungen des Thierreichs.

The sub-order Asellota, which was divided by SARS into the five families *Asellidae*, *Ianiridae*, *Munnidae*, *Desmosomidae* and *Munnopsidae*, was revised by HANSEN (1905 and 1916). In 1905 HANSEN divides the sub-order into the three families *Asellidae*, *Stenetriidae* and *Parasellidae*, according to the conformation of the pleopods. The family *Asellidae* is the same as that defined by SARS; the family *Parasellidae* corresponds to the four remaining families into which SARS (1899) divided the sub-order Asellota. HANSEN points out that the families into which SARS divides the Asellota, with the exception of the *Asellidae*, contain transitional forms which render it impossible to retain the latter's classification. In his important later work HANSEN (1916) divides the *Parasellidae* into a large number of groups, basing this classification in the main on a thorough study of the appendages, especially the oral appendages. The Antarctic and subantarctic *Asellota* still contain many species which are by no means so well known as the northern ones dealt with by HANSEN (1916). Hence many southern species cannot as yet be assigned with certainty to HANSEN's groups. In this study I have found it necessary to suggest one new group, and to sub-divide one of the groups previously proposed by HANSEN. By this arrangement a clearer view has been obtained of the relation of the genera to one another.

As regards the sub-order Valvifera, a new family, the *Pseudidotheidae*, was added by OHLIN (1901) to the three families which SARS included in this sub-order.

The fam. *Idotheidae* was divided by MIERS (1881) into two sub-families *Idotheinae* and *Glyptonotinae*. To these RACOVITZA and SEVASTOS (1910) add the sub-family *Mesidoteinae* in connection with their interesting investigations on their new fossil genus *Proidotea*. In proposing their new sub-family they discuss the position of the genus *Macrochiridothea*, which will be dealt with in the sequel.

Historical notes on the families *Arcturidae* of the sub-order Valvifera and *Serolidae* of the sub-order Flabellifera, which have been treated more thoroughly than the others will be given later on in connection with the discussion of their morphology and classification.

As the systematic classification presupposes thorough morphological studies, the investigators are obliged to tackle many a morphological problem. The Isopod studies of RACOVITZA are in this respect significant. In the course of his very conscientious investigations on Isopods (the first published 1907), this author discusses a number of interesting morphological problems, carefully considering their bearings on classification and on the relations between the units of the system. His conclusions are supported by minute descriptions and excellent figures. At quite an early stage of his researches on Isopods, his attention was attracted to the different kinds of setae and other chitinous projections; in this treatise these will be dealt with in a separate section.

RACOVITZA's investigations, especially those on the families *Trichoniscidae* (1907 and 1908), *Sphaeromidae* (1910) and *Cirolanidae* (1912), show that in these families the setae are highly polyform. It should by observed, however, that the morphological nature of the setae and other kinds of chitinous projections can scarcely be satisfactorily elucidated unless comparative researches are concentrated on this special subject. As regards the terrestrial Isopods a comparative study of chitinous processes was made by WAHRBERG (1922).

WAHRBERG, partly by dissection and partly by comparative morphological studies, ascertained that the thoracopod setae in terrestrial Isopods are of a composite nature, consisting of an axial setal part, enveloped by a scale, which has coalesced, more or less, with the setal part. WAHRBERG did not examine very thoroughly the variations in the form of the freely projecting scales. He holds, however, that the rows of bristle-like »hairs» with which the basipodite of the maxilliped is occasionally beset are not setae proper, being presumably nothing but pectinate scales.

In order to embrace all chitinous processes under a single comprehensive term, RACOVITZA (1923), coins the word »phanere» which he explains as follows (p. 85, note):

»Ce terme de médecine, antonyme de 'crypte', désigne toutes les productions apparentes (*φανερόσ*) de la peau. Je le trouve commode pour réunir sous un vocable commun toutes les productions superficielles, si variées, de la carapace des Crustacés: écailles, peignes, poils, soies, tiges, crochets etc. L'étude de ces productions se nommerait Phanérotaxie ou Chaetotaxie terme déjà usuel chez les Entomologistes.»

In sequel to WAHRBERG's investigations on thoracopod setae in terrestrial Isopods RACOVITZA (1923) laid down the rule that »Les phanères des Isopodes sont des modifications de deux organites primitifs, différents par l'origine et la structure: l'écaille et le poil sensitif, ou bien le résultat de la combinaison des deux organites (p. 86)». In this paper RACOVITZA quite rightly claims that he had shown before WAHRBERG that the thoracopod setae in terrestrial Isopods were composed of different parts, and refers to his earlier work of 1907, where he states (p. 183): »Ces productions, à rôle sensitif, sont formées par deux écailles: l'une lancéolée, dans laquelle s'épanouit le nerf, et l'autre en forme de cornet, qui joue probablement un rôle protecteur» etc. This shows, however, that RACOVITZA has not here properly grasped the distinction between the simple setae and the scale elements, which was brought into clear relief by WAHRBERG (1922). »L'écaille lancéolée, dans laquelle s'épanouit le nerf» is a rather rough description of the organ which RACOVITZA afterwards more correctly termed »poil sensitif».

RACOVITZA's thorough researches on representatives of the fam. *Cirolanidae* (1912) have shown that in this family the thoracopod setae externally resemble the setae of terrestrial Isopods; like the latter setae they frequently assume a trilobate shape. This resemblance in external form, however, is not in itself sufficient evidence of a composite structure. On the other hand, it has been pointed out by WAHRBERG (1922) that even setae which present the appearance of a simple cylindrical structure may be of a composite character. Thus in order to determine the morphological nature of the setae in marine Isopods, it will be necessary to make a careful comparison of the various kinds of setae.

In this treatise the morphological investigation of phaneres has been confined mainly to the family *Serolidae*. The abundant material of *Serolis* preserved at the Swedish State Museum (Riksmuseum) has enabled me to examine the phaneres in 15 species of this genus.

A distinguishing feature of the family is that the species are as a rule provided with two rows (exceptionally one row) of curiously transformed setae on the lower margin of the propodus of the first pereiopod. The characteristic structure of these setae early attracted the attention of investigators. The reports on this subject are, however, inadequate and, in part, contradictory.

The earliest data[1] regarding these setae have been supplied by AUDOUIN and MILNE EDWARDS (1841). They figure setae from the lower margin of the propodus of the first pereiopod as well as from the same place on the second pereiopod, in the full-grown male of the species, *S. gaudichaudi*. The latter setae are described as »tubercules coniques aigus» (p. 24). According to AUDOUIN and MILNE EDWARDS, the setae on the lower margin of the propodus in *Serolis* are (p. 19): »Les unes externes larges et courtes, les autres internes plus grêles et plus longues». In regard to the species *S. gaudichaudi* these authors have observed the marked difference in the shape of the setae in the two rows. But in regard to the corresponding setae in *S. paradoxa* they state (p. 27): »Ces lanières sont également sur deux rangs, mais les supérieures ne diffèrent des secondes que par un peu plus de longueur; elles sont dépourvues de poils et se terminent par un petit article pointu».

GRUBE (1875) made a careful study of the setae on the propodal edge in four species, namely *S. paradoxa, gaudichaudi, schythei* and *tuberculata*. Referring to the genus at large, he states (p. 215): »Die Stachelchen sind von dreierlei Gestalt, in der unteren Reihe etwas lanzettförmig, dicht quergestreift, an den Rändern dicht und fein gewimpert, mit einer zarten, an der Spitze frei hervorragenden, öfters wie mit einem Knöpfchen endenden Mittelrippe, in der dicht darüber befindlichen Reihe mehr drehrund; und länger, je nach den Arten verschieden, glatt oder ebenfalls kurz behaart, einfach griffelförmig oder in eine kurze Gabel auslaufend». As regards the setae on the propodal edge of the first pereiopod in *S. paradoxa* GRUBE states (p. 226): »Die Zähnchen der äusseren Reihe, welche den Innenrand des Handgliedes am 1:ten Fusspaar besetzen, sind nicht stumpfgabelig und glatt wie bei *S. Schythei* sondern einfach und dicht behaart, wie bei *S. Gaudichaudi*, nur nicht so viel länger als die der Innenreihe, letztere sehen schmäler als bei *S. Schythei* aus». GRUBE has here confused the setae of the rostral row (= setae of the upper or inner row) and those of the caudal row (= lower or outer row). In *Serolis* the setae of the rostral row are always the longest (also in *S. gaudichaudi*, see AUDOUIN and MILNE EDWARDS, 1841, Pl. I, Fig. 13 and the explanation of the figure).

In the case of the species *S. schythei*, GRUBE describes and figures the setae on the lower margin of the propodus of the first pereiopod[2] but incorrectly states that the long setae are in the outer row, which is just the reverse of the actual facts. He gives illustrations of setae from the lower margin of the propodus of the second pereiopod in the case of the species *S. schythei, gaudichaudi, tuberculata* and *paradoxa*. His figures show that in *schythei, gaudichaudi* and *tuberculata* the setae were taken from full-grown male specimens, in *paradoxa* from a sub-adult male.

With regard to the setae-armature on the propodus of the second pereiopod in *S. paradoxa*, GRUBE states that it is similar in males and females (p. 226). In reality this is only the case in immature specimens. The very considerable difference in the shape of these setae in the full-grown male of *S. paradoxa* was subsequently demonstrated by BEDDARD (1884).

BEDDARD (1884) supplies us with a great deal of new information on the setae and

[1] EIGHTS (1833) describes the lower margin of the propodus of the first pereiopod as ciliate, in *S. trilobitoides*.

[2] GRUBE (1875, p. 224; Pl. VI, Fig. 1 b).

scales in the family *Serolidae*. He illustrates the setae on the lower margin of the propodus of the first pereiopod in the species *S. schythei, naera, convexa, minuta* and *pallida*. As regards *S. septemcarinata* BEDDARD gives descriptions, but no figures. With reference to the above-mentioned setae in *S. septemcarinata* he says (p. 48) that »the longer spines terminate in a bifid extremity, of which the anterior bifurcation is the longest; the axis of the spine extends between the two branches, and is rather longer than either». The setae from the lower margin of the propodus of the first pereiopod figured by BEDDARD in the case of *S. convexa* have been taken from an adult male. BEDDARD devotes much attention to secondary sexual differences in *Serolis*, including those which are expressed in the transformed setae-armature of the male. Thus he shows that the full-grown male in *S. paradoxa* is distinguished from the female by bearing two rows of »plumose hairs» on the lower margin of the ischium, merus and carpus of the first pereiopods, and by the modified appearance of the setae on the lower margin of the propodus of the second pereiopod. Setae from this place in the adult male are figured in detail in the case of the species *septemcarinata*. The second pereiopod with its setae is also figured in the male of the following species: *schythei, convexa, antarctica, bromleyana, naera, minuta, paradoxa* and *pallida*. BEDDARD is the only author who has observed the projections which usually occur in *Serolis* on the ventral side of the central joints of the flagellum of the antennae.[1] He describes them with reference to the species *paradoxa, schythei* and *trilobitoides* and figures them in the two last-mentioned species. BEDDARD moreover states that similar formations occur in the species *septemcarinata, bromleyana* and *gracilis*. In *S. paradoxa* they assume the shape of »recurved hooks». According to this author these processes, though similar to those in *S. paradoxa*, are less marked in the species *bromleyana, gracilis, septemcarinata* and *schythei*. In the last-mentioned species there occurs[2] on the lower side of the central flagellum joints in the female, distally, a transverse row of »curved spines», as in *S. paradoxa*, whilst in male specimens there occurs besides »a series of delicate lamellar processes arranged in a single line along the inner side of most of the joints» (BEDDARD, 1884, p. 43). BEDDARD considers it probable that these »lamellar processes» have a sensory function. In *S. trilobitoides* BEDDARD maintains that the antennal processes consist of »short lancet-shaped spines», saying (p. 51) that »these spines which are present upon the antennae of both sexes are like those which are found in *Serolis paradoxa* and which have been described».

PFEFFER (1887) gives a detailed description of *S. septemcarinata*, inclusive of its setae-armature, with figures comprising the setae on the lower margin of the propodus of the first pereiopod. His description and figures of these setae[3] differ considerably from the description of setae on the propodal edge in the same species previously given by BEDDARD (1884). For example, the longer setae in the rostral row are illustrated as, single-pointed and broadly flattened, not trilobate, as described by BEDDARD. PFEFFER gives the first detailed figures, as regards any species of *Serolis* of the two stout setae occurring on the free distal edge of the carpus of the first pereiopod, saying, with reference to *S. septemcarinata* (p. 70): »sie sind solide Zapfen mit einem axialen längsstrei-

[1] The second pair of cephalic appendages; for the first pair of appendages (= first pair of antennae) I use the term antennulae.

[2] According to BEDDARD, 1884.

[3] PFEFFER, 1887, Taf. III, Figs. 13, 14, 15.

figen Teile und einem darum liegenden Mantel, dessen Streifung in einem Winkel auf die Axe stösst, sodass es scheint, als entspreche diese Streifung einer ursprunglichen Zusammensetzung des Mantels aus Fiedern». Also in regard to S. *septemcarinata* PFEFFER gives the first detailed figures of some of the characteristically shaped setae occurring on the second and third joints of the mandibular palp.

HODGSON (1910) after a thorough examination of *S. trilobitoides*, reports various new observations, especially regarding the setae on the lower margin of the propodus of the first pereiopod. Referring to the setae of the rostral row HODGSON points out that they have »a strongly-marked 'mid-rib' which, however, is not quite straight, and terminates in a delicate elongate sensory structure» (p. 28). He has, however, wrongly drawn the setal canal, which actually terminates in a pore at the end of the axial part of the setae. HODGSON made some interesting observations on the foliate setae in the caudal row, which he calls »leaf-like organs». He says (p. 28) that »the 'leaf-like' organ also has a distinct 'mid-rib', but that the blade is very unequally developed on the two sides, and exhibits a much coarser striation than the tooth. The 'mid-rib' terminates in precisely the same way and in a similar sensory structure». HODGSON thus shows that the structure of these setae is different on their caudal and on their rostral sides, but does not make it clear wherein the difference consists. HODGSON has moreover given a detailed figure of one of the setae of the mandibular palp in *S. trilobitoides*.

COLLINGE (1918) studied *Serolis septemcarinata*. In contradistinction from BEDDARD (1884) and PFEFFER (1887) he found in this species only one row of setae on the lower margin of the propodus of the first pereiopod. COLLINGE figures one of the setae which, he says, is divided into three of four finger-like processes.[1]

On the other hand TATTERSALL (1921) referring to the setae in question in *S. septemcarinata*, states (p. 228): »My own observations agree absolutely with those of PFEFFER, whose account of this species has evidently been overlooked by COLLINGE.»

SECTION II.

Scales and setae in the family Serolidae.

I. The ordinary Structural scales.[2]

The structural scales in the *Serolidae* are of the usual triangular shape, overlapping, and distally, as a rule, rounded. Generally speaking, they are somewhat indistinct, but here and there, as, for example, on the lower surface of the flagellum of the antennae their structure is very distinctive (Fig. 1 g. and h.). It will be seen from a comparison of these two figures that the shape of the structural scales may vary in different species. In *S. paradoxa* (Fig. 1 g.) they are evenly rounded anteriorly, whilst in *S. pagenstecheri* (Fig. 1 h.) they are acutely triangular. I have found a pointed shape in

[1] See COLLINGE, 1918, Pl. II, Fig. 9.
[2] Structural scales is a translation of the German »Strukturschuppen».

all the structural scales only in the latter species. Structural scales occur also on the tergites, but here they are often ill-defined or sparse. Some well-defined, though sparse,

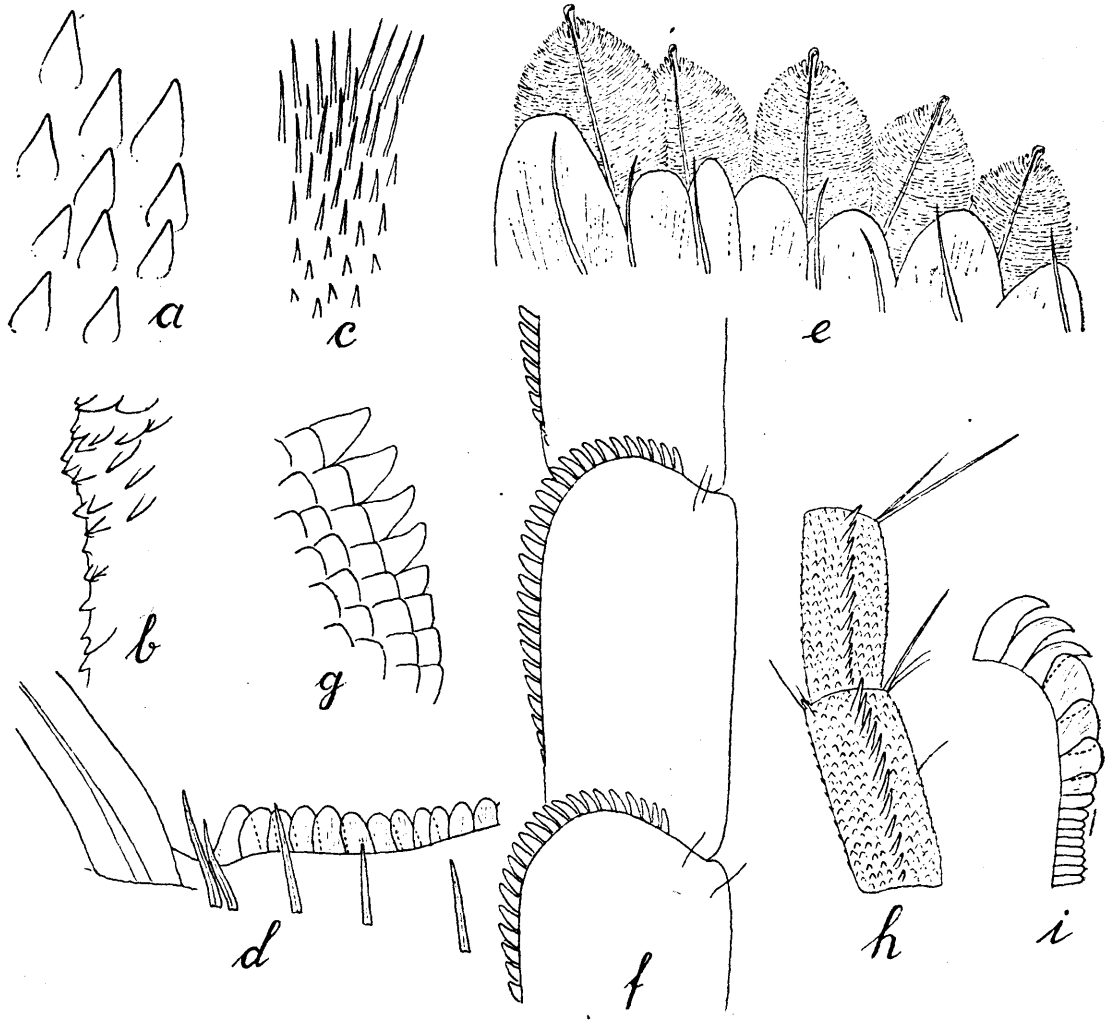

Fig. 1. Scales in *Serolis*. a. Structural scales from the tergum of *S. pagenstecheri*, 435 ×. b. Slightly projecting structural scales close to the lower margin of the propodus of the second pereiopod, adult male of *S. schythei*, 235 ×. c. Spine-like scales from the same spot in an adult male of *S. pagenstecheri*, 240 ×. d. Part of the free distal margin of the carpus of the first pereiopod in *S. septemcarinata*, 240 ×. e. Setae and projecting scales from the lower margin of the propodus of the first pereiopod seen from the caudal side, in *S. polita*, 80 ×. f. Antennal processes on the eighth and part of the seventh and ninth joints of the antennal flagellum, *S. paradoxa*, 80 ×. g. Structural scales and antennal processes from the flagellum of the antenna, *S. paradoxa*, 240 ×. h. Two joints of the antennal flagellum of *S. pagenstecheri*, seen from below, 50 ×. i. Antennal processes from the flagellum of the antenna, female of *S. schythei*, 240 ×.

structural scales from the tergum of *S. pagenstecheri* are shown in Fig. 1 a. Here too we observe the pointed shape of the structural scales, which is characteristic of the species. Generally speaking, however, the structural scales in *Serolis* have a tendency to be effaced and coalesce with one another.

II. Transformed scales.

This general tendency towards the effacement of the distinctive structural scales is not only due to a coalescence of individual scales. In some places they are transformed into chitinous projections of varying shape, which not infrequently assume a spine-like or setiform appearance. This transformation may take place in either of two ways. (1) Each scale increases in size and changes in shape. Or (2) the individual scales split up into several distinct elements.

1. Projections formed by increase in size.

The freely projecting scales of enlarged size occur especially at places where two surfaces meet at an angle. Thus the chitinous processes of varying appearance (hook-like lamellar or fan-shaped), which are situated on the ventral side of the central flagellum joints of the antenna in the angle between the rostral and ventral surfaces,[1] consist of transformed and enlarged structural scales.

An examination of the antennal processes in e. g. *S. paradoxa* shows that the hook-like processes in this species[2] are gradually transformed through transitional forms into the typical scale covering (compare Fig. 1 g. and Fig. 1 f.). A similar transformation is observable in *S. pagenstecheri* (Fig. 1 h.), though only on a few of those joints which are provided with antennal processes, viz. on one or two of those joints, which are situated proximally and one or two of those situated distally. In the species all the spine-like antennal processes attain greater length and assume a more bristle-like appearance as one approaches the centre of the flagellum. The characteristic conformation of the antennal processes in the species *S. schythei* has been illustrated by BEDDARD (1884). I have not been able to detect any such difference in the shape of the processes in male and female specimens as BEDDARD claimed to have observed. The processes which BEDDARD believed to be distinctive of the male are similarly developed also in the female (see Fig. 1 i.). There is therefore no ground for BEDDARD's assumption that certain of the antennal processes — all of which are merely scale formations —, have a sensory function.

Antennal processes occur in most species of *Serolis*. Like BEDDARD (1884)[3] I have found them in the species *paradoxa, trilobitoides* and *schythei*. I have also discovered them in *gaudichaudi, convexa, longicaudata, australiensis, polita, pagenstecheri, glacialis* var. *austrogeorgiensis*, and *exigua*.

In the various species these processes differ not only in shape[4] but also in degree of distinctness. I found them quite faintly developed in full-grown specimens (one male and one female) of *S. convexa*, whilst in three immature females of that species they were entirely lacking. In a sub-adult male specimen of *S. bouveri*[5] they were indistinct and scarcely larger than the structural scales. In *S. paradoxa* on the other hand I found antennal processes typical of the species even in young removed from the marsupium, though only in a row along the distal margin; they were entirely absent on the rostral margin of the ventral

[1] Described and figured by BEDDARD (1884) with reference to certain species of *Serolis* (see p. 13).
[2] Cf. BEDDARD, 1884.
[3] See p. 13.
[4] The reader is referred to the following descriptions of the several species.
[5] The only specimen of this species which I have been able to examine.

surface. In the species *S. latifrons*, — which, together with *S. beddardi*, forms a divergent group within the genus *Serolis* —, antennal processes were entirely wanting, even in full-grown specimens.

Elongated structural scales occur in *Serolis* also in several other places. Occasionally they occur in the full-grown male, on the propodus of the second pereiopod, submarginally, close to the lower margin. This is the case in *S. pagenstecheri* (Fig. 1 c.). The more dorsally situated, pointed structural scales, which are characteristic of the species, increase successively in length towards the lower margin of the propodus, so that near the margin they assume the form of setae. A corresponding part of the propodus of the second pereiopod in *S. schythei* is illustrated in Fig. 1 b. Though the scales in this part have assumed a pointed shape, they scarcely project further than the other structural scales.[1]

We occasionally find a longitudinal row of elongated structural scales on the lower margin of the dactylus of the second pereiopod. In the species *S. schythei* I found them both in males and females. See Fig. 13 d. The scale processes here have a claw-like appearance, and the one most distally situated assumes the form of a distinct claw at the point of the propodus. In different specimens the processes varies in degree of distinctness.

Enlarged and freely projecting scales occur close to the lower margin of the propodus as well as on the distal margin of the carpus of the first pereiopod. In *S. polita* large leaf-like scales are found in a longitudinal row, submarginally, close to the lower margin of the propodus on the caudal side. See Fig. 1 e.[2]

Elongated scales of similar shape are found at the same spot also in *S. minuta, australiensis, longicaudata* and in *S. paradoxa*. In the last-mentioned species they are rather small. In *S. exigua* we find on the lower margin of the propodal joint one longitudinal caudal row of scales and, in contradistinction from other species of *Serolis*, only one longitudinal row of setae (Fig. 4 c.). Similar scale formations from the distal edge of the carpus of the first pereiopod in *S. septemcarinata* are illustrated in Fig. 1 d. In this species they are distinctly developed in a few specimens only.

The masticatory processes on the mandibles, which always are devoid of a setal canal, may be a kind of scale-processes. They differ considerably in shape in the several species, being, as a rule, of a scale-like or spine-like appearance (Figs. 12 c. and d., 13 a. and b., 14 b. and c., 15 c. and d., 19 b. and c., 21 b. and c.); exceptionally they are pectinate at their distal ends (Fig. 17 c. and d.).

2. The pectinate scales[3] and their division into false setae.

We find a variety of the structural scales proper in the pectinate scales. The characteristic feature of these scales is that they are produced distally into a number of slender and acute points. In *Serolis* the size of the part which forms the common basis of these pointed ends, as also the length of the points, varies in individual scales. Indeed in many instances we find no trace of the basal part. In such cases the hair-like points of the scale form regular rows of »hairs». This feature was seized upon by WAHRBERG (1922) as a

[1] The typical form of structural scale in *S. schythei* is much the same as in *S. paradoxa* (see Fig. 1 g).

[2] This figure also shows the caudal row of short leaf-like setae on the lower margin of the propodus as well as the sub-marginal row of slender setae lying close to the projecting scales. The rostral row of long trilobate setae on the lower margin of the propodus has not been figured.

[3] Kammschuppen in German.

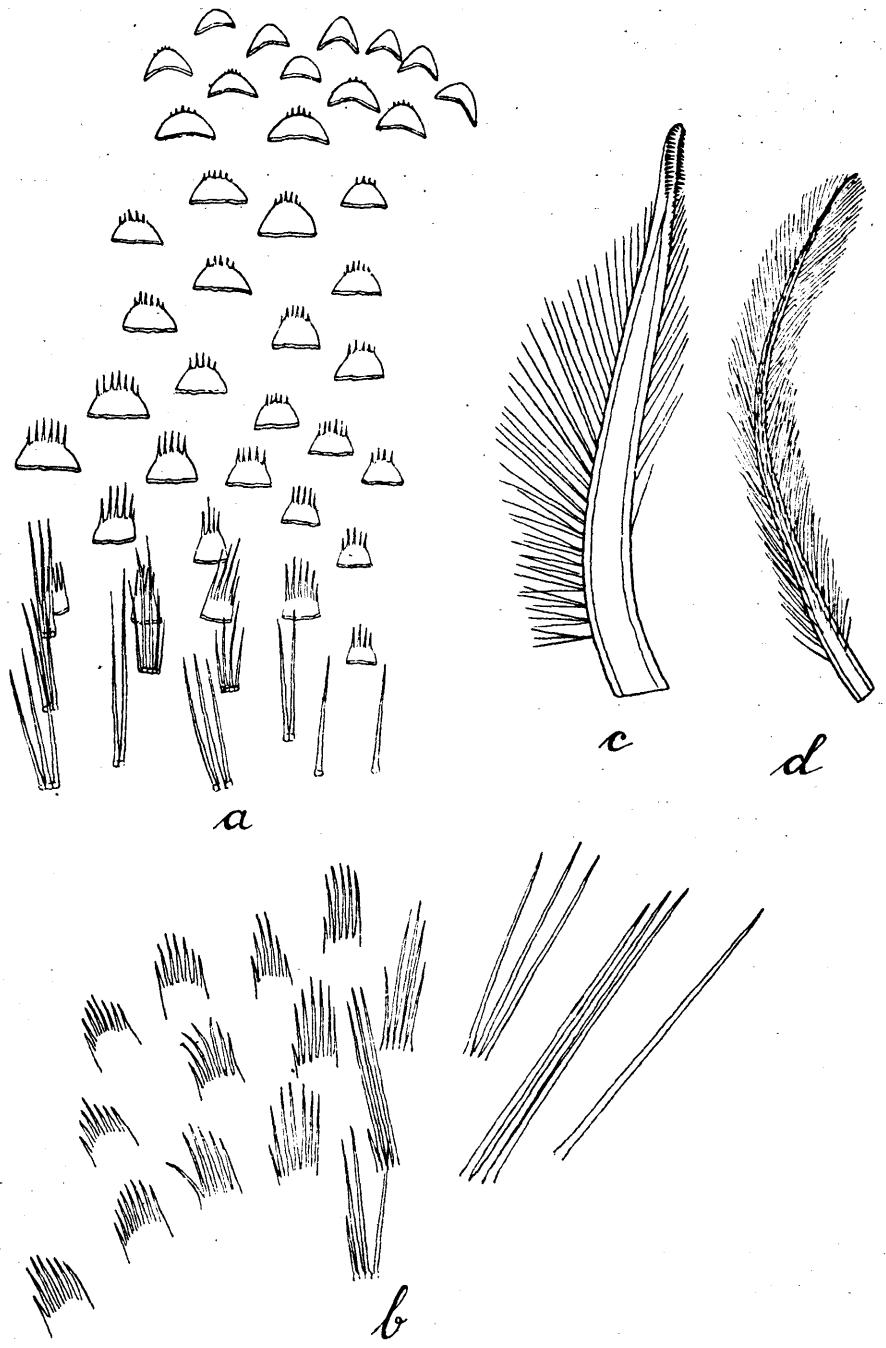

Fig. 2. a. Scales and setae in *Serolis*. Structural scales, pectinate scales and setae-like »hairs». Chitinous tegument from the dorsal surface of the basipodite near its distal margin, maxilliped of *S. paradoxa*, low adjustment of the microscope, 490 ×. b. Pectinate scales and setae-like hairs from the same spot, in *S. paradoxa*, high adjustment of the microscope, 600 ×. c. Seta from the inner proximal angle of the basipodite of the first pleopod, subadult male of *S. polita*, 150 ×. d. Seta from the lower margin of the basipodite of the second pereiopod, adult male of *S. paradoxa*, 115 ×.

plausible explanation of the occurrence of regular rows of hair-like projections without a setal canal on the maxillipeds of terrestrial Isopods (see p. 11). Where a chitinous area is observed proceeding from the basipodite of the maxilliped near its distal margin, we find the features illustrated in Fig. 2 a. Next to the distal edge we see typical structural scales. These are succeeded in a proximal direction by pectinate scales. Those nearest the structural scales are, however, provided with very inconspicuous points. As we advance proximally the hair-like points become longer and longer and their common basal part smaller and smaller, being reduced to nil on the most proximal of the scales figured. In other words we find continuous series of structures forming transitions (1) between the typical structural scales and the pectinate scales and (2) between the pectinate scales and the regular rows of independent setiform projections. It is thus indubitable that each of the structural scales can split up into several separate phaneres.

Further proximally on the basipodite of the maxilliped the surface is covered by a dense nap of long, thin, setae-like »hairs» of considerably greater length than those shown in Fig. 2 a. In this nap the »hairs» are still farther apart. The regular row has in fact been partially dissolved. Here and there one finds solitary hair-like projections at some distance apart from the rest (cf. Figs. 2 a. and b.) Most of these »hairs», however, are grouped together, two and two, in transverse rows; here and there we find groups of three. The distance between the »hairs» in the transverse rows is always greater than in the more distally situated free »hairs» illustrated in Figs. 2 a. and b.[1]

These very slender setae-like »hairs» — which may thus be produced by the separation of the ends of the pectinate scales and which, unlike the setae proper, are devoid of a setal canal —, are widely distributed in marine Isopoda being almost as common as the setae proper. They often form a covering of »hair» on the margins of the pleopods, but also occur abundantly elsewhere, especially on the mouth-parts. Their occurrence is a character which normally applies to all Isopoda.

In the species of *Serolis* examined by me they are very abundant. They occur on the mouth-parts (see for example Fig. 15 f., Fig. 16 and Fig. 17 f.), and on the antennulae (Fig. 21 a.). In all the species of *Serolis* examined by me they are developed on the rostral[2] (medial) margin of the second peduncular joint of the antennae, where they cover a triangular area (see Fig. 12 c. as compared with Fig. 12 a. and b.). They occur also on the pereiopods. In *S. polita*, for example, they form a nap on the upper and lower margin of the sixth pereiopod (Fig. 3 a.). In *S. exigua* they occur on the upper margin of both the basipodite and the ischium of the fifth to seventh pereiopods (Fig. 18 b.), as well as on the upper margin of the basipodite of the second to fourth (Fig. 18 a.). On the pleopods they are very abundant (see Figs. 18 c., d. and e., Fig. 19 d.), as well as on the uropods (Fig. 21 d.).

The antennal processes on the flagellum of the antennae in *Serolis* sometimes likewise assume a pectinate character. I found this to be the case in the species *S. longicaudata* (see p. 92), where the antennal processes are distally produced into points. They deviate, however, from typical pectinate scales in that the central and furthest projecting process is robust and spine-like.

[1] The double lines shown at the foot of the scales and free »hairs» in Fig. 2 a., in contradistinction from Fig. 2 b., are due to the low adjustment of the microscope in the former picture.

[2] When the antennae are in their natural position this margin is the inner (= median or medial) margin. As regards the orientation of the appendages and the terminology of their margins, I have, in the main followed RACOVITZA (1923).

Similar features occur also in other Isopods. In *Edotia tuberculata*, we find, distally, on the penial filament of the second pleopod in the male (see Figs. 22 c. and d.) a covering of slender projections, arranged in rows and increasing in length towards the proximal end. Here they assume a setiform appearance, the rows being entirely dissolved.

In *Eurycope* sp. (cf. *frigida* VANHÖFFEN) the last joint of the mandibular palp is ventrally covered by pectinate scales. See Fig. 78 d. In the distal part of the rostral margin of the joint, however, the pectinate scales form free projections of a somewhat setiform appearance, but furnished, like the typical pectinate scales, with a number of forward-facing points.

III. General considerations on the setae in marine Isopoda.

The setae of the Isopods, as has already been pointed out, are very variable in conformation. In terrestrial Isopods, according to WAHRBERG (1922), they consist of two morphologically distinct kinds of setae, viz. simple and composite, the latter comprising a more or less coalesced complex consisting of a setal and a scale portion.

A comparison between the thoracopod setae occurring in the terrestrial Isopods and those obtained from species of the family *Cirolanidae* (see RACOVITZA, 1912) indicates that thoracopod setae similar in conformation to the composite thoracopod setae in terrestrial Isopods occur also in marine Isopods. Such setae are also common in the *Serolidae*. If we compare one of the setae from the rostral row on the lower margin of the propodus of the first pereiopod in *S. trilobitoides* (see Fig. 5 a. and HODGSON, 1910, Pl. IV, Fig. 8) with a thoracopod seta in *Ligia italica* (see WAHRBERG, 1922, Fig. 5, 4), we shall find that the setae in these two widely separated species are actually of the same shape. A characteristic feature of such setae, also in marine Isopoda, is that they consist of an axial, cylindrical median part of more or less prominence, surrounded by an outer mantle, which distally terminates in two free lappets, between which the axial point of the median part stands forth freely.

The above-mentioned type of thoracopod setae, which presents a distinct resemblance to the evidently composite setae in terrestrial Isopods, is commonly found in various sub-orders and families of the marine Isopods and must therefore be regarded as a character common to the Isopods. They occur, for example in various groups of the *Parasellidae* (see Figs. 40 c., 72 h. and k.). Within the sub-order Valvifera I found setae of a similar character in the genus *Macrochiridothea*, where they occur on the lower margin of the robust seroliform propodus of the first pereiopod (Fig. 26).

In marine Isopods stout setae are often found together with very slender ones. In *Cirolana microphtalma* and *Eurydice pulchra* (according to G. O. SARS 1899, Pl. 307), for example, the pereiopods are furnished with numerous slender hair-like setae together with a smaller number of setae of a shorter and stouter type. On the uropods of species of the fam. *Cirolanidae* (RACOVITZA, 1912) these types of setae are found in conjunction with typical plumose setae.

A common feature of the setae in marine Isopods is that they are furnished with two rows of triangular or hair-like sub-branches. Thus in the genus *Antarcturus*, for example, the propodus and dactylus of the first pereiopod are usually beset with long and rather narrow setae, provided with two longitudinal rows of slender triangular sub-branches, the

setae ending distally in two fine hair-like points. The setae on the remaining pereiopods in *Antarcturus* are devoid of the two rows of sub-branches and are single-pointed. The external resemblance to the primitive plumose setae — notably the two rows of sub-branches — does not necessarily show that the setae in *Antarcturus* are modified plumose setae.

In the following report on my examination of the setae in *Serolis*, I shall compare the various kinds of setae which occur in the family *Serolidae*. It will be shown that some of the setae are manifestly composite. I have arranged my material accordingly.

When the setal part and the scale part of the composite seta have entirely coalesced they may present the same appearance as simple setae. Hence, as will be shown in the sequel, a mere morphological investigation is not always sufficient to determine the category to which a seta belongs.

IV. Non-composite setae.

Non-composite setae of the plumose type occur in marine Isopoda abundantly on the pleopods but sometimes also on the pereiopods (in e. g. the *Eurycopini*). In *Antarcturus* we find setae of a similar plumose type on the expanded coxopodite of the maxilliped in the ovigerous female (Fig. 33 b.).

From the typical plumose setae with their two rows of sub-branches there is a transition to that type of setae where the sub-branches are irregularly situated. I found setae intermediate between the plumose and the penicillated type on the exopodite of the third pleopod in *Ianthopsis bovallii*, where the proximal ends of the setae may be covered by irregularly situated sub-branches, whilst, distally the sub-branches are inserted into faint incisions arranged in two rows.

The sub-branches of the plumose setae may be wholly or partially reduced. Thus on the pleopods of species belonging to *Antarcturus*, in addition to plumose setae of typical development, we find setae with short and sparse sub-branches as well as those in which the sub-branches have been entirely reduced (see Figs. 33 d. and e.).

In the genus *Serolis* the typical plumose setae occur only on the pleopods. On the first three pairs where they fringe the margins of the exopodite and the endopodite, they attain a considerable length (see Fig. 19 d.). In this figure it is faintly indicated that the sub-branches of the plumose setae are fixed in very marked incisions, except at the proximal third of the setae where incisions are missing. The distal ends of the plumose setae are prolonged into hair-fine points. In conjunction with the plumose setae, we find on the first three pairs of pleopods some very short and slender hair-like setae.

Plumose setae, though reduced in size, occur on the distal and lateral margins of the exopodite of the fourth pleopod (Fig. 18 e.). The plumose setae on the lateral margin become still shorter proximally than towards the distal end, being in *S. paradoxa* and *schythei* provided on the proximal part of the margin merely with sparse sub-branches, and passing further proximally into very slender, hair-like setae without any sub-branches. It is thus seen that the plumose setae of typical development may pass over by transitional forms into the very slender type of hair-like setae.

The fifth pleopod is, as a rule, devoid of setae. *S. exigua* forms an exception in this respect; the exopodite of the fifth pleopod in the latter species being provided with two long setae of the typical plumose type (Fig. 18 f.).

In the inner proximal angle of the basipodite of the first three pairs of pleopods, we find that the plumose setae have been more or less modified (Fig. 19 d. and 2 c.). »Plumose hairs»[1] occur at this spot in most of the species of *Serolis*. Their distal ends are always rounded; the sub-branches are not fixed in incisions, but are arranged more or less regularly in two longitudinal rows. In many species the setae are transformed into a kind of setae which are slightly reminiscent of the coupling-setae of the first pleopods in the *Parasellidae* and *Arcturidae*. See Fig. 2 c. and cf. Fig. 35 d. The sub-branches are very slender except at the distal end of the setae, where they pass over into two adjacent rows of shorter and somewhat broader sub-branches.

On an examination of the pereiopods, we find that the setae also on these appendages often assume a shape similar to that of the setae on the pleopods. On one of the last fifth pairs of pereiopods in a species of *Serolis* we find the following kinds of setae (Fig. 3 a.): —

1. Sensory setae of a plumose type (on the upper margin of the basipodite).

2. Very slender and, as a rule, very short hair-like setae similar to those hair-like setae which sometimes occur on the lateral margin of the exopodite of the fourth pleopod. This type of setae occurs on all the joints.

3. Stout sword-shaped[2] setae, usually provided with two rows of short sub-branches, (occurring on all the joints, except the basipodite and the dactylus). The setae are sometimes devoid of sub-branches. In exceptional cases the sub-branches are moderately long, whence the shape of the setae is similar to that of plumose setae (see Fig. 3 a.).

The ordinary stout sword-shaped setae will be treated in detail on p. 34—36. As regards the hair-like setae, they may exceptionally pass over by a series of transitional forms into those of the stout sword-shaped type. This occurs on the second pereiopod of the sub-adult male in *S. paradoxa* (Fig. 3 b.). It would therefore be tempting to conclude that also the stout sword-shaped pereiopod setae are non-composite. It will, however, be shown in the sequel, by a comparison of the sword-shaped setae with those of the composite kind, that this is not necessarily the case.

The slender setae of a hair-like type occur on all the joints of every pereiopod, though they are often minute and difficult to detect. As a rule, they are easily distinguished from those of the stout type by their extreme slenderness.

Slightly longer setae of the hair-like type are always found in a submarginal row on either side of the lower margin of the propodus of the first pereiopod, as well as on the distal margin of the carpus in the same appendage. See for example Figs 1 d. and 1 e. In *S. exigua* they are sparsely distributed over the whole of the rostral and caudal surfaces of the propodus of the first pereiopod.

In the adult male the setae, as a rule, are more abundant than in the female. As a secondary sexual character of the male sex, the non-composite setae may form a dense nap on the lower surfaces of some of the pereiopods. Such a dense covering of non-composite setae we find, for instance, on the lower surface of the ischium, merus and carpus of the second pereiopod in the adult male of *S. paradoxa*. The setae are here densely provided with slender irregularly situated sub-branches (Fig. 2 d.). Similar penicillated setae are found on the lower margin of the carpus of the first pereiopod in the adult

[1] According to BEDDARD (1884).
[2] According to BEDDARD (1884).

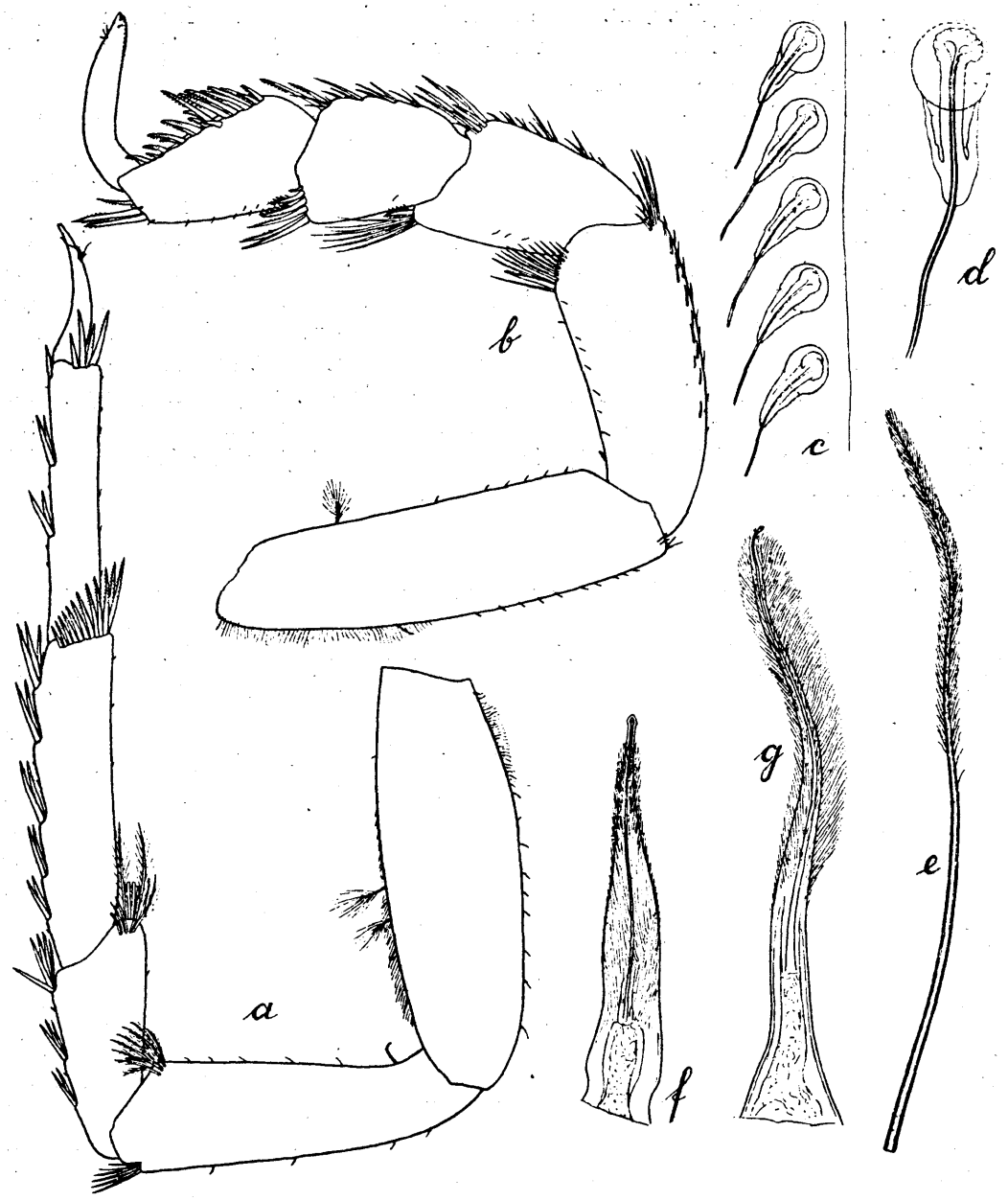

Fig. 3. Setae-armature in *Serolis*. a. Sixth pereiopod, right, female of *S. polita*, 20 ×. b. Second pereiopod, right, sub-adult male of *S. paradoxa*, 25 ×. c. Row of submarginal pores and setae at the lower margin of dactylus of the first pereiopod, seen from the caudal side; immature specimen taken out of the marsupium, *S. paradoxa*, 665 ×. d. Seta from the same row, seen from the rostral side; adult specimen of *S. paradoxa*, 665 ×. e. Non-composite seta from the carpus of the first pereiopod, adult male of *S. gaudichaudi*, 115 ×. f. Composite seta from the carpus of the first pereiopod in the same specimen, 115 ×. g. Seta from the rostral row on the lower margin of the propodus of the first pereiopod, adult male of *S. gaudichaudi*, 115 ×.

male of *S. gaudichaudi*, (Fig. 3 e.).[1] The same kind of setae likewise forms in the adult male of *S. gaudichaudi* a dense nap on the lower surfaces of the basipodite, ischium, merus and carpus of the seventh pereiopod.[2]

Along the lower margin of the dactylus of the first pereiopod, submarginally on the rostral side, there is a row of short setae which may be referred to the non-composite kind; at any rate there is no indication of a composite character. In some species they are sunk in pores from which only their extreme ends project. GRUBE (1875, p. 224) is the only author who mentions this feature. Referring to the species *S. schythei*, GRUBE states: »an der Basis der Zähne sieht man eine Reihe heller runder Flecke und ähnliche auch am Innenrand der Klaue durchschimmern, deren Aussenrand Stachelchen trägt».

In the species *paradoxa*, *schythei*, *polaris* and *convexa* there is a row of pores along the lower margin of dactylus on the rostral side. In *S. convexa* the setae the pointed ends of which project out of the pores are hair-like. In *paradoxa*, *schythei* and *polaris* they are distally bullet-shaped and swollen, and the setal canal has a rather wide opening at the distal end. Their appearance in *S. paradoxa* is illustrated in Fig. 3 c. and d.

V. The occurrence of composite setae in the Fam. Serolidae.

It has already been mentioned (p. 20) that the characteristically transformed setae in the rostral row on the lower margin of the propodus of the first pereiopod present a striking resemblance to the composite thoracopod setae of the terrestrial Isopods. Their characteristic three-pointed shape in both cases may possibly be due to the same causes, in which case these setae in *Serolis* would likewise be of a composite character. In some species of *Serolis*, at any rate, the composite character of the setae in question is manifest.

In the species *S. exigua*, unlike all other previously described species of *Serolis*, there is only a single row of setae on the lower margin of the propodus of the first pereiopod. This row corresponds probably to the rostral row of other species; instead of the short, flattened and leaf-shaped setae of the caudal row in other species of *Serolis*, we find in *S. exigua* a row of projecting scales (see Fig. 4 c.).

The phaneres of the rostral row consist of setae in which there is an evident combination of setal and scale parts (see Figs. 4 a, b and c). From a common base there issue two branches, one longer, rounded at the distal end, and containing the setal canal, which at its extremity opens out into a pore, the other shorter, pointed at the distal end, and without any setal canal. The longer branch is similar in shape to a typical non-composite seta. The shorter branch is smooth and resembles an elongated structural scale. These parts, which are separated from one another, almost throughout, constitute different morphological elements. This is evident from the fact that a suture-line between them can be distinguished, sometimes very distinctly, in the common base.

In *S. convexa* there is another feature which brings into still clearer relief the composite character of the setae on the lower margin of propodus of the first pereiopod. In the female of this species, in the rostral and caudal rows respectively, the setae normally

[1] See also AUDOUIN and MILNE EDWARDS, 1841, Pl. I, Fig. 13'.
[2] See AUDOUIN and MILNE EDWARDS, 1841, Pl. I, Fig. 16".

have the appearance illustrated in Fig. 4 e and d. Near the carpus, however, the setae assume the modified structure illustrated in Fig. 4 f.

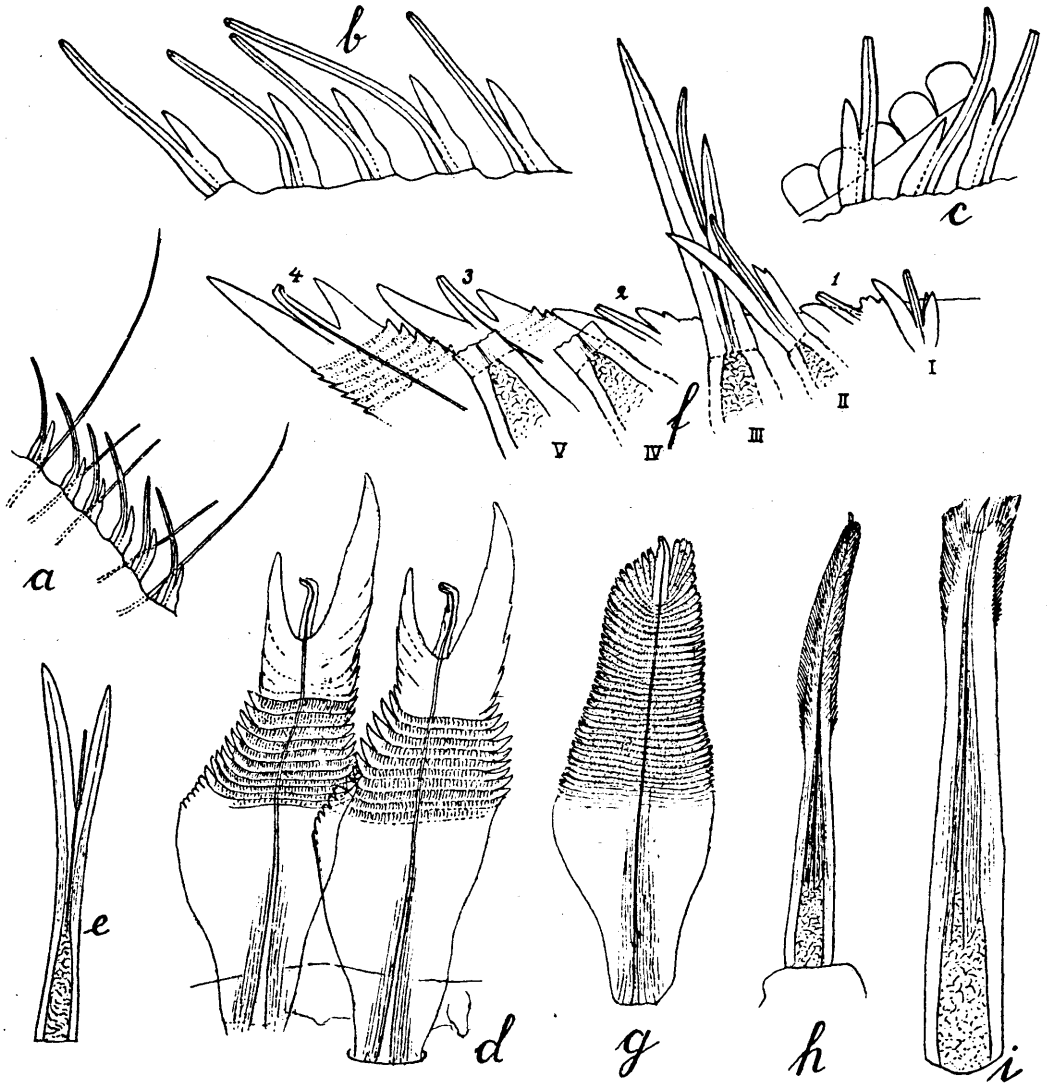

Fig. 4. Setae in *Serolis;* from the lower margin of propodus of the first pereiopod. a. and b. Setae in the female of *S. exigua,* 270 and 600 ×. c. Setae and scales from the lower margin of the propodus, *S. exigua* (female), 490 ×. d. Setae from the caudal row, seen from the caudal side, female of *S. convexa,* 465 ×. e. Seta from the rostral row in the same specimen, 160 ×. f. Proximal part of the lower margin of the propodus in a female of *S. convexa,* 350 ×. g. Seta from the caudal row seen from the caudal side, adult male of *S. convexa* (from a specimen collected by the German »Gazelle» Expedition), 270 ×. h. and i. Setae from the rostral row in the same specimen, 90 and 160 ×.

The setae adjacent to the carpus gradually diminish in size, assuming a stunted appearance close to that joint. Adjoining the carpus in the caudal row there is a non-composite seta (Fig. 4 f, *1*) with a projecting scale on either side of it. The scale furthest

from the carpus is subtriangular and pointed, whilst the one nearest the carpus is very small and bifid. If we compare the phaneres in the caudal row with one another (Fig. 4 f, *1—4*), we shall find that the non-composite seta adjoining the carpus together with the two surrounding scales corresponds to merely a single phanere elsewhere in the row.

If we pass to the second seta of the caudal row, beginning from the carpus (Fig. 4 f, *2*), we shall see that a median non-composite seta has coalesced at the base with two surrounding scales, forming, together with the latter, a composite seta, the base of which, however, is very small. That margin of the scale part which adjoins the carpus is provided with an incision, whilst that most remote from the carpus is unbroken. The freely projecting terminal lappets of the scale part thus are similar in shape to the previously described freely projecting scales, which appear in the vicinity of the non-composite seta adjoining the carpus.

The following phaneres in the setal row (Fig. 4 f, *3* and *4*) deviate very slightly from the normal appearance. The lateral margins of the scale part are furnished in the fourth seta (Fig. 4 f, *4*) with a row of incisions; the only feature which distinguishes this phanere from the typical one illustrated in fig. 4 d is its relative shortness.

The above description of *S. convexa* indicates that phaneres which, in view of their structure and position in the same setal row, must be considered to be homologous consist of (1) a number of apparently homogeneous setae and (2) one seta with a separate scale on either side of it. We are thus forced to the conclusion that all the setae in the caudal row with the exception of the one nearest the carpus are composed of a setal part and a scale part.

The setae of the rostral row in the female of *S. convexa* likewise belong to the composite category. In this row the phanere nearest to carpus has the appearance illustrated in Fig. 4 f, I. From a short common base there issue three branches, the median one of which is traversed by the setal canal, whilst the lateral branches are subtriangular and pointed. The phanere thus resembles, in its main features, the second phanere of the caudal row, reckoned from the carpus (Fig. 4 f, *2*). Thus in the rostral row, in contradistinction from the caudal, the series of phaneres illustrating the coalescence of a non-composite seta with the surrounding scaly elements is incomplete.

In the female of *S. gaudichaudi*, in which the normally developed setae in both the caudal and rostral rows have the same structure as those of *S. convexa* (cf Figs. 4 d and e), we find, however, that the phanere, nearest to the carpus, in the rostral row, consists of a small non-composite seta with a rounded distal end, situated very close to a small pointed scale. The seta and the scale may possibly have coalesced in a slight degree at their proximal ends, but even there their outlines are quite distinct. The following phaneres of the rostral row form a series of transitional forms leading up to the normally developed composite seta typical of the female in *S. convexa* and *gaudichaudi* (Fig. 4 e).

Thus, in the case of *S. gaudichaudi*, a comparison of the phaneres in the rostral row of female specimens shows that all the setae in this row with the exception of the small one nearest to the carpus are of a composite character. As regards the females of *S. convexa* there is a slight difference from *S. gaudichaudi* in that the setae of the rostral row only form a somewhat incomplete series leading up to the type of seta characteristic of both species (Fig. 4 e). It must be assumed, however, that even in the case of *S. convexa* this type of seta belongs to the composite category.

As regards the setae of the rostral row in the female of *S. convexa*, we find that in the phanere next to the carpus (Fig. 4 f, I) the freely projecting setal part is nearly twice as long as the common base of the setal and scale-parts.

In the immediately succeeding phanere in the setal row (Fig. 4 f, II) the common base is considerably longer, but here too the freely projecting setal part is of great length. In the next phanere the common base is still longer, the freely projecting setal part here being only of about the same length as the base. In the following phaneres the common base increases successively in length, as also the two free branches of the scale part, whilst the freely projecting distal portion of the setal part becomes shorter and shorter, so that the setae finally assume the typical appearance illustrated in Fig. 4 e.

If we compare the setae adjoining the carpus (Fig. 4 f, I—V) with the typical setae situated further distally (Fig. 4 e) in the rostral row, it will be found that they differ from the latter in yet another respect. The first and second setae reckoned from the carpus, (Fig. 4 f, I—II) merge at their proximal ends into a basal part situated below the cuticle.[1] In the third seta the distal end of the basal part protrudes freely beyond the cuticle. In the succeeding setae the entire basal part is situated outside the cuticle.

In the second to eighth setae, reckoned from the carpus, we find on the caudal side (but not on the rostral) a faint suture-line between the base and the remaining part of the seta. These sutures are indicated in Fig. 4 f by dotted lines. In the ninth seta there are vestiges of such a suture-line, whilst in the tenth it has completely vanished.

The above comparison of setae on the lower margin of the propodus of the first pereiopod in the female of *S. convexa* shows that setae in the same row form a continuous series of transitional forms between (1) a non-composite seta plus one or two free scales and (2) large trilobate composite setae. As regards the setae of the rostral row, it has been shown that they form a series of phaneres differing continually in the degree of coalescense between their setal and scale parts, as well as in the development of their basal parts.

It may thus be referred that the above described series of phaneres in the same row, each differing in a slight degree from those immediately adjacent to them, possibly illustrates, in some measure, the normal process of development of the composite setae. The implication is that the phaneres nearest to the carpus have assumed their stunted appearance owing to an arrestment of their growth. In that case the most stunted phanere or group of phaneres, that nearest to the carpus, would correspond to a comparatively early stage of development.

VI. Composite setae on the first pereiopods.

It has been shown above that the setae on the lower margin of the propodus of the first pereiopod in *S. exigua, convexa* and *gaudichaudi* belong to the composite category and that their trilobate shape in the females of the two latter species is due to an incomplete coalescence between their setal and scale parts. In immature male specimens of *S. gaudichaudi* the setae are equal to those of the female, whilst in the adult

[1] This basal part of the first seta has not been drawn, though it could be brought into view by a low adjustment of the microscope.

males they have, in part, lost their trilobate shape (see p. 30). The composite setae on the propodus of the first pereiopod may thus vary considerably in shape in the same

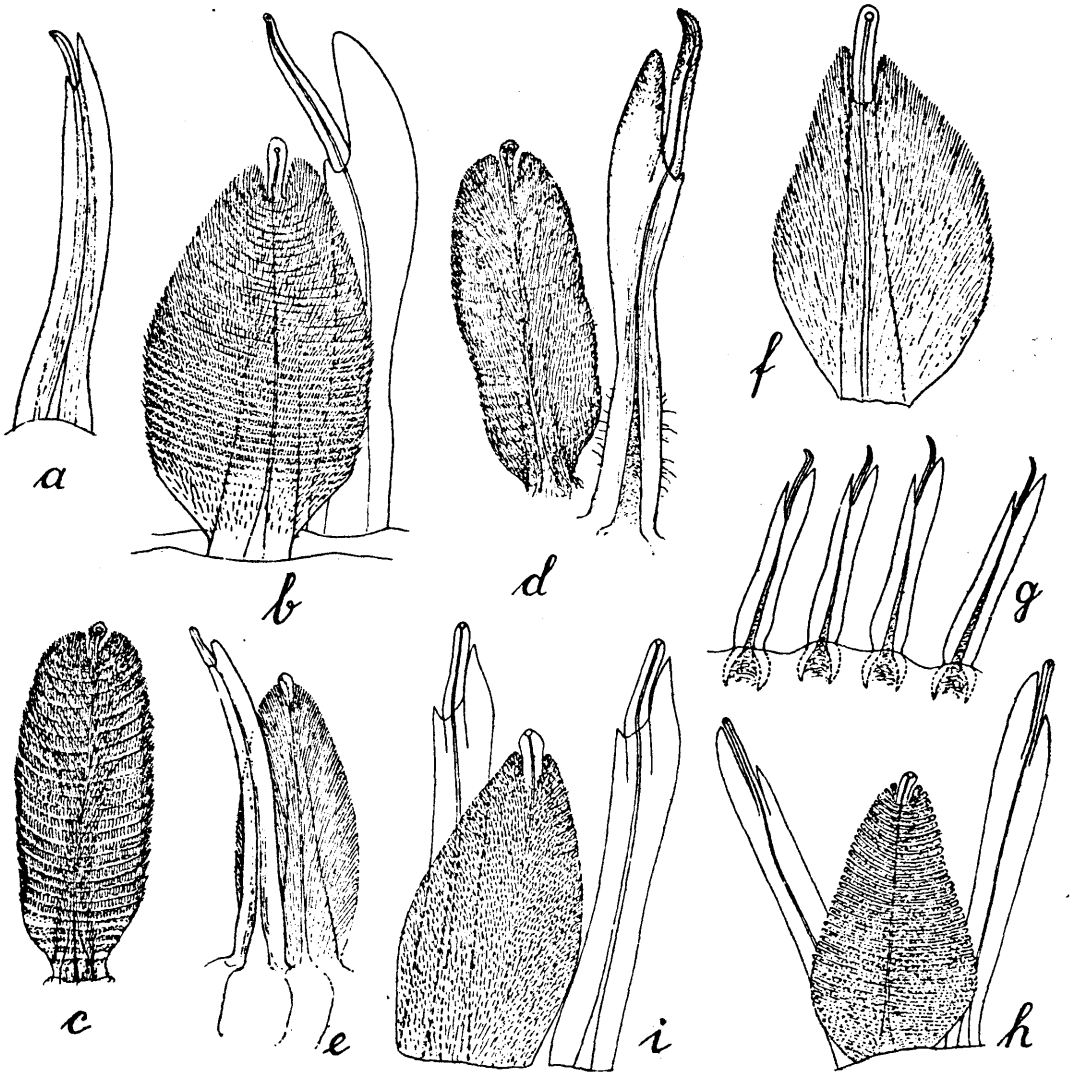

Fig. 5. Setae in *Serolis;* from the lower margin of propodus of the first pereiopod. a. Seta from the rostral row in *S. trilobitoides*, 270 ×. b. Setae from *S. paradoxa*, 265 ×. c. Seta from the caudal row seen from the caudal side, *S. schythei*, 270 ×. d. Setae seen from the rostral side, *S. schythei*, 270 ×. e. Setae, seen from the rostral side. *S. pagenstecheri*, 180 ×. f. Seta from the caudal row, seen from the rostral side, female of *S. polita*, 465 ×. g. Setae from the rostral row, female of *S. polita*, 160 ×. h. Setae from *S. septemcarinata*, seen from the caudal side (high adjustment of the microscope) 270 ×. i. Setae from *S. bouvieri*, seen from the caudal side (high adjustment of the microscope), 270 ×.

species. On a comparison of the setae on the lower margin of the propodus in the several species of *Serolis* we will find that they all are of exactly the same type as those of *S. convexa* and *gaudichaudi*, agreeing with the setae of the two latter species even in their minute, chitinous structure. As a rule, their shape is characteristic of each species,

but the difference between setae of the different species is not as marked as that between corresponding setae from young and adult males in *S. gaudichaudi*. Setting aside *S. convexa* and *S. gaudichaudi*, the setae adjacent to the carpus differ from the remaining setae in the rows only in their smaller size. Even in young removed from the marsupium, I found the setae on the propodal edge to be of exactly the same shape and structure as in adult specimens (in *S. paradoxa* and *schythei*).

Except in *S. exigua* (see p. 24), two longitudinal rows of setae occur on the lower margin of the propodus. The setae in the two rows always show rather considerable differences in their detailed structure. They are equal in both sexes, except in *S. convexa* and *gaudichaudi*.

In the caudal row they are short, thin, leaf-like phaneres whose setal part is always freely projecting. At a somewhat low adjustment of the microscope, the setal part becomes, as a rule, dimly discernable in its entire length (see Figs. 5 b, e and f). The setae are traversed throughout by a narrow setal canal, opening into a pore at the tip of the setal part; this pore is situated more or less towards the caudal side (see Figs. 5 b, c, f, i, h). The lateral margins of the scale part are often, more or less distinctly split up into pointed triangular lappets.[1]

As was pointed out by HODGSON (1910) with reference to *S. trilobitoides*, the rostral and caudal surfaces of the setae of the caudal row differ in appearance, a difference which I could observe in all the species examined by me. Viewed from the rostral side, the setae have a more or less distinct longitudinal striation (Fig. 5 f and d), whereas from the caudal side, they are seen to have transverse streaks (Fig. 5 c). This is due to the caudal surface of the setae being traversed by fine transverse grooves, running parallel to one another and issuing into the lateral incisions between the triangular marginal lappets. Between the transverse grooves the longitudinal striation[2] of the setae is visible, as minute streaks or dots, also on the caudal side. The striated structure of the setae leads to the formation of minute hair-like points, which occur sparsely at the margins, for example in *S. trilobitoides* (Fig. 5 f) and *S. paradoxa* (Fig. 5 b); in the latter species they occur moreover on the proximal part of the caudal surface. The sculpturing of the caudal surface in setae of *S. bouvieri* deviates from other species in another respect. As will be seen from Fig. 5 i, the leaf-like setae in this species have well-defined grooves only at the distal end, close to the margins.

The typical structure of the setae of the caudal row in several species is illustrated in Fig. 5 with reference to *S. paradoxa* (b), *schythei* (c and d), *pagenstecheri* (e), *polita* (f), *septemcarinata* (h), and *bouvieri* (i). As shown by the figures, setae from different species differ mainly from one another in their shape, as well as in having the lateral margins of the scale part more or less split up into pointed, triangular lappets.

---

[1] See, for example *S. schythei* (Fig. 5 c and d) and *S. convexa* (Fig. 4 d and g).

[2] I found a similar chitinous structure at the tip of the dactylus of the first pereiopod in *S. gaudichaudi*. The tip of the dactylus, except its extreme distal end, forms a subtriangular portion which has the appearance of an »impressed» seta of the leaf-like type. The rostral surface of the subtriangular portion is traversed by parallel transverse grooves terminating in faint incisions on the lower margin of the dactylus; its caudal surface is either faintly striated in a longitudinal direction (in the adult male) or, as the rostral surface, traversed by faint parallel transverse grooves (in the female). The subtriangular part is moreover traversed by a narrow longitudinal canal, which, however, does not reach quite up to its distal end. The extreme tip of the »impressed seta» projects freely.

The setae of the rostral row, unlike those of the caudal row, are always long and subcyindrical. The setal part is not discernible within the scale part, but may be indistinctly indicated by a faint longitudinal striation (see Fig. 5 a). As in the setae of the caudal row, the setal part is always freely projecting. As a rule, the scale part is produced at its distal end into two triangular lappets, one on either side of the freely projecting tip of the setal part. The setae are thus trilobate at their distal ends. Only setae from the adult males of *S. convexa* and *gaudichaudi* deviate in this respect (see Fig. 4 h and 3 g). As a rule, the setae of the rostral row in the different species are distinguished by the distal lappets of the scale part being dissimilar in shape and length, and by the varying length of the free terminal portion of the setal part. This feature is illustrated in Fig. 5 with reference to the species *trilobitoides* (a), *paradoxa* (b), *schythei* (d), *pagenstecheri* (e), *polita* (g), *septemcarinata* (h) and *bouvieri* (i). In *S. paradoxa*, for example, the setae of the rostral row have the usual trilobate shape and are not single-pointed, as GRUBE (1875) asserted (see p. 12). As regards the setae in *S. septemcarinata*, which have been variously described and figured by BEDDARD (1884), PFEFFER (1887) and COLLINGE (1918), my observations agree with those of BEDDARD.

In *S. convexa* and *gaudichaudi* we find a marked difference in structure between setae from female specimens and corresponding setae from adult males.

In *S. convexa* the setae of the caudal row in the female have the structure shown in Fig. 4 d. As in other species they are leaf-like, flattened, and shorter than the setae of the rostral row; but at the distal end the scale part is produced into triangular lappets, one on either side of the free setal part, a feature which is usually peculiar to the setae of the rostral row. Viewed from the rostral side the longitudinal striation is, as usual, visible. The transverse grooves of the caudal surface are well-marked only in the middle part of the setae.

A corresponding seta of the full-grown male is shown in Fig. 4 g.[1] It will be seen that the terminal lappets of the scale part have disappeared, and that the entire distal portion of its caudal surface, from a point situated somewhat proximally from the centre, is traversed by transverse grooves. The setae thus have the general shape and structure which characterizes setae of the caudal row in most species of *Serolis*. A feature peculiar to the setae in the male of *S. convexa* is, however, that each marginal lappet of the scale part terminates in slender hair-like processes.

The setae of the rostral row in the female of *S. convexa* have the usual cylindrical and trilobate shape (Fig. 4 e). The distal end of the setal part projects freely between the two terminal lappets of the scale part, which protrude beyond the free portion of the setal part.

In the corresponding setae of the full-grown male (Fig. 4 h) the free terminal lappets of the scale part are missing, and the setal part projects freely from the tip of the scale-part. The distal portion of the scale-part is obliquely striated, so that it seems to be split up into slender »hairs». This, however, is actually the case only at the proximal end of the obliquely striated portion. Some of the setae of the rostral row in the single male specimen of *S. convexa* which I have been able to examine differs in shape from the rest (see Fig. 4 i). These setae show somewhat less deviation from the corresponding,

[1] Cf. BEDDARD, 1884, Pl. VI, Fig. 11.

trilobate setae in the female, in that their scale parts are distally produced into two short lappets.

The material at my disposal did not allow of an investigation of the setae in immature male specimens of *S. convexa*. It may, however, be presumed that they are similar in structure to those of the females; this at least is the case in the allied species *S. gaudichaudi*, whose setal armature is very similar to that of *S. convexa*.

In *S. gaudichaudi* the setae of the full-grown female have the same shape and structure as in the female of *S. convexa* (cf. Figs. 4 d and e); in the full-grown male of *S. gaudichaudi* the setae of the caudal row are similar to those of the caudal row of *S. convexa*, whilst in the rostral row the setae have the structure illustrated in Fig. 3 g. As was pointed out by AUDOUIN and MILNE EDWARDS (1841), they are provided with very densely situated hair-like sub-branches. A comparison between a seta in the adult male of *S. gaudichaudi* (Fig. 3 g)[1] and a corresponding seta in the adult male of *S. convexa* (Fig. 4 h) shows, that the obliquely striated part in the latter seta has, in *S. gaudichaudi*, been split up into slender »hairs».

In sub-adult[2] male specimens of *S. gaudichaudi*, the setae in the caudal row have already acquired the same character as in the adult male, whilst in the rostral row they are similar to those of the female. The only way in which these last-mentioned setae differ from those in the rostral row of the female is that the freely projecting terminal part of the setal portion is longer, being of about the same length as the free terminal lappets of the scale part. The setal part has thus almost acquired the length characteristic of the setal part in setae of full-grown males.

In immature males[3] the setae of *S. gaudichaudi* in both rows have the same structure as in female specimens.

As shown above, the setae in the two rows on the lower margin of the propodus usually have a structure peculiar to each species. The setae of the caudal row are thin, leaf-like and flattened, their lateral margins are often provided with more or less distinct incisions, which on the caudal surface are produced into transverse parallel grooves. The setae of the rostral row are longer than those of the caudal row, subcylindrical and — setting aside full-grown male specimens of the species *S. convexa* and *gaudichaudi* —, distally trilobate. The trilobate form is occasionally found even in setae from the caudal row.[4]

The deviations in *S. exigua* have been pointed out above (p. 24).

The type of composite setae found on the lower margin of the propodus recurs also in some of the setae on the carpus. All the species of *Serolis* which I examined are provided, on the lower margin of the carpus or on its free distal edge, with two stout setae, surrounded by a varying number of slender setae. The stout setae on the carpus in the species examined by me are sub-cylindrical in shape and similar in structure to the setae of the rostral row on the propodus; in some cases, however, they may exhibit features which, as shown by the above description, are characteristic of the leaf-shaped setae in the caudal row.

[1] See also AUDOUIN and MILNE EDWARDS (1841, Pl. I Fig. 13II and 13III).

[2] Male specimens possessing semi-developed penial filaments and a slightly swollen propodus on the second pereiopod.

[3] Male specimens possessing minute penial filaments and with no swelling of the propodus of the second pereiopod.

[4] In female specimens of *S. convexa*, as well as in female and immature specimens of *S. gaudichaudi*.

In the two stout setae which may thus be referred to the composite kind, the setal part, as a rule, has a freely projecting tip which is exactly like the distal end of the surrounding slender non-composite setae. See Fig. 6 f, illustrating a composite seta from the carpus of *S. paradoxa* and Fig. 6 g, which shows one of the surrounding non-composite setae. See also *S. exigua*, Fig. 6 e.

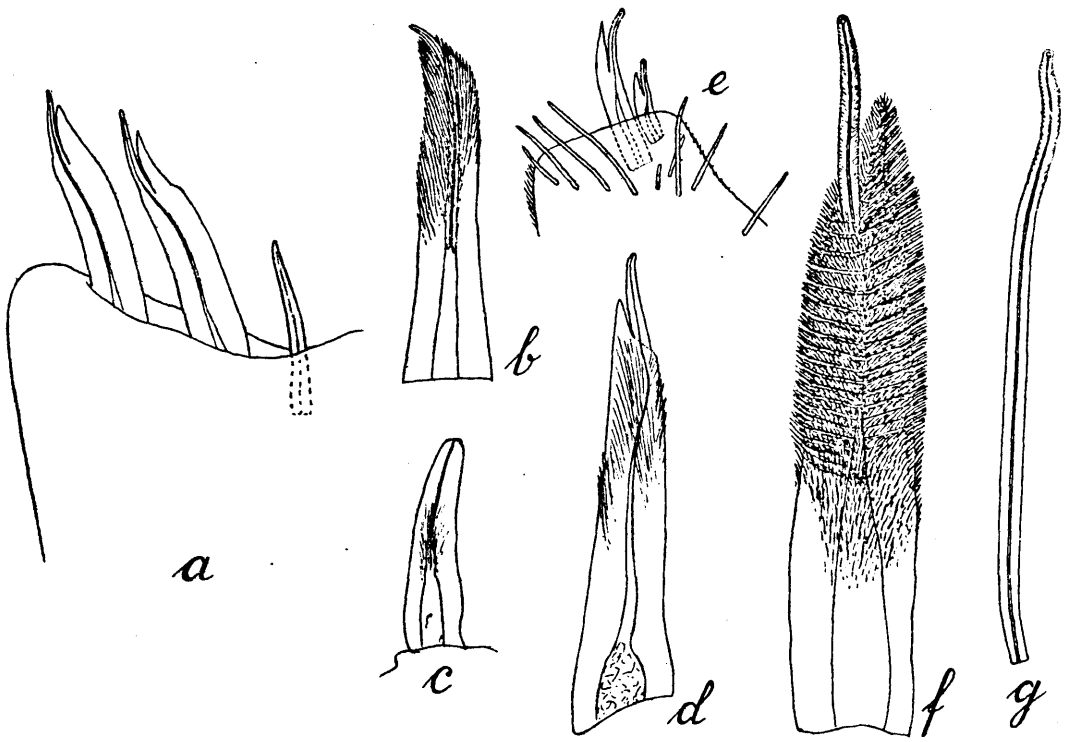

Fig. 6. Setae in *Serolis;* from the carpus of the first pereiopod. a. *S. septemcarinata*, female, 270 ×. b. *S. polita*, female, 270 ×. c. *S. pagenstecheri*, female, 90 ×. d. *S. convexa*, female, 465 ×. e. Distal part of the carpus with setae in a female of *S. exigua*, 160 ×. f. Composite seta in *S. paradoxa*, 270 ×. g. Non-composite seta in *S. paradoxa*, 270 ×.

In *S. exigua* (Fig. 6 e) the composite setae on the carpus are of the same type as the setae on the lower margin of the propodus in this species, where there is only a single row. They differ, however, in the following respects: the base common to the setal and scale part is longer; no line of demarcation between the setal and scale parts is observable within this base; and the freely projecting tip of the setal part is shorter.

In *S. septemcarinata* (Fig. 6 a) the two stout setae on the carpus are similar to the setae in the rostral row on the propodus, but differ in the scale-part having only a single free terminal lappet.

In the female of *S. convexa* (Fig. 6 d) their structure is similar to that in *S. septemcarinata*, except that the distal half of the scale part is distinctly striated. In *S. gaudichaudi* these setae differ slightly in structure in adult males and females. In the adult male (Fig. 3 f) they are provided with hair-like sub-branches at the distal end of the scale part; in female and immature specimens as well as in sub-adult males the scale part is instead obliquely striated.

In *S. polita* (Fig. 6 b) the setal part is dimly discernable within the scale part. The scale part appears to be longitudinally grooved distally but is split into short sub-branches at the margins.

In *S. pagenstecheri* (Fig. 6 c) the setae have a compact structure, being entirely devoid of a freely projecting setal part.

In *S. paradoxa*, the composite setae on the carpus (Fig. 6 f) show resemblance to the setae in the caudal row on the propodus in that the caudal surface of the scale part is traversed by transverse, parallel grooves, but they differ from the latter setae in having a sub-cylindrical shape and in being densely provided with short hair-like sub-branches.

In *S. schythei* the structure of the setae is much the same as in *S. paradoxa*.

VII. Setae of the composite type on the second pair of pereiopods.

The same type of stout setae which occurs on the propodus and carpus of the first pereiopod occurs also on the propodus of the second pereiopod. The setal armature of this pereiopod differs, however, with the sex. In female and immature specimens all the

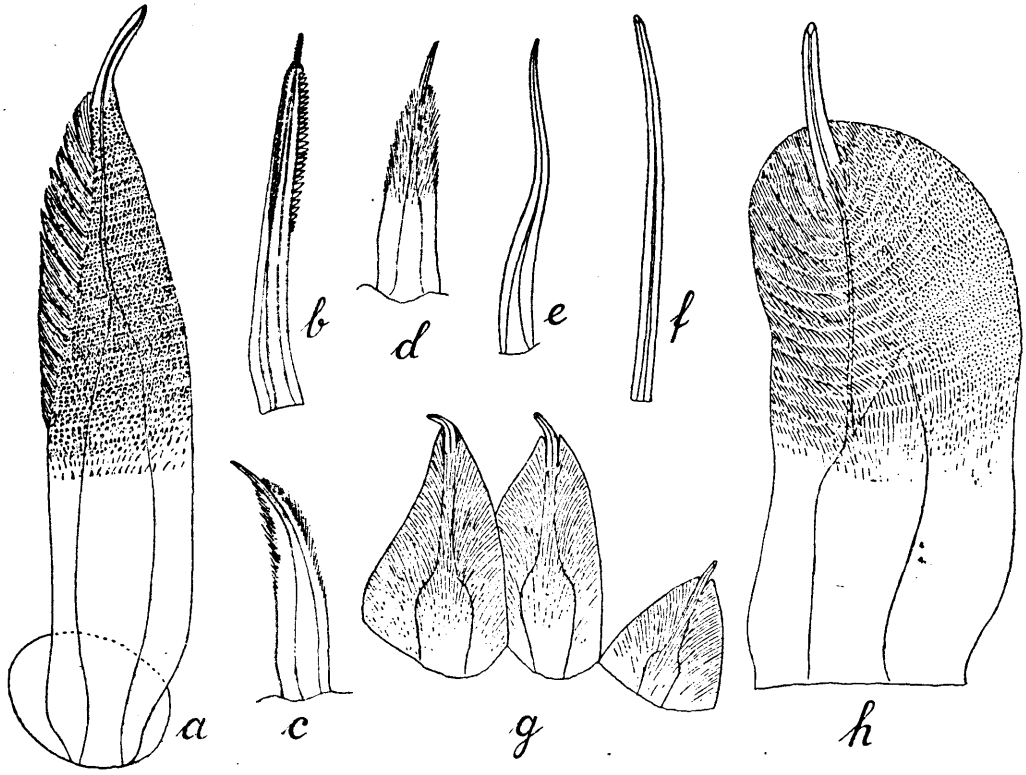

Fig. 7. Setae in *Serolis;* from the propodus of the second pereiopod in the male. a. From the lower margin of the propodus, adult male of *S. paradoxa*, 240 ×. b. From the same spot in a sub-adult male, 140 ×. c. Seta from the proximal part of the lower margin of the propodus, seen from the caudal side, adult male of *S. pagenstecheri*, 80 ×. d. The same seta seen from the rostral side, 80 ×. e. A seta from the distal part of the lower margin of the propodus, adult male of *S. pagenstecheri*, 80 ×. f. One of the submarginal setae near the lower margin of propodus, adult male of *S. pagenstecheri*, 200 ×. g. Seta from the proximal part of the lower margin of the propodus, adult male of *S. septemcarinata*, 240 ×. h. Seta from the lower margin of the propodus, adult male of *S. schythei*, 535 ×.

stout setae on this pereiopod agree with those of the ordinary sword-shaped type which occur on the other pereiopods (see Fig. 3 h). In adult male specimens, we find, however, that the stout setae on the lower margin of the propodus have always been transformed. These setae, in the adult male, agree in their main features with those of the composite kind on the first pereiopod.

The setae are always equal in shape in both the rows. Setae from these rows in adult males of *S. paradoxa* and *schythei* are illustrated in Figs. 7 a and h. Exactly as in composite setae on the first pereiopod the distal end of the setal portion projects freely from the tip of the scale part, and the caudal surface of the scale part is traversed by transverse grooves. The rostral surface, on the other hand, is devoid of transverse grooves in all the setae.

In *S. paradoxa* (Fig. 7 a) the scale part is approximately cylindrical in shape, except at its distal end, where it is markedly three-sided, that side which is directed towards the dactylus being most markedly flattened. The distal half of that portion of the scale part which is directed towards the dactylus differs from the one directed towards the carpus in being obliquely striated, and in having its margin provided with faint incisions. Towards the centre these incisions are produced into oblique grooves. That portion of the scale part which is directed towards the carpus is minutely sculptured, in the manner shown in Fig. 7 a.

In the full-grown male of *S. septemcarinata* the setae on the lower margin of the propodus (Fig. 7 g) are compact and have a conical form and the setal part can be discerned within the scale part.

In the adult male of *S. pagenstecheri* the structure of the setae differs at the proximal and distal ends of the setal rows. The proximal setae have the appearance shown in Figs. 7 c and d. The part directed towards the propodus is somewhat concave. Distally the setae are abundantly provided with hair-like sub-branches; the latter, however, are absent on the caudal surface (Fig. 7 c). The setal part which projects freely at the tip agrees even in minute detail with the distal ends of the slender non-composite setae which occur in a submarginal row on either side of the lower margin of the propodus. (Fig. 7 f). The more distally situated setae on the lower margin of the propodus (Fig. 7 e) are sub-cylindrical, tapering towards the end. They are thus similar to non-composite setae, but are much stouter and thicker.

VIII. The ordinary conspicuous sword-shaped pereiopod setae.

The above described type of stout setae on the lower margin of the propodus of the second pereiopod is found in the adult males only. In sub-adult males the setae on this spot agree with, or are very similar to, the ordinary sword-shaped thoracopod setae.

In sub-adult[1] males of *S. paradoxa* the setae on the lower margin of the slightly swollen propodus (Fig. 3 b) are arranged in two adjoining rows, except in the region near the dactylus, where they converge into a single row. All the setae in the proximal half of the propodus are about twice as long as those more distally situated. Most of the setae have the appearance illustrated in Fig. 7 b. They are distinctly three-sided, except at their

[1] Male specimens with semi-developed penial filaments and with a slightly swollen propodus on the second pereiopod.

proximal ends. They are furnished with two rows of short sub-triangular sub-branches. The setae agree with the ordinary sword-shaped thoracopod setae, except that they have a freely projecting tip at the distal end. Some of the most distally situated setae, however, preserve the same structure as ordinary thoracopod setae of the sword-shaped type; they thus differ from the seta illustrated in Fig. 7 b by tapering continuously towards the tip. All the setae have their rows of sub-branches directed towards the dactylus. The sub-branches thus correspond to the obliquely striated portion in setae of adult males (cf. Fig. 7 a). Even in the latter setae the triangular sub-branches can be dimly discerned, though they are coalesced with one another and separated only by grooves, except at their extreme ends. The three-sided shape which is characteristic of the distal parts of the setae in adult males is characteristic also of the setae in sub-adult males, though it is here still more marked.

In immature males[1] the setae on the lower margin of the propodus are likewise situated in a longitudinal row, which, in the vicinity of the carpus, divides into two; the setae adjacent to the carpus have shorter and narrower sub-branches than the rest. It is not possible to observe any difference whatsoever between a setal part and a scale part.

The setae on the same spot in the female are arranged in a single longitudinal row; in the vicinity of the carpus this row is sometimes broken up into two adjoining rows. The setae adjoining the carpus are provided with two rows of slender, minute, almost hair-like sub-branches. As we approach nearer the dactylus the sub-branches become more triangular. Between the setae with triangular sub-branches and those with hair-like sub-branches there occur setae which exhibit a continuous series of transitional forms in regard to the structure of the sub-branches.

As mentioned above, the setae on the lower margin of the propodus of the second pereiopod in female and immature specimens correspond to the ordinary stout, sword-shaped setae which occur on all the pereiopods, except the first. On the third to seventh pereiopods the sword-shaped setae occur in groups on all the joints, except the basipodite and the dactylus. In each group the setae may vary in structure and slenderness. In *S. paradoxa* and *schythei* the most conspicuous setae in the groups are distinctly three-sided at their distal ends, the surface facing the joints being the broadest. From each margin of this surface there issue a row of short, flattened subtriangular sub-branches. The more slender setae differ from the stouter, ones in being furnished with hair-like sub-branches; they are likewise three-sided at their distal ends, but the surface which faces the joints is narrower than in the more conspicuous setae. As for the most slender setae, they are sub-cylindrical also at their distal ends and either furnished with minute hair-like sub-branches or devoid of sub-branches. Exceptionally[2] the sub-branches of the ordinary stout pereiopod setae are long and slender (see Fig. 3 a). On examining the second pereiopod in a sub-adult male of *S. paradoxa*, we find (see Fig. 3 b and cf. p. 22) that the stout kind of setae on the ischium gradually diminish in size, so that on the proximal part of this joint they are quite similar to the short and hair-like non-composite setae. Hence it is no longer possible here to distinguish the composite and none-composite type of setae.

[1] Male specimens with extremely short penial filaments and with no swelling of the propodus of the second pereiopod.

[2] I have only found this type of setae in *S. polita*.

The above study of the setae on the pereiopods has shown the existence of a series of transitional forms between composite setae and the ordinary sword-shaped setae on the pereiopods. It should be noted, however, that there is also a continuous series of transitional forms between the latter setae and those of the hair-like, apparently non-composite type.

IX. The setae on the oral appendages.

Maxillipeds. Most of the setae are slender, sub-cylindrical and devoid of sub-branches. On the distal margin of the basipodite, however, we always find two setae[1] of another type; they are distinguished from the rest by considerably greater thickness as well as by their sculpturing. The latter agrees with that characteristic of the composite type of setae.

In *S. paradoxa* (Fig. 8 a) the ventral surface of the stout setae on the basipodite of the maxilliped is provided with oblique transverse rows of freely projecting »hairs» which proximally assume the form of ridges. The dorsal surface of the seta agrees with the ventral, except that a distinct longitudinal striation is observable at the proximal end and that the projecting »hairs» are shorter and sparser.

In *S. pagenstecheri* (Fig. 8 b) a longitudinal striation of the surface is clearly visible. Freely projecting scale-like processes are found in sparse transverse rows on the ventral surface of the setae; the dorsal surface is smooth.

In *S. polita* (Fig. 8 c) the setae are covered with stout spiny points, which are more scanty on the dorsal surface.

In the species *S. schythei, convexa, exigua* and *septemcarinata* the corresponding setae are similar to those of *S. paradoxa.*

First and second maxillae. On the distal margins of the lobes of the first and second maxillae we find setae of a sub-cylindrical shape, in many cases provided with two rows of short sub-branches. On the outer lobe of the first maxilla the setae are stout and spine-like, whilst on the inner lobe a single slender seta is seen at the tip.

The second pair of maxillae has the same type of setae as the first pair, though somewhat weaker and longer. Occasionally, however, the setae on the distal margin of the inner lobe vary greatly in length and thickness (see Fig. 15 f).

Mandibles. The somewhat modified setae on the second and third joints of the palp[2] resemble those of the sword-shaped kind on the pereiopods in being provided with two rows of sub-triangular sub-branches, but differ from the latter setae in terminating at the distal end in a distinct knob. In the species *S. paradoxa, schythei, pagenstecheri, polita, convexa, septemcarinata* and *exigua* the sub-branches of the setae have the same structure as in *S. tribolitoides.*[3] PFEFFER[4] (1887), however, figures the setae of the mandibular palp in *S. septemcarinata* as having slender hair-like sub-branches. The end-knob of the setae varies in shape in different species. In *S. septemcarinata,* as correctly figured by PFEFFER (1887) it is of elongated oval shape; in *S. convexa* it is still more elongated, almost lancet-

[1] In isolated specimens occasionally three.

[2] Described and figured by PFEFFER (1887) with reference to *S. septemcarinata* and by HODGSON (1910) with reference to *S. trilobitoides.*

[3] See HODGSON, 1910, p. 27, Pl. IV, Fig. 6.

[4] PFEFFER, 1887, Pl. III, Fig. 19.

shaped, and terminally pointed; in *S. exigua* it is oblong-oval; in *S. paradoxa* it is of about the same shape as in *S. trilobitoides*, but tapers less anteriorly.

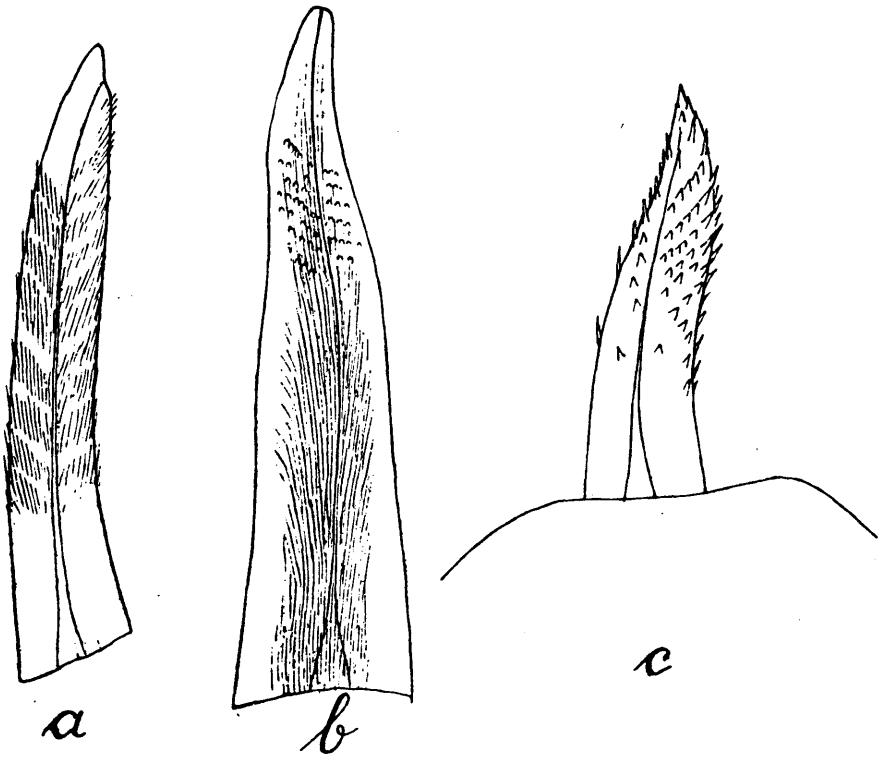

Fig. 8. Setae in *Serolis;* from the distal margin of the basipodite of the maxilliped. a. Seta seen from the ventral side, *S. paradoxa*, 360 ×. b. Seta seen from the ventral side. *S. pagenstecheri*, 360 ×. c. Seta seen from the ventral side, *S. polita*, 470 ×.

X. Summary.

A comparative study of the setae in *Serolis* makes it clear that some of the setae are composite. The composite character is apparent as regards the setae on the lower margin of the propodus of the first periopod. The occurrence of composite seteae is thus not only restricted to terrestrial Isopods. A distinction between the composite and the non-composite category of setae cannot, however, always be made merely by a morphological examination, but requires further investigation of the development of the setae.

Morphological examination makes it clear, however, that the structural scales play an important rôle as phanere-builders, whether independently or by coalescence with non-composite setae.

The part played by scales and setae in phanere-formation may be succinctly described as follows:

1) By the transformation and enlargement of single scales, lamellar, fan-shaped, spiniform, hook-like and even setiform processes may be formed.

2) A nap of delicate chitinous hairs may be formed by a division of the different scales.

3) The plumose seta may be deprived of its sub-branches partially or entirely.

4) The formation of setae is often complicated by the coalescence of the non-composite seta with one or more structural scales.

5) The degree of coalescence between the setal and the scale part of the composite setae shows great variations, ranging between very slight and complete coalescence. In the latter case the composite setae may assume the external appearance of simple setae.

Attention has been drawn to the tendency of the structural scales to be divested of their typical form partly by coalescing with one another, partly by giving rise to heteromorphic and, in many cases setiform processes. In view of this inconstancy of the structural scales it is not surprising that they should lead to the formation of phaneres by coalescence with the primitive non-composite kind of setae. The occurrence of phaneres where the setae and the scales are only slightly coalesced and, broadly speaking are entirely unconnected with one another, seems to indicate that in such cases coalescence has taken place at a relatively late stage of phanere-formation. In the case of setae where this coalescence is complete, it is possible that composite setae may even assume a structure similar to that of the plumose setae. In order to solve this problem it will necessary to study the setal development. The distinction between composite and non-composite setae would be manifested by the number and position of the cells which partake in the phanere-formation.

SECTION III.

Morphology and Classification of the Fam. Serolidae.

I. Morphology.

Suppression of segmentation and reduction of segments.

The family *Serolidae* comprises the single genus *Serolis*. It deviates from the usual type of Isopods in having its first pereion segment (= second thoracic segment) partially fused with the head, and in having dorsally only five complete and distinctly demarcated segments.

GRUBE (1875) and BEDDARD (1884) supposed that the first pereion segment, which is partially fused with the head, had been developed by the coalescense of two segments (viz. that of the maxillipeds and that of the first pereiopods). This view is based on the fact that in certain species the first pereion segment is traversed by two transverse ridges, one on either side of the head. These ridges extend in a transverse direction to a point opposite the centre of the eyes, thus dividing the segment into a small anterior and a large posterior area on either side. GRUBE (1875) and BEDDARD (1884) regarded them as vestigial segment sutures.

In opposition to this view, CALMAN (1920) states: »As a matter of fact, in *Serolis*, as in all other Malacostraca with the exception of *Bathynella*, the first thoracic somite (that of the maxillipeds) is completely incorporated in the head» (p. 301).

The above-mentioned transverse ridges on the epimera of the first pereion segment occur only in certain of the species. In some of the species we find, on either side, yet another ridge situated submarginally behind the anterior margin. The occurrence of both an anterior and a posterior ridge is characteristic of the species *S. trilobitoides, glacialis* and *pagenstecheri*.

In the species *paradoxa, schythei* and *polaris* we find only the posterior ridge, whilst in *septemcarinata, polita* and *australienses* the anterior ridge only is distinctly developed.

The species *exigua, convexa, gaudichaudi, longicaudata, latifrons* and *bouvieri* are devoid of ridges on the epimera of the first segment.

On the epimera of the other pereion segments we frequently find similar ridges, situated submarginally along the anterior margin. They are distinct in *S. paradoxa, septemcarinata, pagenstecheri* and *bouvieri*, indistinct in *polita*, and almost missing in *trilobitoides;* in *latifrons* they are distinct on the fifth an sixth segments, but entirely missing or very indistinct on the second to fourth segment. Submarginal ridges on segments 2—6 are lacking in the species *gaudichaudi, convexa, exigua, minuta, longicaudata*, as also in the species *schythei* and *polaris*. In the latter two species, however, a posterior ridge has been developed on the epimera of the first pereion segment.

S. australienses, which has a submarginal ridge on the epimera of the first segment, is furnished with two transverse rows of tuberculae on the epimera of the other segments.

The last thoracic segment in *Serolis*, as a rule, is not developed on the dorsal side. CALMAN (1920) shows, however, that in two species, *S. beddardi* and *S. latifrons*, the tergum of the last thoracic segment still exists as two minute plates, one on either side laterally from the first abdominal segment.[1] These plates are traversed by a suture, which separates the tergite proper from its coxal plate.

The considerable deviation of the two species *S. latifrons* and *S. beddardi* from other species of *Serolis* is shown in another respect. Their uropods are transformed in a manner reminiscent of the family *Sphaeromidae*. According to the views of STUDER (1879, p. 31) and CALMAN (1920, p. 300) regarding the structure of the uropods, the protopodite is produced into a long point; CALMAN (1920) holds the view that the single branch of the uropod is the exopodite, whilst the endopodite has entirely disappeared.

In her »Analytical key to the families of the *Cymotheidea* or *Flabellifera*», RICHARDSON (1905, p. 55) says that the family *Serolidae*, in contrast to the *Sphaeromidae*, is distinguished by »uropoda with both branches movable». In her diagnosis of the family *Serolidae* RICHARDSON states: »seventh thoracic segment» (actually the eighth thoracic segment) »entirely wanting on dorsal side» and »uropoda lateral, with both branches free and subequal» (p. 320). As these characters do not hold good of *S. latifrons* and *beddari*, RICHARDSON's diagnosis of *Serolis* is not applicable to the genus at large.

Just as the tergum of the seventh pereion segment in *Serolis* shows a tendency to disappear, so does also that of the sixth pereion segment. In some species (*S. tuberculata* and the other Australian species, with the exception of *minuta*[2] the middle part of the tergum of the sixth pereion segment has likewise been reduced, so that the first abdominal segment in the centre comes into direct contact with the posterior margin of the fifth

[1] They were regarded by BEDDARD (1884) as the epimera of the first abdominal segment.
[2] Including its varieties *bakeri* CHILTON and *eugeniae* n. var.

pereion segment. In *S. minuta* a similar reduction of the dorsal central portion of the sixth pereion segment is merely incipient; the first abdominal segment in the centre of the dorsal side has coalesced with the sixth pereion segment, so that the posterior suture of the latter is interrupted in the middle. In this respect *S. minuta* agrees with the species *S. pagenstecheri* and *bouvieri*.

Another process which is unequally developed in this family is the coalescence of the coxal plates with the segments. The number of segments in which the dorsal sutures of the coxal plates are developed varies in different species.

The process of coalescence (with corresponding suppression of segmentation) between the head and the first pereion segment as well as between the last pereion segments should appear also in the sternal parts of the segments. On this point, however, only incomplete information is available.

SCHIOEDTE (1866), whose studies are not referred to in BEDDARD's monograph on *Serolis* (1884), figures and describes in detail the ventral side of the head and the first pereion segment in *S. paradoxa*[1]. On the ventral surface the suture-line between the head and the first segment is distinct laterally and posteriorly, being interrupted only for a short distance medially from the articular foramina for the first periopods (see Fig. 9). Cf. also SCHIOEDTE (1866)[2]. In the posterior part of the head caudally from the maxillipeds a ridged centre-piece is discernible, and laterally therefrom two small, well-defined oval chitinous plates, situated caudally and laterally from the maxillipeds.

The ventral surface of the first pereion segment is furnished in the middle with a trapezoidal area, which is demarcated by longitudinal limits and anteriorly provided with a longitudinal carina. The ventral side of the first pereion segment shows a rather uniform development in the different species. The above-mentioned carinated central plate (described by SCHIOEDTE (1866) in the case of *S. paradoxa*) is always found[3]. The details of its sculpturing as also the course of its lateral limits vary, however, in the different species. Moreover we always find laterally from the central plate the two small oval chitinous plates mentioned by SCHIOEDTE (1866). In the young of *S. paradoxa* and *schythei* taken from the marsupium the small oval chitinous plates were missing; hence they are not indicative of a primitive organization.

In all the species of *Serolis* examined by me, in addition to the longitudinal sutures which mark off ventrally the central plate of the first pereion segment, we find on either side a distinct laterally situated longitudinal suture passing through the articular socket for the first pereiopod (Fig. 9). This longitudinal suture has not been figured by SCHIOEDTE. One of these sutures has been illustrated by AUDOUIN and MILNE EDWARDS as regards the species *S. gaudichaudi*[4]. These authors, on the other hand, do not figure the longitudinal sutures which mark off the central plate of the first segment.

The ventrally developed sutures passing through the sockets for the first pereiopod mark off externally the epimera of the segment. In view of the course which they run, it may be presumed that these sutures at the same time mark off the coxal plates of the

[1] SCHIOEDTE (1866, Pl. X, Figs. 2 a and b).
[2] SCHIOEDTE (1866, Pl. X, Fig 2 a).
[3] E. g. in *S. paradoxa* (Fig. 9.).
[4] AUD. and EDW. (1841, Pl. 2, Fig. 1).

first segment. Even in young specimens removed from the marsupium the sutures are quite distinct.

No epimeral sutures are developed on the dorsal side of the first pereion segment. On the remaining segments there are epimeral sutures on the dorsal side only.

Ventral sutures are found also on the last three pereion segments, which are more or less fused with one another. The course of these sutures (shown in Figs. 10 and 11) is fairly uniform in the different species. On the other hand, the coalescence of the sternal parts of the last pereion segments has apparently been carried further in some species than in others. The varying degree of reduction of the last two pereion segments, which is noticeable in their terga (see p. 39 and 40), is set off on the ventral side by a corresponding coalescence of their sternal parts.

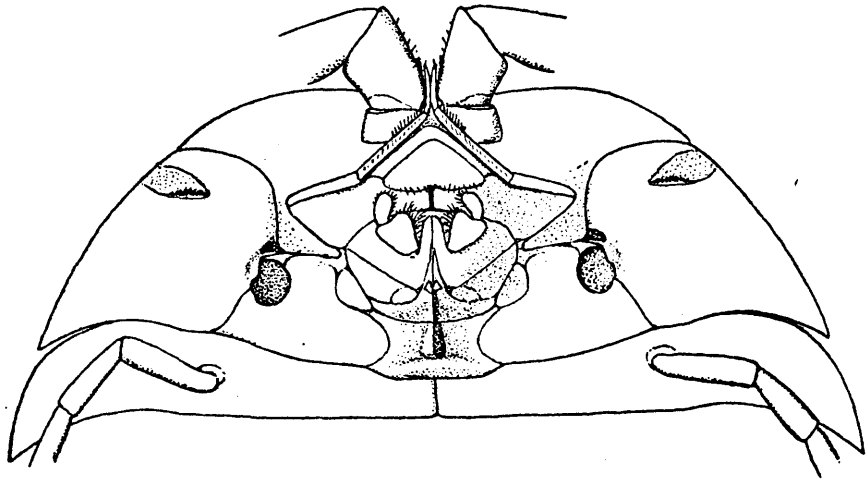

Fig. 9. Ventral surface of the head and first two pereion segments of *S. paradoxa*, sub-adult male, 5 ×.

In *S. latifrons* (Fig. 10 a) which in this respect belongs to the most primitive group of species and in which vestiges of the tergite of the seventh pereion segment are still found, the sternite of this segment is distinctly marked off from the sixth segment.

In *S. paradoxa* (Fig. 10 b) the suture-line between the sixth and seventh segments is clearly defined only laterally, whilst medially it is feebly indicated by a groove on either side of the middle line. The suture-line between the sternites of the fifth and sixth segment is distinct in its entire length in immature specimens, in females and sub-adult males, being, however, interrupted in the middle in adult males (Fig. 10 b). In young removed from the marsupium and thus having the seventh pereiopods not yet developed the suture-line between the sternites of the fifth and sixth segments is very distinct (Fig. 10 c).

I found the suture-line between the sternites of the fifth and sixth segments distinct in its entire length in females of the following species: *paradoxa, schythei, polaris, polita, septemcarinata, glacialis* (var. *austrogeorgiensis*), *gaudichaudi* and *convexa*. As regards *convexa* this feature is illustrated in Fig. 10 d. The suture-line is interrupted in the middle in adult males of *S. paradoxa* (see above) and *schythei*, or indistinct

medially: in *S. polaris;* but it is distinct in its entire length in female and immature specimens of these three species also. In *septemcarinata, polita* and *convexa* the suture-line is distinct in its entire length in adult males as well as in female and immature specimens. In *trilobitoides* I found a distinct suture-line in two immature specimens.

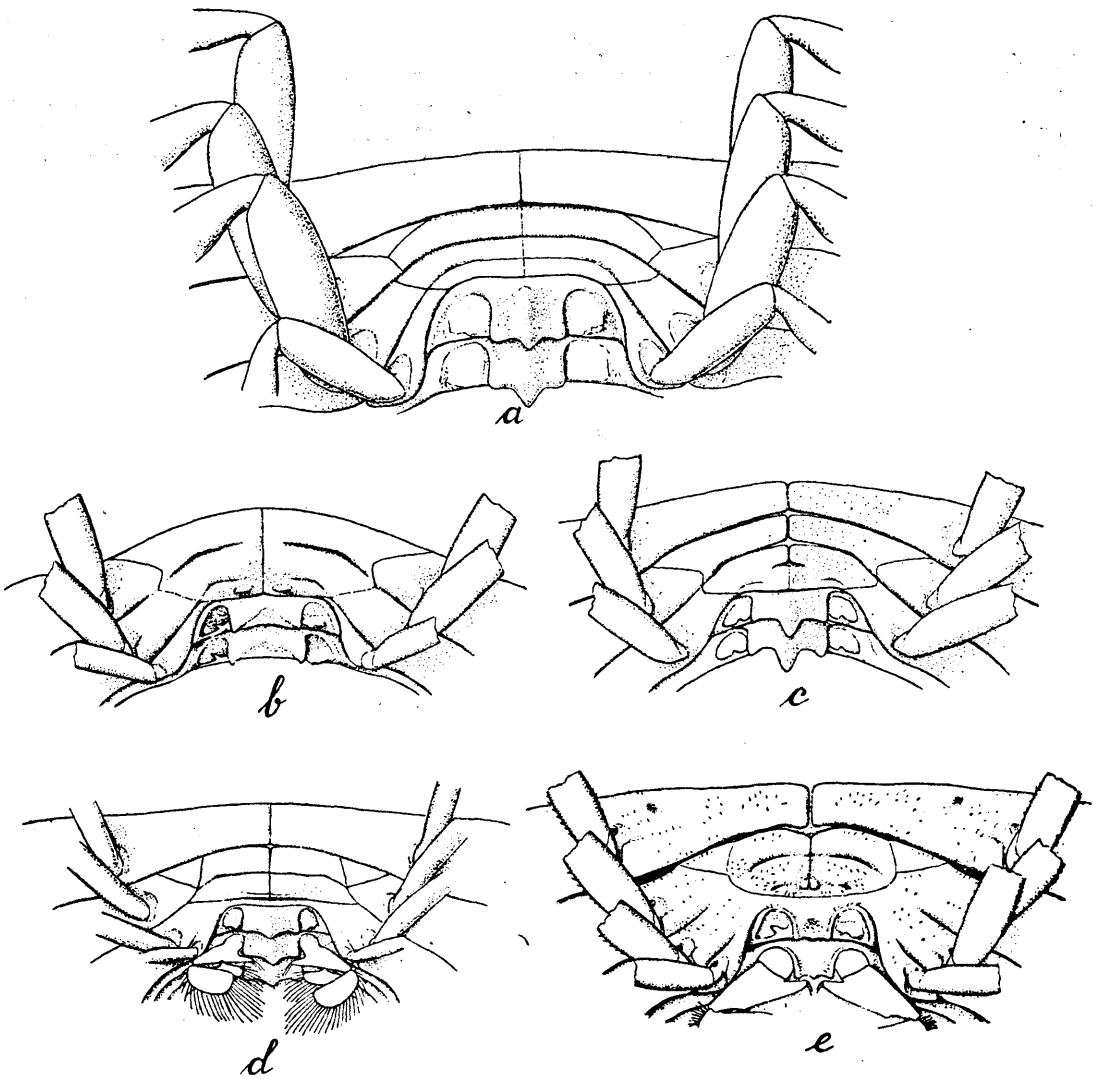

Fig. 10. Ventral surface of the last pereion segments and the first two abdominal segments in *Serolis*. a. *S. latifrons*, immature specimen, 8 ×. b. *S. paradoxa*, adult male, 3.5 ×. c. *S. paradoxa*, immature specimen taken out of the marsupium, 10.5 ×. d. *S. convexa*, female, 5.5 ×. e. *S. pagenstecheri*, adult male, 2.5 ×.

In the species *minuta, pagenstecheri* and *bouvieri,* which agree with each other in having the tergum of the sixth pereion segment fused in the middle with the first abdominal segment (see p. 39 and 40), the sterna of the last two pereion segments are more fused with one another than in the above-mentioned species of *Serolis.*

In *S. pagenstecheri* (Fig. 10 e) a suture-line between the sternites of the seventh and sixth pereion segments is developed laterally, whilst medially it is indicated by two

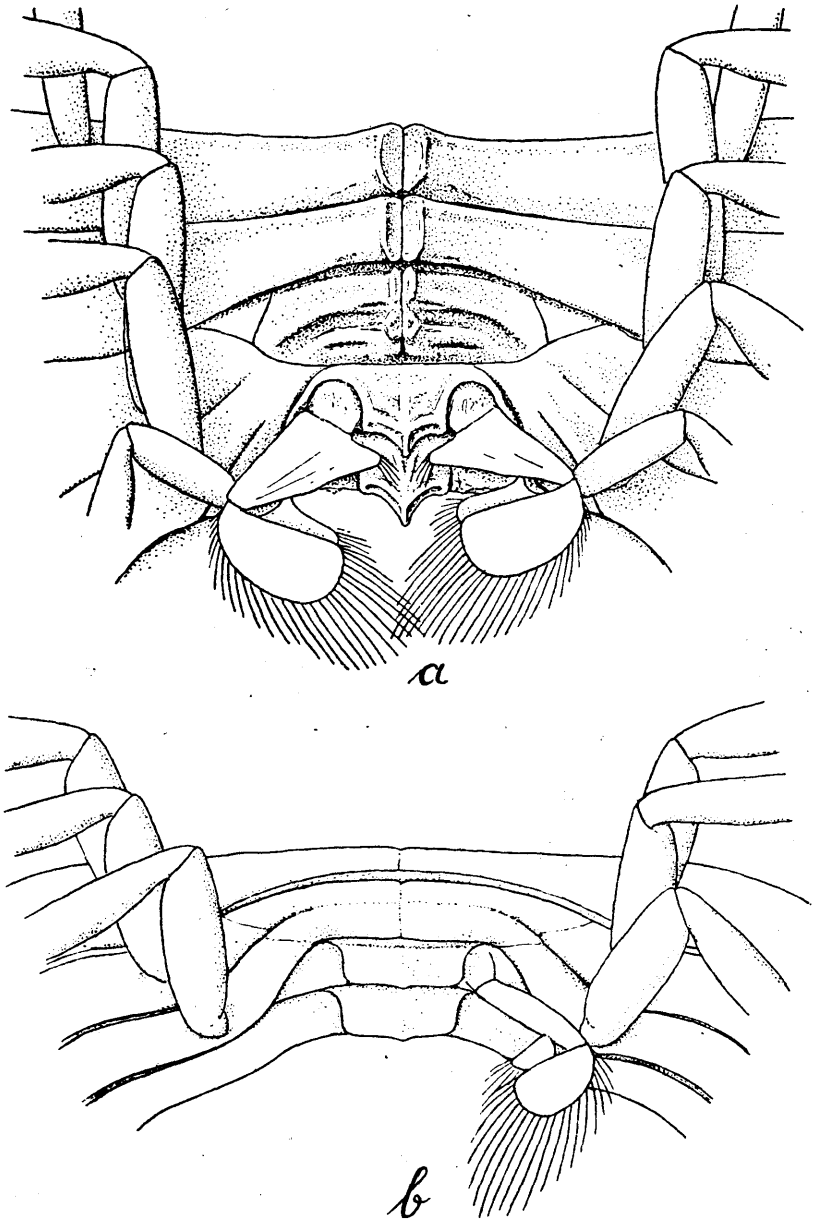

Fig. 11. Ventral surface of the last pereion segments and the first two abdominal segments in *Serolis*. a. *S. bouvieri*, immature male, 7 ×. b. *S. minuta*, var. *eugeniae*, immature specimen taken out of the marsupium, 55 ×.

extremely faint grooves one on either side of the middle line. The suture-line between the fifth and sixth pereion segment is also distinct laterally, whilst medially it is indicated merely by two grooves one on either side of the middle line.

In *S. bouvieri* (Fig. 11 a.) the sternites of the seventh, sixth and fifth segments are fused with each other similarly as in *S. pagenstecheri*. There are two grooves one on either side of the middle line (somewhat more distinct than in *S. pagenstecheri*), which indicate the suture-lines between the seventh and sixth segments.

As regards *S. minuta*[1], I have been in a position to study in this respect only a single specimen taken out of the marsupium; in the specimen the seventh pereion segment as also its pereiopods were not yet developed. In this young specimen the suture-line between the sixth and fifth segments is distinct laterally, whilst medially the sternites of these segments are fused; we find, however, traces of a suture proper in an extremely faint and narrow groove.

Owing to lack of adequate material, I have not been in a position to examine the ventral side of any species of *Serolis* with the tergum of the sixth pereion segments imperfectly developed.

A morphological feature which is connected with the copulation.

GRUBE (1875) states that in *S. paradoxa*, close to the upper lateral angle of the epimera of the first pereion segment, there occurs an attenuated chitinous area of oval shape[2], which, according to him, represents an organ of sense. I have found this chitinous area only in the species *S. paradoxa*, *schythei* and *latifrons*, and merely in some of the specimens. In *S. paradoxa* it occurs in females with semi-developed oostegits, in sub-adult males (see Fig. 9) and in young specimens.[3] It is wanting in full-grown males and, as a rule, also in females with a fully developed marsupium.

In one specimen this thin chitinous tegument was broken up into two lateral incisions (in a ♀ with fully developed marsupium), whilst in another it was provided with an aperture (in a ♀ with semi-developed oostegits).

The place occupied by this chitinous area corresponds exactly to the spot gripped by the claw of the second pereiopod of the male in clasping the female during copulation. In the Swedish Antarctic Expedition's collection of *S. pagenstecheri* there is a specimen which clearly illustrates this feature. The specimen, a ♀ with semi-developed oostegits, shows the »chela» of a male still attached to the first pereion segment in such wise that its dactylus grips the ventral side of the epimeron exactly at the spot where the attenuated chitinous area is found in *S. paradoxa*. It is therefore evident that the chitinous areas on the first pereion segments in *S. paradoxa* and *schythei* mark the place where the »chela» of the male is attached during copulation, whence it may be presumed that they facilitate the attachment of the male to the female. In view of the fact that the male »chela» in the above-mentioned specimen of *S. pagenstecheri* was attached to a female with semi-developed oostegits, it may be presumed that copulation takes place in the females at this stage of development. It has been ascertained that all females of *S. paradoxa* with semi-developed oostegits have the attenuated chitinous areas developed. It is significant that they are usually missing in females with a fully developed marsupium,

[1] The var *eugeniae* of this species.
[2] See GRUBE, 1875, Taf. VI, Fig. 3 a.
[3] It is absent, however, in young removed from the marsupium.

which seems to indicate that at this stage they no longer have any function to fulfil. It is moreover interesting to note that the attenuated chitinous areas are found also in subadult males and in immature specimens.

The antennae.[1]

The antennal peduncle consists of five complete joints. PFEFFER (1887) has, however, shown that in *S. septemcarinata*, between the first and second joints, there is a vestige of yet another small »joint», developed imperfectly and only laterally.[2] This imperfectly developed »joint» I found in all species of *Serolis* examined, as a rule exactly as described by PFEFFER in regard to *S. septemcarinata*. In the case of *S. paradoxa* it is illustrated in Figs. 12 a and b. Viewed from the ventral side (Fig. 12 a), the »joint» is well defined and of an irregularly triangular shape. The dorsal side of the same »joint» (Fig. 12 b) is imperfectly delimited, its suture-line gradually vanishing towards the inner (rostral) side. *S. exigua* (Fig. 17 b) differs in having a very faint suture-line on the ventral side and none at all on the dorsal side.

The development of »the joint» in young specimens removed from the marsupium agrees (in *S. paradoxa*) exactly with that of adult individuals.

The inner (rostral) surface of the second peduncular joint, (according to PFEFFER 1887, the third) in all species of *Serolis* carries a fine nap of slender »hairs», which occupies an area of triangular shape having its broadest part proximally situated (Fig. 12 c).[3] In all preserved specimens the third joint of the mandibular palps are inserted between these »hairy» areas on the second peduncular joints, so that the nap serves to protect the last joint of the mandibular palp and its marginal setae.

The ventral side of the flagellum of the antenna is provided, as a rule, with antennal processes of varying shape. These are lacking in the species *S. minuta* (var. *eugeniae*) and *S. latifrons*. This is presumably the case also in *S. beddardi*, which is closely allied to *S. latifrons*. On this assumption, the two divergent species *S. latifrons* and *beddardi* differ from the rest in yet another character.

The mandibles.

Of fairly uniform structure in all the species of the genus. The cutting edge is more or less dentated[4]. The mandibles near the cutting edge carry two masticatory processes; the inner and somewhat more anteriorly situated process on the left mandible possibly corresponds to a lacinia and is usually very marked; usually it is attached by a broad base and is completed distally by a long dentated edge. In some species this masticatory process, instead of being expanded, is similar to the lateral somewhat more posteriorly situated process. This applies to the species *S. exigua, australiensis* and *longicaudata*. In *S. exigua* (Fig. 17 c and d) the anterior masticatory process is more marked than the

[1] The second pair of appendages. For the first pair of appendages (= first pair of antennae) I use the term antennulae.

[2] PFEFFER, 1887, Pl. III, Fig. 1.

[3] Cf. Fig. 12 a and b.

[4] According to BEDDARD (1884, p. 10—11) the cutting edge is more sharply dentated in young specimens. I found, however, that in young removed from the marsupium of *S. paradoxa*, the cutting edge was similar to that of adult specimens.

posterior one. In *S. convexa* (Figs. 19 b and c) the anterior masticatory process on both the left and the right mandibles are much expanded.

The first pair of maxillae.

The inner lobe in most species is distally expanded and usually ends in an oval area, which usually is narrowly rounded at the tip or truncate; its shape, however, varies in different species; its distal margin is always furnished with a small seta.

The second pair of maxillae.

The two lappets of the outer lobe have, as a rule, only two or three apical setae. A larger number of setae on the lappets of the outer lobe is found only in the species *S. convexa* and *gaudichaudi* (in the former species 6, in the latter 7 or 8 on each lappet) and in *S. latifrons*, in which the outer lappet of the outer lobe is furnished with two apical setae; the inner lappet of the outer lobe has eight setae on the left maxilla, only four on the right.

In *S. glacialis* var. *austrogeorgiensis* the outer lobe of the left maxilla was uncleft and furnished with five apical setae; the right maxilla had the outer lobe cleft in the usual way into two lappets, each lappet being provided with two apical setae.

The maxillipeds.

Usually divided into four distinct plates, two of which are situated proximally and two larger ones distally, there being in addition a palp, generally three-jointed. Three of these plates consist of the coxopodite, the basipodite and the epipodite; the fourth must have developed from a division of either the coxopodite or the epipodite. PFEFFER (1887) supposes that the epipodite has split up into two plates.[1]

The attachment of the epipodite to the lateral margin of the coxopodite is a feature common to all Isopods.

In *Serolis*, as also in the *Idotheidae* and the *Arcturidae*[1], it may therefore be presumed that the extra chitinous plate at the proximal lateral angle of the maxilliped has developed from a division of the epipodite. Had this chitinous plate been formed by a division of the coxopodite, the distal epipodite plate would have issued from the lateral margin of the extra chitinous plate, which is not the case.

In some species of *Serolis* the distal epipodite is more or less coalesced with the basipodite, so that the suture-line between them has been effaced.

This has occurred in the species *S. paradoxa, schythei, gracilis* (see BEDDARD, 1884)[2], in *S. carinata*[3] and in the species *S. minuta, S. polaris* and *exigua*. In all these species, except *exigua* and probably also *carinata*[3], there is a distal incision between the epipodite and the basipodite.

---

[1] In the families *Idotheidae* and *Arcturidae* we likewise find maxillipeds provided with an extra joint, which must have developed from a division of either the epipodite or the coxopodite. HANSEN (1916), after comparing the maxillipeds in *Astacilla granulata* and *Mesitodea sabinei*, shows that in the latter species the epipodite, but not the coxopodite, has been divided into two plates. COLLINGE (1916, 1916 a, 1917), on the other hand, contends that in the genera *Pentias, Idothea* and *Mesidotea* the coxopodite has been divided.

[2] BEDDARD (1884, p. 35, 43, 62, Pl. II, Fig. 10; Pl. III, Fig. 10).

[3] See RICHARDSON (1905, Fig. 354 d).

In *S. exigua* (Fig. 17 g) the coalescence is very marked, the distal incision between the distal epipodite and the basipodite having also disappeared.

The palp of the maxilliped usually consists of three joints; occasionally a fourth vestigial joint is found. In the species *S. pagenstecheri* and *bouvieri* this joint, though small, is well demarcated from the third palp joint. The same is the case in *S. gerlachei*[1]. In *S. schythei*[2] there is an indication of a fourth palp joint, which, however, is not clearly demarcated from the third joint; the distinctness of its demarcation varies in different specimens. *S. polita* resembles *S. schythei* in this respect (see Fig. 15 g). In *S. glacialis* var. *austrogeorgiensis* the vestigial joint is not delimited from the third joint. See Fig. 16. The figure shows that the third palp joint in this species carries distally two small projecting lappets, the outer one of which certainly corresponds to a fourth palp joint.

In some species also the third palp joint is reduced in size. This is the case in *S. gaudichaudi*[3] and still more in *S. convexa*[4].

The second palp joint is always large and in most species approximately cordate.

In the Australian species of *Serolis* with the exception of *S. minuta* (with its varietys *bakeri* and *eugeniae*) the second palp joint is of a different shape; instead of being cordate it is curved, having the outer margin concave and the inner margin convex[5]. The maxilliped has been figured in the case of *S. australiensis* by BEDDARD (1884)[6], and in the case of *S. tuberculata* by CHILTON (1917)[7]. I may mention that also in *S. longicaudata* the palp of the maxilliped has the same characteristic shape as in the two above-mentioned species.

S. minuta, which in other respects also diverges from other Australian species, has the second joint of the palp of the maxilliped irregularly cordate. See Fig. 20.[8]

The pleopods.

The first, second and third pairs of pleopods have a small first peduncular joint, viz. the coxopodite[9]. The inner proximal angle of the basipodite on the first three pleopods is in most species triangularly extended and furnished with three setae on the first pair, and two on the second and third pair. This triangular extension is lacking in the Australian species, even in *S. minuta*,[10] as well as in the species *S. paradoxa, schythei* and *polaris*. The endopodite of the fourth pair is generally triangular; in *S. naera*, according to BEDDARD (1884), it is divided into two lappets by a distal incision. This is the case also in *S. paradoxa, schythei* and *polaris*.

The uropods.

Characteristically transformed in *S. latifrons* and *beddardi*, otherwise fairly uniform; they are reduced in size in *S. bouvieri* (see RICHARDSON 1906).

---

[1] MONOD (1926, Fig. 37 F).
[2] Cf. BEDDARD (1884, p. 43, Pl. II, Fig. 10).
[3] AUDOUIN and MILNE EDWARDS (1841, Pl. I, Figs 12 and 12').
[4] BEDDARD (1884, Pl. VI, Fig. 15).
[5] Cf. BEDDARD (1884, p. 67).
[6] BEDDARD (1884, Pl. VI, Fig. 6).
[7] CHILTON (1917, Fig. 7).
[8] The figure illustrates the maxilliped of the var. *eugeniae* of *S. minuta*.
[9] Figured only by PFEFFER (1887, Pl. III Figs. 22, 23, 24) in the case of *S. septemcarinata*.
[10] In *S. minuta* var. *eugeniae*. The main species and the var. *bakeri* have not been examined in this respect.

II. Classification.

Genus **Serolis** (LEACH), 1818.

For diagnosis of the genus see BEDDARD (1884, p. 7) and RICHARDSON (1905, p. 320). RICHARDSON's diagnosis must be slightly modified so as to include also the species *S. latifrons* and *beddardi* (see p. 39); the latter two species are assigned below to the new sub-genus *Spinoserolis*.

Since the great work on *Serolis* by BEDDARD (1884) the following species have been established:

bouvieri, RICHARDSON (1906); *meridionalis*, HODGSON[1] (1908); *polaris*, RICHARDSON (1911); *beddardi*, CALMAN (1920); *glacialis*, TATTERSALL (1921); *gerlachei*, MONOD (1926).

To these species I can add the new species *S. exigua*, described below, whilst I regard »*S. bakeri*», CHILTON (1917), as a variety of *S. minuta*.

Division into sub-genera.

BEDDARD (1884) assigned the six Australian species of *Serolis* to a special group within the family.

A distinguishing feature of all these species, with the exception of *S. minuta*, is that the middle part of the tergum of the sixth pereion segment has disappeared, whilst the second palp joint of the maxilliped is characteristically developed, not being cordate, but of almost uniform breadth. *S. minuta*, in which the tergum of the sixth pereion segment is preserved in its entirety but coalesces in the middle with the first abdominal segment, thus represents a transitional form leading up to *S. paradoxa* and allied species.

BEDDARD neither describes nor figures the maxilliped in *S. minuta*, but points out that, except in the characters of the sixth pereion segment, *S. minuta* more closely resembles *S. paradoxa* and allied species than *S. tuberculata*. He does not follow up his groups by a division into sub-genera.

Nor was the genus divided into subgenera by CALMAN (1920). He showed, however, that the two species *S. beddardi* and *latifrons* deviate considerably from the other species of *Serolis*, firstly in the continued existence of vestiges of the tergum of the last thoracic segment and secondly in the characteristic transformation of their uropods. These characters are regarded by CALMAN (1920) as being of almost generic importance.

CALMAN divides the family into three groups, viz. the *S. latifrons* group, the *S. paradoxa* group and the *S. tuberculata* group. Of these the *S. latifrons* group comprises *S. latifrons* and *S. beddardi*, while the two other groups are the same as those established by BEDDARD. CALMAN includes *S. minuta* in the *S. tuberculata* group, which, according to him, is characterized by having »tergum of penultimate thoracic somite interrupted in the middle so that the first abdominal comes in contact with the antepenultimate thoracic tergum» (CALMAN, 1920, p. 299); *S. minuta*, however, deviates from his group diagnosis.

As has been pointed out above the tergum of the penultimate thoracic segment in *S. minuta* is fused in the middle with the first abdominal segment; this is the case

[1] Fide VANHÖFFEN (1914).

also in the species, *pagenstecheri* and *bouvieri*[1]. Thus, as regards the fusion and partial reduction of the last thoracic terga, the above-mentioned species occupy an intermediary position between the *S. paradoxa* group and the *S. tuberculata* group. The reduction of the dorsal middle part of the sixth pereion segment has been carried further than in the species of the *S. paradoxa* group, but is not complete as in the *S. tuberculata* group.

If the different degree of coalescence between the tergal parts of the posterior thoracic segments is consistently taken as a systematic character, these species must be assigned to a special group.

That these species constitute a special type within the family, quite as much as the *S. paradoxa* and *S. tuberculata* groups, is clearly shown also by an examination of the sternal parts of the segments. It has been pointed out above that only in the species *S. minuta, pagenstecheri* and *bouvieri* is the coalescence between the sternites of the fifth and sixth pereion segments so far advanced that the greater part of the suture-line between them has been effaced.

In contrast to the four above-mentioned species, all the species of the *S. paradoxa* group which I have been in a position to study have the suture-line between the sterna of the fifth and sixth pereion segments developed in its entirety (see p. 41 and 42)[2].

The genus *Serolis* thus exhibits four different constantly recurring types, which differ in regard to the degree of the reduction of, and the coalescence between, the last three pereion segments. Moreover these »types» of the genus sometimes have other characters in common (particularly in the uropods and the maxillipeds). We are, therefore, warranted in dividing the genus into four sub-genera, for which I propose the following terminology:

1. *Spinoserolis* (= *S. latifrons* group, CALMAN);
2. *Serolis* (= *S. paradoxa* group, CALMAN);
3. *Homoserolis* (= *Serolis minuta, pagenstecheri* and *bouvieri*);
4. *Heteroserolis* (= *Serolis tuberculata* group, CALMAN).

Spinoserolis n. subg.

Diagnosis. Uropods spiniform, two-branched, lacking endopodite. Vestiges of the tergum of the seventh pereion segment persist laterally. The sternum of the seventh pereion segment completely demarcated from the sixth pereion segment. Coxal plates marked off by dorsal sutures on second to sixth pereion segments. Second joint of the palp of the maxilliped cordate. Antennal processes on the antennal flagellum missing[3]. Basipodites of the first three pairs of pleopods with their inner proximal angles projecting and furnished with setae.

Serolis n. subg.

Diagnosis. Uropods two-branched (not spiniform). Tergum of seventh pereion segment entirely vanished. Tergum of sixth pereion segment well demarcated from first abdominal segment in its entire length. Suture between the sterna of seventh and sixth pereion segments partially effaced; suture between sixth and fifth segments complete. Coxal

[1] In *S. bouvieri* the tergum of the sixth pereion segment also coalesces in the middle with that of the fifth.

[2] A short median part of this suture is missing in adult males of *S. paradoxa* and *schythei* (see p. 41 and Fig. 10 b), but the suture-line is distinctly developed in its entirety in female and young male specimens of these species (Fig. 10 c).

[3] Established only in the case of *S. latifrons*.

plates marked off by dorsal sutures on a varying number of segments. Second joint of the palp of maxilliped cordate. Antennal processes developed on the antennal flagellum. Basipodites of first three pairs of pleopods with or without triangular extension at their inner margins.

Homoserolis n. subg.

Diagnosis. Uropods two-branched (not spiniform). Tergum of seventh pereion segment entirely missing; that of sixth pereion segment in the middle short and coalesced with abdomen so that the suture-line between this segment and abdomen has been effaced in the middle. Suture-lines between the sterna of seventh and sixth as also between sixth and fifth pereion segments developed only laterally. Coxal plates marked off by dorsal sutures on second, third and fourth pereion segment. Second palp joint of the maxilliped cordate. Antennal processes developed on the flagellum of the antennae. Basipodite of the first three pairs of pleopods with or without triangular extension at its inner margin.

Heteroserolis n. subg.

Diagnosis. Uropods two-branched (not spiniform). Tergum of seventh pereion segment entirely missing; likewise middle of tergum of sixth pereion segment. Second joint of palp of maxilliped non-cordate, with outer margin concave and inner margin convex. Antennal processes developed on the flagellum of the antennae. Basipodites of first three pairs of pleopods without triangular extension at their inner margins.

Group-division of the sub-genus Serolis.

The subgenus *Serolis* includes the main part of the species. In the subgenus the dorsal sutures of the coxal plates are developed in a varying number of segments. In addition there are differences in the second pair of maxillae and in the shape of the maxillipeds and the pleopods. On the basis of these characters, the subgenus may be divided into the following five groups: —

Group I. Coxal plates marked off from the tergum on second to sixth pereion segments. Third palp joint of maxilliped well-developed. Basipodites of first three pairs of pleopods with their inner proximal angles projecting and furnished with setae.

The group comprises only *S. gracilis* BEDDARD. The second pair of maxillae is not known in the species. As regards the last pleopods BEDDARD (1884, p. 63) states: »The suture which divides the exopodite of the opercula is oblique; the exopodite of the gill appendage is bifurcate».

Group II. Coxal plates marked off from the terga of the second to fifth pereion segments. Outer lappet of outer lobe of second pair of maxillae provided with two or three apical setae, inner lappet of the same lobe with four to seven. Basipodite of first to third pleopods with proximal part of the inner margin slightly convex and lacking setae. Endopodite of the fourth pleopod divided into two lappets by a distal incision.

Comprises the species *paradoxa, schythei* and *polaris.*

Group III. Coxal plates marked off from the terga of the second, third and fourth pereion segments. Third palp joint of the maxilliped well developed[1]. Lappets of outer lobe on

[1] The maxillipeds of *S. meridionalis* have not been described or figured.

second pair of maxillae provided with a small number of setae[1]. Basipodites of the first three pairs of pleopods each provided at their inner proximal angles with a triangular extension which is furnished with setae[2]. The endopodite of third pleopod, as a rule, entire (exceptionally bifid)[3].

Comprises the species *trilobitoides, septemcarinata, antarctica, naera, bromleyana, polita, meridionalis, glacialis, gerlachei* and *exigua.*

Group IV. Coxal plates marked off from the terga on second to fourth pereion segments. Third palp joint of maxilliped minute. Lappets of outer lobe on the second pair of maxillae provided with a large number (6—8) of apical setae. Basipodites of first three pairs of pleopods with inner proximal angles triangularly projecting and furnished with setae. Endopodite of third pleopod entire (not bifid).

Species belonging to this group deviate also in having the setae on the propodal edge of the first pereiopod differently shaped in females and adult males.

The group comprises the species, *S. gaudichaudi, convexa* and *plana.* Our knowledge of *S. plana* is inadequate; it has been examined only with reference to the first character in the group-diagnosis. In its general aspect it is, however, very similar to *S. convexa* and may possibly be identical with that species.

Group V. Dorsal sutures of coxal plates lacking on all pereion segments. Third palp joint of maxilliped well developed.

Comprises only the species *S. carinata* LOCKINGTON, which, as regards most of the characters taken as a basis for the group diagnoses, is inadequately known. The second joint of the palp of the maxilliped in this species is of almost uniform width (cf. RICHARDSON 1905, Fig. 354 d.)

Remarks. Groups II and IV are the most distinctly demarcated groups. Only in Group II, notably in the subgenus *Serolis*, do we find that the coxal plates are dorsally delimited on four of the pereion segments, and that the basipodites of the first three pairs of pleopods have the proximal parts of their inner margins slightly convex.

The species belonging to group IV have, indeed, the same number of demarcated coxal plates as is characteristic of group III, but they are distinguished from all other species of the genus by differences in the second pair of maxillae and in the palp of the maxilliped, as also in the setal armature on the propodus of the first pereiopod.

Subgenus *Serolis*[4], Group II[5].

Serolis (*Serolis*) **paradoxa** (FABRICIUS, 1775).

Text figs. 1 f and g, 2 a, b and d, 3 b, c and d, 5 b, 6 f and g, 7 a and b, 8 a, 9, 10 b and c, 12 a—f.

Oniscus paradoxus. FABRICIUS, 1775, p. 296.

Serolis Fabricii. LEACH, 1818, p. 339—340; MILNE EDWARDS, 1840, p. 231—232; NICOLET, 1849, p. 821—282; GRUBE, 1875, p. 233.

Serolis Orbignyana. AUDOUIN and MILNE EDWARDS 1840, in MILNE EDWARDS 1840, p. 232; AUDOUIN and MILNE EDWARDS, 1841, p. 25—27, Pl. 2 Figs 8—9; SCHIOEDTE, 1866, p. 181—183, Pl. X, Figs. 2 a—2 g; GRUBE, 1875, p. 225—227, p. 233, Pl. V Figs. 3 and 3 a, Pl. VI Fig. 3 a; SCHMELZ, 1876, p. 161.

[1] The second pair of maxillae are unknown in *S. antarctica, naera* and *meridionalis.*
[2] The pleopods are unknown in *S. meridionalis.*
[3] In *S. naera.* The shape of the third pair of pleopods is unknown in *antarctica, meridionalis* and *gerlachei.*
[4] For diagnosis see p. 49—50.
[5] For diagnosis see p. 50.

Serolis Orbigniana. CUNNINGHAM, 1870, p. 498.
Serolis paradoxa. AUDOUIN and MILNE EDWARDS, 1841, p. 28—29, Pl. 2 Fig. 10; MIERS, 1875, p. 116—117; 1881, p. 76; BEDDARD, 1884, p. 33—36, Pl. V, Figs 12—14; DOLLFUS, 1891, p. 61—62, Pl. VIII Fig. 4; ORTMANN, 1911, p. 650; NIERSTRASZ, 1917, p. 110.
For synonomy and literature see also MILNE EDWARDS (1840), AUDOUIN and MILNE EDWARDS (1841) and BEDDARD (1884).

Diagnosis. Anterio-lateral angles of the head triangularly prolonged. Coxal plates delimited by dorsal sutures on the second to fifth pereion segments. Posterior epimeral angles on the second to sixth segments of pereion all successively reach further back than the epimeral angles of the preceding segments. Posterio-lateral epimeral angles of the second and third abdominal segments extend to the lateral margins of the pleotelson. Pleotelson with three longitudinal diverging ridges. Inner lobe of first maxilla expanded distally. Outer lappet of outer lobe of second maxillae with two, and inner lappet of the same lobe with five or six, apical setae. Maxilliped without suture between the distal epipodite and the basipodite, the distal epipodite being fused proximally with the basipodite to about half its length; second joint of the palp cordiform. Basipodite of the first three pairs of pleopods with proximal part of the inner margin slightly convex. Fourth pair of pleopods with the endopodite bifid.

Supplementary Description.

Body. Body with lateral margins slightly serrate and furnished with minute setae. Dorsal surface with dark ramose pigment spots.

Colour. Slightly yellowish to brownish.

Head. Anterior margin laterally from the proximal joints of the antennae, slightly bent downwards; there is a submarginal ridge at the base of the downturned part, extending from the second peduncular joint of the antennulae to the anterio-lateral angle of the head.

First pereion segment. Dorsal surface of the epimera with a transverse ridge on each side of the head, extending to a point opposite the centre of the eyes. Close to the anterio-lateral angle of the segment there is a small oval area of very thin chitin (see Fig. 9).

Ventral surface (see Fig. 9) with four longitudinal sutures, the lateral ones passing through the articular sockets for the first pereiopods[1]. Along the middle line there is a broad longitudinal carina, extending from the anterior margin of the segment to about two-thirds of its length and increasing in width backwards. Posteriorly the keel is limited by a transverse furrow from a crescent-shaped elevation along the hinder margin.[1]

The other segments of the pereion. Epimera with faint transverse ridges near their anterior margins. All the segments with a longitudinal furrow ventrally in the middle line. For the ventral surface of the last three segments see Figs. 10 b and c.

Antennulae. Second and third peduncular joint on each of the anterior and posterior sides with a longitudinal row of slender setae. Each joint of the flagellum with one sensory filament and three setae. Last joint of the flagellum with three setae.

Antennae (Fig. 12 a, b and c). First peduncular joint short and visible only from below. Second peduncular joint about twice as long as the first, with an incomplete suture proximally (cf p. 45). Second and third peduncular joints ventrally with groups of

[1] Cf. SCHIOEDTE, 1866, Pl. X Fig. 2 a.

setae arranged in transverse rows, each group consisting of four to six setae. The rows stretch from about the centre of the joints to the anterior margin, the setae being shorter in the groups situated more anteriorly. Second peduncular joint with three rows of groups of setae, third and fourth joint with five rows.

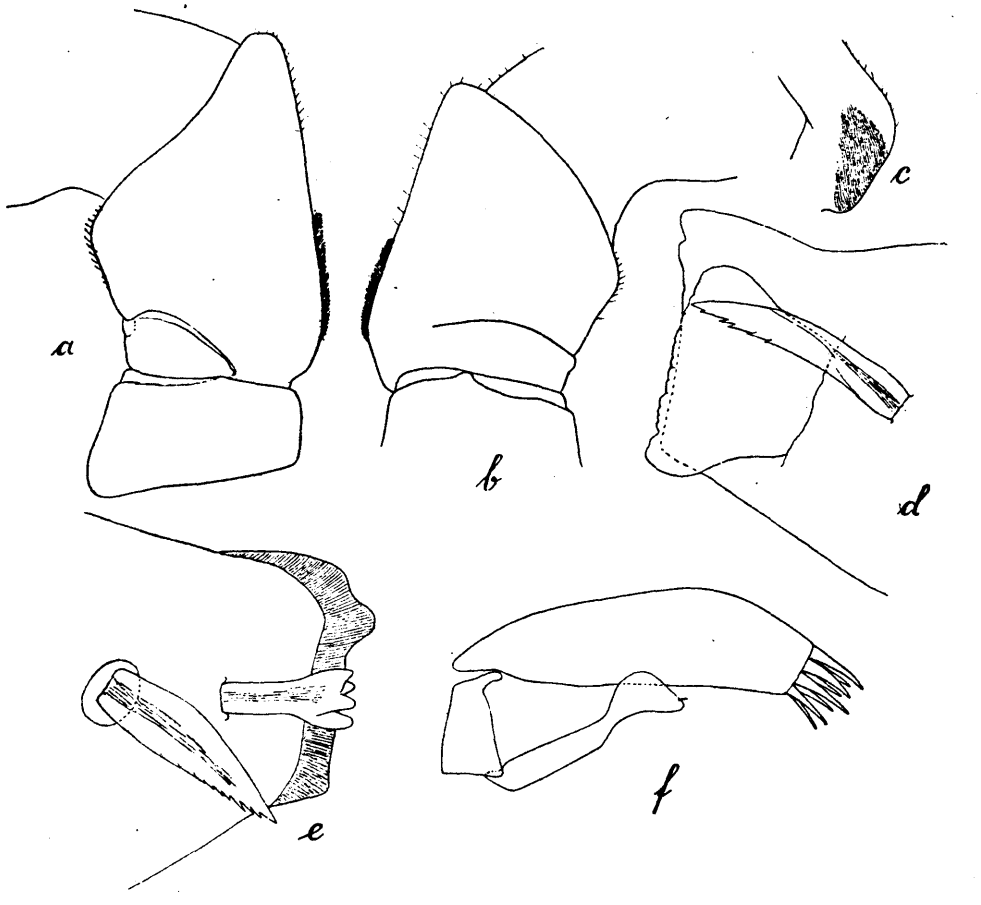

Fig. 12. *Serolis paradoxa* (FABR.) a. Proximal joints of the antenna, seen from below, 13 ×. b. The same, seen from above, 13 ×. c. Part of the peduncular joint of the antenna, seen from the rostral (= medial) side, 10 ×. d. Inner part of the left mandible seen from above, immature specimen taken out of the marsupium, 60 ×. e. Inner part of the right mandible, seen from above, the same specimen, 60 ×. f. First maxilla, male, 20 ×.

Mandibles (Figs. 12 d and e). The inner masticatory process of the right mandible provided at the tip with a number of irregularly placed obtuse teeth, the lateral seta with a row of saw-teeth along its caudal margin.

Setae on the second and third joints of the palp as in *S. trilobitoides*.[1]

First pair of maxillae (Fig. 12 f). Cf. SCHIOEDTE (1866, Pl. X, Fig. 2 b); BEDDARD (1884, Pl. V. Fig. 14).

[1] Cf. HODGSON, 1910, Pl. IV, Fig. 6.

Second pair of maxillae.[1] Outer lappet of outer lobe with two, and inner lappet of the same lobe with five or six, apical setae.

Maxillipeds.[2] Distal epipodite proximally coalesced with the basipodite to about half its length. Distal margin of the basipodite concave and furnished with two large setae (See Fig. 8 a), one in the middle of the margin and one at the inner distal angle.

First pair of pereiopods. Lower distal angle of the carpus prolonged into a short spine-like projection. Distal margin with two composite sub-cylindrical setae (See Fig. 6 f.) On both the rostral and the caudal side there is a submarginal row of slender setae along the lower part of the distal margin and the distal part of the lower margin.

For the setae on the lower margin of the propodus see Fig. 5 b.

Dactylus with a submarginal row of pores on the rostral side close to lower margin (See Fig. 3 c and d).

Second pair of pereiopods. For the setae on the lower margin of the propodus see Fig. 7 a and b. A dense covering of slender setae[3] on the lower surface of ischum, merus and carpus occurs only in adult males which have penial filaments of full length.

First three pairs of pleopods. Endopodite, decreasing in length but increasing in width, from the first to the third pair. Margins of exo- and endopodite with long plumose setae, mingled with very short »hairs», lacking setal canals.

Fourth pair of pleopods. Exopodite divided by an oblique transverse suture and obtusely pointed distally. Endopodite distally cleft into one narrow digitiform inner lobe and one larger outer lobe. Outer and inner margins of the exopodite provided proximally with branchless slender setae, which gradually become branched distally.

Fifth pair of pleopods. Peduncle short, exopodite and endopodite not divided by transverse limits. BEDDARD (1884, p. 36 and cf. p. 13—14) says that the exopodite of this appendage is bifurcate. This is really only the case with the endopodite of the fourth pleopod.

Uropods. Exopodite almost twice as broad as the endopodite. Outer, inner and distal margins of the branches serrate, each serration provided with one plumose seta; also the outer margin of the basipodite is serrate.

Localities*[4] *and material.

St. 33. South Georgia, Grytviken, lat. 54° 22′ S., long. 36° 28′ W. 22 m. Clay and algae. $^{30}/_{5}$ 1902. 24 specimens, males and females, all sub-adult or immature. Largest specimen, a male with semi-developed penial filaments, length 27.5 mm.

St. 39. Falkland Islands, Port William, lat. 51°40′ S., long. 57° 41′W. 40 m. Sand and small stones with algae. $^{6}/_{7}$ 1902. Ovigerous female. Colour light yellowish to brownish. Length 28 mm.

St. 41. Falkland Islands, Berkeley Sound, Port Louis, lat. 51 ° 33′ S. long. 58° 9′ W. Shallow water. Gravel and sand. $^{23}/_{7}$ 1902. One ovigerous female.

St. 52. Falkland Islands, Port William, lat. 51° 40′ S., long. 57° 44′ W. 17 m. Sand. $^{3}/_{9}$ 1902. 33 specimens, males and females. Length of largest specimen, male, about 36 mm.

St. 54. Falkland Islands, Stanley Harbour, lat. 51° 42′ S., long. 57° 50′ W. 10 m. Mud with shells. $^{3}/_{9}$ 1902. 3 specimens of dark colour (one ovigerous female and two immature specimens).

Swedish Magellanian Expedition. Falkland Islands, Port William. Rocks. 20 specimens. Colour, light yellowish. Length of largest specimen 30 mm.

Swedish Expedition to Tierra del Fuego.

Tierra del Fuego, Lennox Island, Lennox Cove. 10—20 fathoms Floride bottom. $^{5}/_{2}$ 1896. 9 immature specimens. Colour, dark in the middle, small dark spots along the posterior margins of the segments and on the head and the pleotelson.

[1] Cf. BEDDARD, 1884, p. 35.
[2] Cf. SCHIOEDTE, 1866, p. 182, Pl. X, Figs. 2 a and g.
[3] Cf. BEDDARD, 1884, p. 35.
[4] In the list of localities those visited by the Swedish Antarctic Expedition are placed first.

Tierra del Fuego, Paramo. Shore at low tide. Jan. and Febr. 1896. 7 large specimens of very dark colour, males and females. Length of largest specimen, an adult male, 31 mm.

Patagonia, Puerto Gallegos. Common on the shore at low tide. Clay mixed with sand. $^{16}/_{11}$ 1895. 17 specimens (6 adult, 11 immature). Colour of the adult specimens blueish black. Length of the largest specimen, a female with empty marsupium, 34 mm.

Magellanian Region, Gente Grande. $^{25}/_{12}$ 1895. 2—3 fathoms. Rocks and algae. 3 specimens of brownish black colour. Length of the largest specimen, a female, 32 mm.

Magellanian Region, Punta Arenas. Shore at low tide. Sand. $^{25}/_{11}$ 1895. 7 specimens, males, females and immat. Colour, dark brown. Length of the largest specimen (female with young) 38 mm. Length of largest male specimen 36 mm.

The »Gefle» Expedition (G. E. WESTERGREN legit). South Chile, Corral, at Valdivia Bay. 1866. Ovigerous female.

Falkland Islands. Port Stanley. 20 fathoms. 1866. Immature specimen.

Distribution. Coast of Central Chile (NIERSTRASZ 1917), Tierra del Fuego and Patagonia (AUDOUIN and MILNE EDWARDS 1841), Falkland Islands (BEDDARD 1884), South Georgia (Sw. Ant. Exped.)

The species has not previously been recorded from South Georgia. It occurs with certainty as far northwards as the coast of Central Chile. Perhaps it may also be distributed at the coasts of North Chile and Peru. In any case, there are at the Swedish State Museum two specimens, which are labelled: »Vanadis Expedition, Callao» (coast of Peru). This locality I regard, however, as uncertain.

Serolis (*Serolis*) schythei LÜTKEN, 1859.

Text fig. 1 b and i, 5 c and d, 7 h, 13 a—e.

Serolis schythei. LÜTKEN, 1859, p. 98—104, Pl. I A Figs. 12 and 13; GRUBE, 1875, p. 220—225; STUDER, 1884, p. 8; DOLLFUS, 1891, Pl. VIII a, Fig. 5; BEDDARD, 1884, p. 40—44, Pl. II Figs. 5—13; PORTER, 1917, p. 99; TATTERSALL, 1921, p. 227; GIAMBIAGI, 1928, p. 11—12; Pl. II, Fig. 3.

Diagnosis. Head of greatest width across the eyes. Coxal plates marked off by dorsal sutures on the second to fifth pereion segments. Epimeral angles of the second to sixth segments of pereion all successively extending beyond the epimeral angles of the preceding segments. Epimera of second abdominal segment extending further back than the posterior angles of the epimera of the fifth pereion segment, but not as far back as those of the sixth pereion segment. Pleotelson with three diverging longitudinal ridges. Posteriolateral angles of pleotelson prolonged into retroverted points. First maxillae with inner lobes expanded distally. Outer lappet of the outer lobe of second maxilla provided with two apical setae, inner lappet of the same lobe with six or seven. Maxilliped without suture between the distal epipodite and the basipodite, the distal epipodite being fused proximally with the basipodite to about half its length. Palp of maxilliped with a vestigial fourth joint. Basipodite of the first three pairs of pleopods with proximal part of the inner margin slightly convex and devoid of setae. Endopodite of fourth pleopod bifid.

Supplementary Description.

Head and pereion. The submarginal ridge on the anterio-lateral parts of the head indistinct. Transverse ridges on the first pereion segment more marked than in *S. paradoxa*. No transverse ridges on the other pereion segments. Ventral surface of pereion as in *S. paradoxa*[1].

[1] Cf. GRUBE, 1875, Pl. VI, Figs. 1 and 1 c.

Antennae. Antennal processes on the flagellum (Fig. 1 i) exactly alike in males and females.

Mandibles (Figs. 13 a and b). Anterior masticatory process on the right mandible (Fig. 13 c) with a great number of digitiform lobes. Posterior process with a row of teeth.

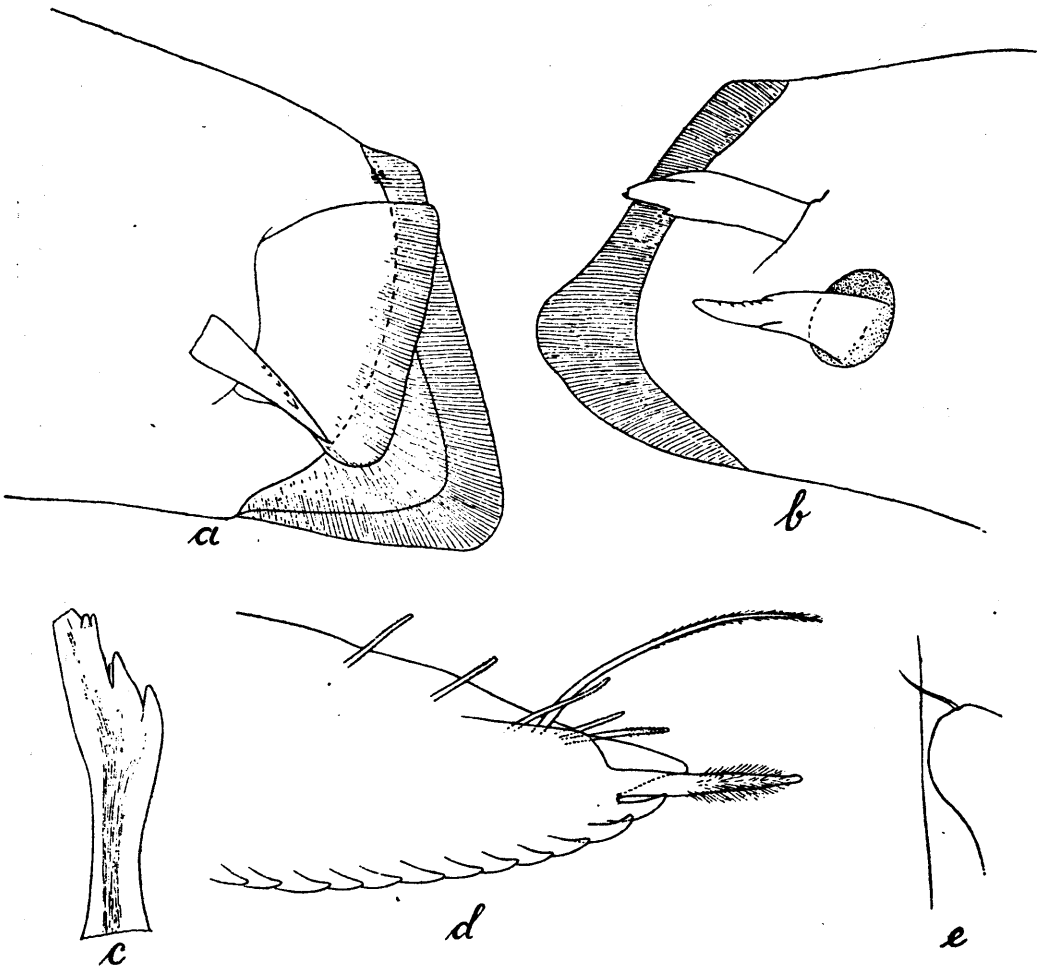

Fig. 13. *Serolis schythei*, LÜTK. a. Inner part of the left mandible, seen from above, 80 ×. b. Inner part of the right mandible, seen from above 80 ×. c. The rostral masticatory seta on the right mandible, 140 ×. d. Tip of the dactylus of the second pereiopod, in a female, 240 ×. e. Tuberculum and seta at the dorsal margin of the ischium of the fourth pereiopod (in an adult male) 115 ×.

First pair of maxillae. Outer lobe with about 12 apical setae, of which that at the posterior-distal angle is provided with two adjacent rows of short and slender sub-branches.

Second pair of maxillae: Outer lappet of outer lobe with two, inner lappet of the same lobe with six or seven, apical setae, most of the setae furnished with two rows of slender sub-branches.

Maxillipeds. Distal epipodite proximally fused with the basipodite to about half its length. Palp with a fourth vestigial joint, distinctly delimited by a suture only in certain specimens[1]. The composite setae on the basipodite as in *S. paradoxa.*

First pair of pereiopods. For the composite setae on the propodus see Figs. 5 a and d. The composite setae on the distal margin of the carpus as in *S. paradoxa.* On the rostral side of the dactylus, close to the lower margin, there is a submarginal row of pores with one seta protruding from each pore.

Second pair of pereiopods.[2] For the setae on the lower margin of the propodus of the adult male see Fig. 7 h. Along the lower margin of the dactylus there is a row of elongated, projecting structural scales (Fig. 13 d), of which the most distal one constitutes the short ventral claw of the joint. Between the two claws is a stout sensory seta. Only sparse setae on the lower margin of the ischium, merus and carpus, in the adult male.

The other pereiopods. In the adult male the seventh pereiopod differs from the same appendage in the female only in having a greater number of setae on the lower margin of the carpus and propodus. BEDDARD (1884, p. 43) states with reference to the third to seventh pereiopods »the second joint (in the males only) has a series of about fifteen tubercles close to the inner margin». Such tuberculae are found on the ischium in the adult male. Each tuberculum is furnished with a simple seta (Fig. 13 e and cf. BEDDARD, 1884, Pl. II, Fig. 9).

Pleopods and uropods. LÜTKEN, (1859, p. 102), GRUBE, (1875, p. 223—224, Pl. V, Figs. 1 c and 1 d.), BEDDARD, (1884, p. 43 and 44).

Localities and Material.

St. 2. Coast of North Argentina, lat. 37° 50′ S., long. 56° 11′ W. 100 m., Gravel mixed with sand. $^{22}/_{12}$ 1901. 9 specimens, males and immature. Length of largest specimen 23 mm. (adult male.)

St. 16. Between Falkland Islands and South Georgia, lat. 51° 40′ S., long. 57° 25′ W. 150 m. Sand. $^{11}/_{4}$ 1902. 8 immature specimens.

St. 33. South Georgia, off Grytviken, lat. 54° 22′ S., long. 36° 28′ W. 22 m. Clay and algae. $^{30}/_{8}$ 1902. 35 specimens, males and females. Length of largest specimen 24 mm. (adult male.)

St. 40. Falkland Islands, Berkeley Sound, lat. 51° 33′ S., long. 58° 0′ W. 16 m. Bottom temp. + 2.75°. Gravel and shells with algae. $^{19}/_{7}$ 1902. 6 adult specimens. Length of the largest specimen 31.5 mm (male).

St. 48. Falkland Islands, Berkeley Sound, lat. 51 °34′ S., long. 57° 55′ W. 25 m. Bottom temp. + 2.75°. Sand and stones. $^{10}/_{8}$ 1902. 10 specimens, males and females. Length of largest specimen 28 mm (female with young).

St. 55. Falkland Islands, Port Albemarle, lat. 52° 11′ S., long. 60° 26′ W. 40 m. Sand bottom with algae. $^{8}/_{9}$ 1902. One sub-adult male (penial filaments about as long as the endopodite of second pleopod). Length 17.8 mm.

St. 57. Falkland Islands, Port Albemarle, lat. 52° 8′ S., long. 60° 33′ W. 18—30 m. Sand. $^{11}/_{9}$ 1902. 15 specimens, males and females. Length of largest specimen, a male, 21.5 mm. One female of a length of only 19.3 mm. was already mature and provided with a marsupium containing young.

St. 58. South of W. Falkland, lat. 52° 29′ S., long. 60° 36′ W. 197 m. Bottom temp. + 4.1°. Sand and gravel. $^{11}/_{9}$ 1902. Female with young. Length 17.3 mm.

Eugenie Expedition. Patagonia. Off Cape Corrientes, lat. 39° 14′ S., long. 57° 0′ W. 52 fms. Black sand. 3 specimens (females and immature specimen). Length of largest specimen, a female with an empty marsupium, 22 mm.

Magellan Straits, off. Cape Virgines, 32 fms. 10 immature specimens of yellowish colour. Length of largest specimen 22 mm, sub-adult male (with penial filaments slightly longer than the endopodite of second pleopod, but with sterna on the first three abdominal segments already transformed).

Swedish Expedition to Tierra del Fuego. Magellanian Region, Punta Arenas. Bottom: sand and algae. 7—8 fathoms. Not rare. $^{4}/_{12}$ 1895. Collected on the shore at low tide. 9 specimens with numerous black spots. Length of largest specimens, adult male and ovigerous female, 27 mm.

---

[1] Cf. BEDDARD (1884, p. 43, Pl. II, Fig. 10).

[2] See GRUBE, (1875, Pl. V, Fig. 1 a, p. 224), BEDDARD (1884, Pl. II, Fig. 8).

Material collected by Captain LARSEN 1894. Graham Region, Terror and Erebus Golf. Adult male, yellowish with dark spots, length 23 mm.

Material collected by I. G. HÖGBERG. Argentina, Chubut Territorio. Golfo nuevo, Harbour, Madryn. One specimen, adult female.

Distribution. Coast of Central Chile (PORTER 1917). Argentina (Sw. Ant. Exped.), Patagonia (STUDER 1884. BEDDARD 1884, Tierra del Fuego (GIAMBIAGI 1925), Magellanian Region (LÜTKEN 1859), Falkland Islands (BEDDARD 1884, TATTERSALL 1921), Between Falkland Islands and South Georgia near Falkland Islands (Sw. Ant. Exped.), South Georgia (Sw. Ant. Exped.), Graham Region (Capt. LARSEN 1894).

The species has previously been found at the Falkland Islands, Magellan Straits, Patagonia and Chile. Here it is for the first time recorded from Argentina, South Georgia and Graham Region; it is thus widely distributed.

Serolis (*Serolis*) **polaris** RICHARDSON, 1911.

Serolis polaris. RICHARDSON 1911, p. 396—398, Fig. 1.

Specific Characters and Remarks.

The species is closely allied to *S. schythei* and tallies with that species in most of the features mentioned above in the diagnosis of *S. schythei*. It differs in that the anterio-lateral angles of the head are more pointed and projecting and in that the posterior angles of the pleurae of the second abdominal segment project beyond the posterior angles of the coxae of the sixth pereion segment. There is also a slight, but distinctly marked, difference in the sculpturing of the pleotelson, as well as in some minor features mentioned below. As in *S. schythei* the adult male differs from the female in having the posterior margin of the first three abdominal segments concave.

Supplementary Description.

Colour. Yellowish, often with a brownish spot at the junction of the coxal plates and the thoracic segments.

Antennae. Antennal processes occur on the central joints of the flagellum and consist of 3—5 hook-like projections in a row along the distal margin of the joints.

First and second pairs of maxillae. Inner lobe of first maxilla with the distal end widened; distal margin sub-truncate (very slightly concave). Outer lappet of outer lobe with three apical setae, inner lappet of the same lobe with four or five.

Maxillipeds. As in *S. schythei* but without any trace of a fourth joint of the palp.

First pair of pereiopods. Setae on the lower margin of propodus as in *S. schythei*. Carpal joint (at its lower distal angle) with two composite setae subequal in structure to the corresponding setae in *S. schythei*.

Second pair of pereiopods. Similar to the same appendages in *S. schythei*. The second pereiopod of the adult male differs from *S. schythei* in that the lower margins of the ischium, merus and carpus are furnished with a dense covering of setae, which are abundantly provided with hair-like, sub-branches. The lower margin of the propodus in the adult male is furnished with two rows of setae. In the rostral row there are twelve setae similar in structure to the corresponding setae in *S. schythei* (cf. Fig. 7 h), in the caudal row eight setae, similar to those on the lower margin of ischium, merus and carpus, but with sub-branches on their central parts only.

Pleopods. Basipodites of the first three pairs of pleopods with proximal part of the inner margin slightly convex and devoid of setae. Endopodites of the fourth pair of pleopods bifid, as in *S. schythei* and *paradoxa.*

Localities and Material.

Eugenie Expedition. Argentina, South of La Plata, lat. 36° 50′ S., long. 55° 54′ W. 5 specimens, males and females. Length of largest specimen 21 mm., an adult female with empty marsupium.

Distribution. Argentina (Eug. Exped.), South Sandwich Islands (RICHARDSON 1911). Thus this species presumably is widely distributed.

Subgenus *Serolis*, Group III.[1]

Serolis (*Serolis*) **trilobitoides** (EIGHTS, 1833).

Text fig. 5 a.

For synonymy and literature see RICHARDSON, 1913, p. 9. It may be added:
Serolis Brongniartiana. AUDOUIN and MILNE EDWARDS, in MILNE EDWARDS 1840, p. 232—233.
Serolis trilobitoides. MONOD, 1926, p. 38.

Diagnosis. Anterio-lateral angles of the head slightly extended; greatest width of the head in front. Coxal plates marked off by dorsal sutures on second to fourth pereion segments. Posterior angles of the coxal plates of the second to sixth pereion segments all successively projecting beyond those of the preceding segments; the pleurae of the second and third abdominal segments extending with their posterior angles about as far back as two-thirds the length of the pleotelson. Posterior angles of the epimera of the sixth pereion segment reaching further back than those of the second and third abdominal segments, about as far back as the tip of the pleotelson. Pleotelson with three dorsal longitudinal diverging ridges, the one in the middle line being narrow and denticulated. Lateral margins of pleotelson denticulated; pleotelson distally pointed, but without spine-like prolongation at the tip. Inner lobe of first pair of maxillae expanded distally. Lappets of outer lobe on the second maxillae, normally, each provided with two apical setae. Maxilliped with distal epipodite marked off from the basipodite by a distinct suture. Palp of maxilliped consisting of three joints, of which the second is approximately cordiform. Basipodites of first three pairs of pleopods their inner proximal angles projecting and furnished with »plumose setae». Endopodites of fourth pair of pleopods entire (not bifid).

Supplementary Description.

Pereion. Ventral surface of first pereion segment sculptured in the middle in the usual way (see HODGSON, 1910, p. 25) and with four longitudinal sutures, of which the lateral ones pass through the sockets for the first pereiopods. Ventral surfaces of the last three pereion segments have the apperance normally found in the subgenus.

Antennulae. In the flagellum the first joint is about three times as long as the others. In a young male, 24.5 mm. in length the flagellum consists, of 27 joints, in a young specimen of a length of 22.5 mm., of 22 joints.

Antennae. The antennal processes on the central joints of flagellum are spine-like.[2] Joints of the flagellum in a young male 24.5 mm. in length 16, in a young specimen 22.5 mm. in length 14, in number.

[1] For diagnosis see p. 51.
[2] See BEDDARD, 1884 Pl. I, Fig. 6.

Mandibles. See BEDDARD (1884, Pl. I, Figs. 7 and 8), HODGSON (1910, p. 26). Normal.

Maxillipeds. See BEDDARD (1884, Pl. I, Fig. 11), and HODGSON (1910, Pl. IV, Fig. 5). HODGSON (1910) was unable to find any suture between the coxopodite and the proximal epipodite. In my specimens this suture is distinct and has the appearance figured by BEDDARD (1884).

First pair of pereiopods. For the composite setae on the lower margin of propodus see Fig. 5 a and HODGSON (1910 Pl. IV, Figs. 7 and 8). Distal margin of the carpus close to its inner distal angle with two composite setae of sub-cylindrical shape, the setal part protruding freely at the tip. Around these setae there are slender setae of the non-composite kind. The structural scales around the two composite setae on the distal margin are triangularly prolonged.

First three pairs of pleopods. Peduncle composed of two joints, of which the proximal one is short.

Uropods. HODGSON (1910) states that the exopodite is two-jointed and that »the endopodite is a little longer than the first joint of the exopodite» (HODGSON 1910, p. 30). BEDDARD (1884, p. 52) observes »the exopodite being almost half again as long as the endopodite».

In the two specimens I have seen that the exopodite was single-jointed and somewhat shorter than the endopodite. Both the rami are distally pointed. The lateral margin of the exopodite in the larger specimen has seven teeth, in the smaller only five. Distal part of the inner margin of the same joint in the larger specimen with four, in the smaller one with two, teeth; the lateral margins of the endopodite in both specimens distally provided with two teeth; distal part of the inner margin of the endopodite has three teeth in both specimens.

The shortness of the exopodite in both the specimens examined is due, presumably, to immaturity, the largest being only of 24.5 mm. in length whereas the largest specimens examined by BEDDARD and HODGSON were 41 and 48 mm. The species can attain a length of 70 mm. (EIGHTS 1833), RICHARDSON (1913) records a length of 67 mm. in one specimen.

Localities and Material.

St. 8. Graham Region, lat. 64° 3′ S., long. 56° 37′ W. Situation as well as depth of the station uncertain, (360 m?). Soft clay. $^{11}/_{2}$ 1902. One immature male specimen, with a trace of penial filaments but with the propodus of the second pereiopods not at all transformed. Length of the specimen 24.5 mm.

St. 11. Graham Region, lat. 65° 19′ S., long. 56° 48′ W. 400 m. Clay mixed with gravel. $^{18}/_{2}$ 1902. One immature specimen. Length 22.5 mm.

Distribution. Patagonia (EIGHTS[1] 1833), Cape Horn (EIGHTS[1] 1833), Kerguelen (STUDER[1] 1879, BEDDARD 1884), South Shetland Islands (EIGHTS[2] 1833), West of Graham Region (MONOD 1926), Graham Region (Sw. Ant. Exped.), Off Victoria Land (HODGSON 1910).

The species has previously been found in the neighbourhood of Graham Region. Its ocurrence at Graham Region (st. 8 and 11) was therefore to be expected.

[1] Fide AUDOUIN and MILNE EDWARDS (1841).
[2] Fide BEDDARD (1884).

Serolis (*Serolis*) septemcarinata MIERS, 1875.

Text. Fig. 1 d, 5 h, 6 a, 7 g, 14 a—c.

For synonymy and literature see TATTERSALL, 1921, p. 227. Moreover may be added:
Serolis septemcarinata. RICHARDSON, in MURPHY, 1914, p. 53; MONOD, 1931, p. 26.

Diagnosis. Anterio-lateral angles of the head triangularly prolonged; greatest width of the head at the front margin. Coxal plates delimited by dorsal sutures on the second to fourth pereion segments. The posterio-lateral angles of the epimera of the segments (except those of the first abdominal segment) all projecting beyond those of the preceding segments. Pleotelson with seven longitudinal carinae. First maxilla with the inner lobe expanded distally into an oblong oval area. Outer lappet of outer lobe of second maxilla with two, inner lappet of the same lobe with five, apical setae. Distal epipodite of the

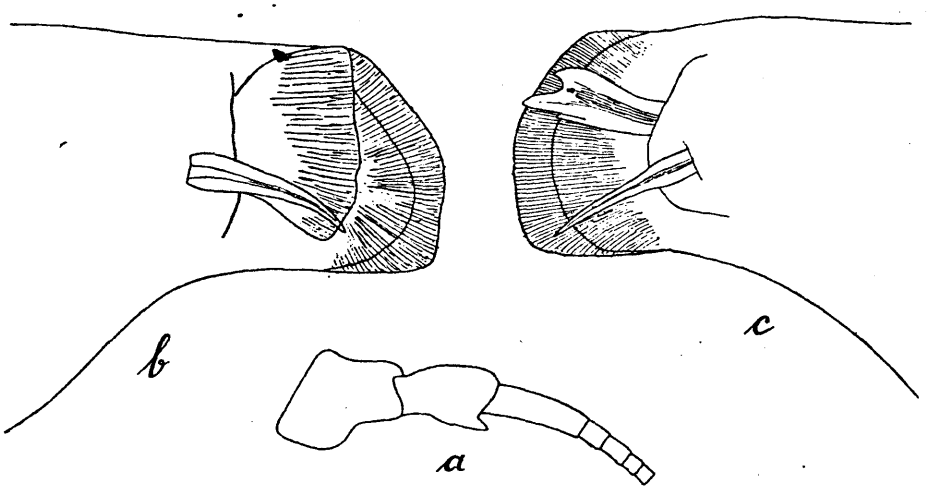

Fig. 14. *Serolis septemcarinata*, MIERS. a. Peduncle and proximal joints of the flagellum of the antennula, male, 17 ×. b. Inner part of the left mandible, seen from above, 80 ×. c. Inner part of the right mandible, seen from above, 80 ×.

maxilliped delimited from the basipodite by a distinct suture. Palp of maxilliped consisting of three joints, of which the second is approximately cordate. Basipodites of first three pairs of pleopods with their inner proximal angles projecting and furnished with setae. Endopodite of fourth pair of pleopods entire, (not bifid).

Supplementary Desciption.

Head and pereion. Anterio-lateral parts of the head dorsally marked off by a ridge. There is a faint transverse anterior ridge on the first pereion segment. Ventral surface of the first pereion segment divided by longitudinal sutures and sculptured in the middle similarly as in *S. paradoxa*. Ventral surface of the last three thoracic segments have the appearance normally found in the subgenus (cf. PFEFFER, 1887, Pl. II, Fig. 7)[1].

[1] PFEFFER's explanation of the figures of his Pl. II (PFEFFER, 1887 p. 145) is incorrect as regards figures 1—7).

Antennulae (Fig. 14 a). See BEDDARD (1884, p. 48); PFEFFER (1887, p. 66, Pl. III, Fig. 2). Peduncle consisting of four joints, the first, second and third being of about equal length. The short fourth joint is one-fourth to one-third as long as the third. BEDDARD (1884) states that the second peduncular joint is about twice as long as the first.

Antennae[1]. The central joints of the flagellum, ventrally, with a row of approximately twelve triangular and pointed processes along the anterior margin. In a female specimen with not yet fully developed marsupium and with ten joints in the flagellum, the prolonged scales occur on the second to the seventh joints, no traces of them being observed on the eighth joint. In an adult male with ten joints in the flagellum, they were found even on the first joint already, but were not developed on the seventh.

Mandibles (Fig. 14 b and c)[2]. Third joint of the palp with typical pectinate scales near its lower margin. For the setae on the second and third joint of the palp see p. 36.

Maxillipeds[3]. The composite setae on the distal margin of the basipodite as in *S. paradoxa.*

First pair of pereiopods.[4] For the composite setae on the lower margin of the propodus see Fig. 5 h. Carpal joint distally with two composite and a few simple setae, (see Fig. 6 a), its distal margin (see Fig. 1 d) usually with a row of projecting rounded scales.

Second pair of pereiopods[5]. In the adult male there are two incomplete rows of setae on the lower margin of the propodus, setae being developed only at the proximal and distal parts of the joint. For the setae from the proximal portion of the lower margin see Fig. 7 g. The proximal and distal setae differ slightly in shape, the distal ones being somewhat more slender.

The other periopods.[6] Lower surface of merus, carpus and propodus in the adult male with a dense felt-like nap, extending also somewhat over to the caudal surface. The nap consists of hair-like points, devoid of a setal canal.

First three pairs of pleopods.[7] As observed by PFEFFER (1887), the peduncle consists of two joints, the proximal joint being, however, very short.

Fourth and fifth pairs of pleopods.[8] Expodites with a distinct transverse suture.

Localities and Material.

St. 34. South Georgia, off the mouth of Cumberland Bay, lat. 54° 11′ S., long. 36° 18′ W. 125 m. Bottom temp. +1.45°. Gray clay with a few stones. $^{5}/_{8}$ 1902. 8 specimens. Length of the largest specimen 11 mm.

St. 34 b. Atlantic Ocean, North of Falkland Islands and East of Patagonia, lat. 44° 49′ S., long. 57° 34′ W. 700—500 m. $^{27}/_{12}$ 1901. 14 specimens, males and females. Length of largest specimen about 15 mm (male). males and females, most of them immature. Length of largest specimen about 12.2 mm (female with marsupium).

South Georgia, Grytviken. From old kelp on the shore. 22 and 23 May 1902. More than 45 specimens,

Material collected by E. SÖRLING, 1905. South Georgia, Grytviken, Cumberland Bay. $^{15}/_{1}$ 1905. 3 adult specimens, male and 2 females. The largest specimen is the male, which measures 14.5 mm. in length.

---

[1] PFEFFER, 1887, Pl. III Fig. 1.
[2] See also PFEFFER, 1887, Pl. III, Figs. 5, 6 and 12.
[3] BEDDARD, 1884, p. 40; PFEFFER, 1887, p. 69—70, Pl. III, Figs. 9, 10 and 11.
[4] PFEFFER, 1887, p. 70—71, Pl. III, Figs. 13—17.
[5] BEDDARD, 1884, p. 49, Pl. VIII, Figs. 3 and 4; PFEFFER 1887, p. 71, Pl. III, Fig. 18; COLLINGE, 1918, Pl. III, Fig. 8.
[6] BEDDARD, 1884, Pl. VIII, Fig. 5, PFEFFER, 1887, p. 71—72, Pl. III, Figs. 19—21.
[7] BEDDARD, 1884 p. 49, PFEFFER 1887, p. 72, Pl. III, Figs. 22—24.
[8] PFEFFER, 1887, p. 72, Pl. III, Figs. 25 and 26.

Distribution. South Atlantic Ocean E. of Patagonia N. of Falkland Islands (Sw. Ant. Exped.). South Georgia (PFEFFER 1887, TATTERSALL 1921), Prince Edward's Island (BEDDARD 1884), Crozet Islands (MIERS 1875), Kerguelen (STUDER 1879, 1884, COLLINGE 1918).

The species has not previously been recorded from a locality situated as far north as st. 34 b (Sw. Ant. Exped.).

Serolis (*Serolis*) **polita** PFEFFER, 1887.

Text Fig. 1 e, 2 c, 3 a, 5 f and g, 6 b, 8 c, 15 a—g.

S. polita. PFEFFER, 1887, p. 81—85, Pl. II, Figs. 4 and 5, Pl. IV, Figs. 4 and 5; RICHARDSON, 1906, p. 7; 1908, p. 5; 1911, p. 396; TATTERSALL, 1921, p. 231—232, Pl. VII, Fig. 6; MONOD, 1931, p. 26—27.

Diagnosis. Anterio-lateral angles of the head prolonged, so that the width of the head is greatest anteriorly. Coxal plates marked off by dorsal sutures on the second to fourth pereion segments. Posterio-lateral angles of the epimera of the pereion segments and those of the second and third abdominal segments all reach further back than those of the preceding segments. Tip of pleotelson sinuate. First pair of maxillae with the inner lobe slightly expanded distally. Second pair of maxillae with the lappets of outer lobe each furnished with two apical setae. Maxilliped with distal epipodite marked off from the basipodite by a distinct suture; palp generally consists of three joints, but sometimes with a vestigial fourth joint; second joint of the palp cordiform. Basipodites of first three pairs of pleopods with their inner proximal angles projecting furnished with setae. Endopodite of fourth pleopod entire (not bifid).

Supplementary Description.

Head, pereion, and abdomen. Anterio-lateral parts of the head demarcated by a ridge. Epimera of first pereion segment with a submarginal ridge at a short distance from their anterior margins. Ventral surface of the first pereion segment on each side with a longitudinal suture passing through the articular sockets for the first pereiopods. Ventral surface of the fifth to seventh pereion segments approximately as in *S. paradoxa.*

The adult male has a sub-circular shape of body, the female has a more oval form. In the adult male the longitudinal ridge in the middle of the sterna of the first to third abdominal segments is missing; the projection in the middle of the posterior margin of the sternum of the first abdominal segment is of smaller size and shorter than the lateral projections.

Antennulae (Fig. 15 a). Peduncle consisting of four joints; the last joint, which is not figured or mentioned by PFEFFER (1887), is one-third the length of the second.

Antennae. The antennal processes on the ventral side of the central joints of the flagellum are somewhat hook-like and resemble those in *S. paradoxa.* They fringe both the distal and rostral margins of the joints. They are longest at the rostro-distal angle.

Mandibles (Figs. 15 b, c and d). Rostral margin of the mandible corpus with a small rounded projection adjacent to the proximal part of the second joint of the palp. (Fig. 15 b). Left mandible (Fig. 15 c) with the posterior masticatory process cleft distally. Right mandible (Fig. 15 d) with the rostral masticatory process expanded. The setae on the second and third joints of the palp have oval and not very prominent end-knobs.

First pair of maxillae (Fig. 15 e). Inner lobe slightly expanded distally. The apical setae on the lobes generally branchless; only one seta, situated at the posterio-distal angle of the outer lobe, is furnished with two rows of short and slender sub-branches.

Second pair of maxillae (Fig. 15 f). Lappets of outer lobe each with two apical setae.

Maxillipeds (Fig. 15 g). Basipodite and distal epipodite marked off from each other by a distinct suture. Palp usually consisting of three joints, but sometimes with an indi-

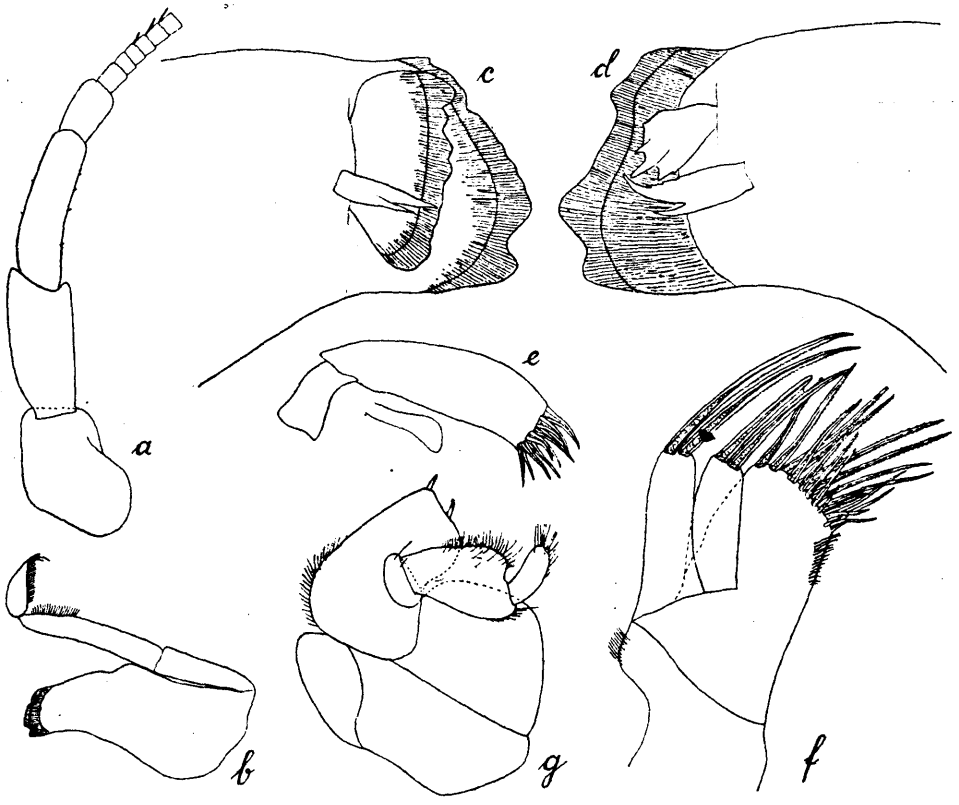

Fig. 15. *Serolis polita* PFEFF. a. Peduncle and proximal part of the flagellum of left antennula, male 13 ×. b. Left mandible, seen from below, 13 ×. c. Inner part of the left mandible, from above, 60 ×. d. Inner part of the right mandible, from above, 60 ×. e. Right first maxilla, female 23 ×. f. Second maxilla, male 60 ×. g. Left maxilliped, 23 ×.

cation of a fourth joint, appearing as a small prolongation, carrying some setae; this prolongation is indistinctly demarcated from the third joint. Composite setae on the basipodite (see Fig. 8 c) usually two; but in one specimen there was also a third seta.

First pair of pereiopods. Distal margin of the carpus with two composite subcylindrical setae (see Fig. 6 b) and about seven simple narrow bristles, provided with two rows of short hair-like sub-branches. For the composite setae on the lower margin of the propodus, see Figs. 5 f and g. On the caudal side of the propodus there is a sub-marginal row of prolonged scales close to the lower margin of the joint (see Fig. 1 e).

On both the rostral and caudal side of the propodus there is also a submarginal row of simple setae (see Fig. 1 e, which shows the caudal row of these setae).

Second pair of pereiopods[1]. In the adult male with two rows of composite setae on the lower margin of propodus, similar to those in *S. schythei*, but without transverse grooves on their caudal surfaces; the submarginal scales close to the lower margin of propodus are somewhat triangularly produced.

Pleopods. Coxopodite of the first three pairs very short and for about half of its length fused with the sternum. On the fourth and fifth pleopods the exopodite has an oblique transverse suture, on the fifth pair the exopodite is divided by a faint suture, which is distinct only near the margins.

Uropods. Inner margin of the protopodite with hair-like setae, its lateral margin with four large plumose setae. Exopodite with distal margin and distal half of the lateral margin obtusely denticulated, distally with plumose setae; inner margin without denticulation, but with hair-like setae. The endopodite has the distal margin and the distal part of the lateral margin serrate and furnished with plumose setae, its inner margin smooth and furnished with hair-like setae.

Localities and Material.

St. 34 b. Lat. 44° 49′ S., long. 57° 34′ W. Atlantic Ocean, North of Falkland Islands and East of Patagonia. 700—500 m. $^{27}/_{12}$ 1901. 8 specimens, males and females. Length of largest specimens 17.5 mm. (ovigerous female), 16 mm. (male).

South Georgia, Grytviken. 15—25 m. $^{14}/_{6}$ 1902. At the rocky islet outside the Bay. Stony bottom with algae. One female specimen with semi-developed marsupial plates, length about 15.5 mm.

Material collected by E. SÖRLING. South Georgia, Grytviken, Cumberland Bay. $^{15}/_{1}$ 1905. 5 specimens (3 adult males and 2 females). Colour brownish with a shade of blue. The largest specimen is a male 16 mm. in length, with the dorsal surface overgrown with algae.

Distribution. South Atlantic Ocean E. of Patagonia N. of Falkland Islands (Sw. Ant. Exped.), South Georgia (PFEFFER 1887, TATTERSALL 1921, MONOD 1931), South Sandwich Islands (RICHARDSON 1911), Graham Region (RICHARDSON 1906 and 1908).

The most northerly locality where the species is known is the st. 34 b, Sw. Ant. Exped.

Serolis (*Serolis*) **glacialis** TATTERSALL var. **austrogeorgiensis** n. var.

Pl. I, Fig. 1; Text fig. 16.

Diagnosis. Anterio-lateral angles of the head only slightly prolonged in lateral direction; the width of the head at the front margin about equal to the width across the middle of the eyes. Coxal plates demarcated by dorsal sutures on the second to fourth pereion segments. Each posterior angle of the coxal plates of the pereion segments extends further back than that of the preceding segment. The posterior angles of the pleural plates of the second and third abdominal segments reach further back than the posterior angles of the coxal plates of the sixth segment of the pereion; pleural plates of the second and third abdominal segments extend about equally far back. First pair of maxillae with the inner lobe narrowly rounded (not expanded) distally. Left second maxilla with the outer lobe uncleft and furnished with five apical setae (one of the setae small); right second maxilla with the two lappets of the outer lobe each provided with two apical setae. Distal

[1] TATTERSALL 1921, Pl. VII, Fig. 6.

epipodite of the maxilliped marked off from the basipodite by a distinct suture. Palp of maxilliped consists of three joints, of which the second is approximately cordiform. Basipodite of first three pairs of pleopods with a medial extension furnished with setae. Endopodite of the fourth pair of pleopods entire (not bifid).

Description.

Type. Female with marsupial plates semi-developed; length 10.3 mm.

Shape of body. Pear-shape as in *S. glacialis.* There is a longitudinal convex elevation along the middle line, running from the head to the tip of the pleotelson. From this middle keel the segments of the pereion and the free abdominal segments slope in a lateral direction. Lateral margins of the epimera of the pereion segments and the second abdominal segment continuous, so that only the posterior angles of the pleurae of the second and third abdominal segments project freely. Posterior margins of the terga of the pereion segments and the first three abdominal segments without a triangular tip in the middle line.

Colour and sculpturing. The colour is brownish-yellow with scattered dots of dark brown pigment. Almost the whole dorsal surface is covered with a more or less marked network of anastomosing ridges. Anterior part of the pereion epimera slightly semi-translucent.

Head. Anteriorly with an indication of a small triangular rostrum. The front margin of the head between the distal margins of the first joint of the antennulae has a transverse ridge, which, continuing laterally, traverses the anterio-lateral parts of the head. The head is sculptured as in the main species of *S. glacialis.* Behind the rostrum is a subtriangular elevation, the anterior margin of which is convex, and the posterior concave; this elevation forms the anterior tuberculae of the head, which coalesce with each other in front. The posterior part of the head is sculptured exactly as in the main species. Between the eyes are three tuberculae covered with a distinct network of anastomosing ridges, the two lateral tuberculae being almost circular in shape.

Pereion. The second, third, and fourth pereion segments of about equal length in the middle; fifth and sixth segments in the middle together about as long as the fourth. The posterior margin of the tergites without a triangular tip in the mid-line. First pereion segment dorsally with two somewhat curved transverse ridges, the anterior one being a continuation of the transverse ridge on the head. Neither of the transverse ridges extends to the lateral margin of the segment, as they vanish laterally in a network of anastomosing ridges. Between the ridges near the head the surface is smooth; behind the posterior ridge there is a deep cavity, likewise devoid of network. Epimera of second to sixth pereion segments with dorsal submarginal ridges along their anterior margins.

The second, third, and fourth pereion segments have the coxal plates marked off by dorsal sutures; the sutures of the third and fourth coxal plates issue anteriorly somewhat medially of those of the second and third segments respectively.

First, second, third, and fourth segments of the pereion have, as in the main species, a faint rounded elevation on either side medially from the coxal plates; the elevations are covered with anastomosing ridges. They are situated more medially from the coxal plates, as one passes from the first to the fourth segment.

The posterior margins of the first, second and third pereion segments, medially from the coxal plates, are slightly convex. The coxal plates of the second, third and fourth

segments are laterally 1.7 times as long as the length of the segments in the middle. Fifth and sixth pereion segment as in the main species.

Ventral surface of the first pereion segment with four longitudinal sutures, the two lateral ones passing through the sockets for the first pereiopods. In the middle it is sculptured in the usual way; posteriorly there is an elevated trapezoidal part with its narrow end pointing to the front; in the middle line anteriorly there is a longitudinal ridge, divided from the trapezoidal part by an incision.

Ventral surface of the second to seventh pereion segments with a longitudinal groove in the middle line. On the second, third, and fourth segment there is a faint longitudinal ventral ridge on each side of the mid-line, from these ridges transverse ridges extend to the coxal plates along the anterior and posterior margins of the segments. On the fifth segment the sternal sculpturing is much the same as on the fourth, but more indistinct. The sixth and seventh segments typical of the subgenus *Serolis*.

Abdomen. The pleurae of the second and third abdominal segments reach further back than the coxal plates of the sixth pereion segments and approximately to the proximal margins of the exopodites of the uropods. The sterna of the free abdominal segments each with a longitudinal carina along the middle line; their posterior margins, in the middle prolonged into large backward-directed points, which increase somewhat in length from the first to the third segment; the posterio-lateral angles of the sternal middle plates are also somewhat pointed and backward-directed.

The pleotelson, dorsally, with five longitudinal carinae, diverging from each other. The keel along the middle line is proximally broad and rounded; it narrows gradually backwards, being sharper from the middle to the distal end; distally it ends in an obtuse point. The middle carina has no trace of any basal point, but is covered with a network of anastomosing ridges. The keels laterally from the middle keel are faint. They are slightly curved, being somewhat concave at the inner side, and they reach proximally only about half the length of the pleotelson. These keels are separated by broad cavities from those most laterally situated. The two most laterally situated keels are moreover somewhat curved, with their inner margins concave. Each of them forms the inner limitation of a triangular elevation, which narrows caudally and is covered with anastomosing ridges. None of the carinae, except the middle one, has any indication of a terminal point.

Antennulae. The peduncle almost reaches the penultimate joint of the antennal peduncle. The flagellum is almost as long as the peduncle and consists of fifteen joints.

Antennae. Peduncle as in the main species; the last two peduncular joints subequal in length. The flagellum, which is about as long as the last peduncular joint, has twelve joints. Rostral margins of the second, third and fourth peduncular joints with groups of setae, one group on the second, and five on each of the third and fourth joints. Antennal processes triangular and pointed, situated along the caudal and distal margins of the central joints of the flagellum.

First pair of maxillae. Inner lobe narrowly rounded (not expanded) distally.

Second pair of maxillae. Outer lobe of left maxilla uncleft and furnished with five apical setae, the one at the posterio-distal angle being small. Outer lobe of right maxilla with two lappets, each furnished with two apical setae.

Mandibles[1]. Normal. Anterior masticatory process on the left mandible broad and strong and furnished with a cutting edge.

Maxillipeds. (Fig. 16.) Distal epipodite marked off from the basipodite by a distinct suture. Palp consists of three joints, second joint approximately cordiform, third joint long with an incision in the distal margin, thus dividing the tip of the joint into two lobes; the lateral lobe corresponds to a minute fourth joint. I was unable to find any suture between the coxopodite and the proximal epipodite.

Fig. 16. *Serolis glacialis* TATT. var. *austrogeorgienses* n. var. Maxilliped, 63 ×.

First pair of pereiopods. As in the main species.[2] Propodal joint with a characteristic point at its upper distal angle. Rows of composite setae on the lower margin of propodus much as in *S. septemcarinata* (cf. Fig. 5 h). Thus the setae in the rostral row are more slender than figured by TATTERSALL (1921)[3] and approximately as illustrated by MONOD (1926)[4]. The setae in the caudal row have the distal margin of the scale-part rounded, but they are not as broad anteriorly as figured by MONOD[4] (1926).

First three pairs of pleopods[5]. Inner angle of basipodite triangularly prolonged and furnished on the first pleopod with three, on the second and third pleopods with two, setae.

Fourth pair of pleopods. Exopodite with a transverse suture at a distance from the distal end of one-third the length of the exopodite. Endopodite entire (not bifid).

---

[1] Cf. MONOD (1926, Figs. 34 A and B).
[2] See TATTERSALL (1921, p. 229, Pl. VII, Fig. 2), MONOD (1926, Fig. 34 C).
[3] TATTERSALL (1921, Pl. VII, Fig. 3).
[4] MONOD (1926, Fig. 34 D).
[5] Cf. MONOD (1926, Fig. 34 F).

Uropods. Shorter than in the main species; the exopodite about half as long as the endopodite. Exopodite and endopodite oval with distal margins broadly rounded.

Remarks. The species *glacialis* has previously been recorded from the Antarctic and is known from an adult male specimen of the length of 17 mm (TATTERSALL, 1921) and a small male specimen 11 mm in length (MONOD, 1926).

The Swedish Antarctic Expedition collected (at South Georgia) only one specimen, a young female with small oostegits, and measuring 10.3 mm in length. It differs from *S. glacialis* as described by TATTERSALL (1921) and MONOD (1926) in the following features: —

1. The lateral margins of the epimera of the pereion segments and the second abdominal segments are continuous with each other, so that the posterior angles of the pereion epimera do not protrude freely[1].

In the main species of *glacialis* the posterior angles of all the pereion epimera protrude freely, except the first. In the figure by TATTERSALL (1921, Pl. VII Fig. 1) the posterior angles of the epimera of the fifth and sixth segments of the pereion appear to protrude freely. The epimera of the sixth pereion segment and those of the second abdominal segment are separated laterally by an interspace, a feature which, in the variety *austrogeorgiensis*, is only slightly indicated on one side.

2. The second, third and fourth segments of the pereion are subequal in length in the middle.

In the main species the second pereion segment is medially twice as long as the third and longer than the second.

3. The distinct proximal spine in the middle line on the pleotelson is missing in *austrogeorgiensis*. The lateral keels are not so marked as in the main species and do not terminate in spines.

4. The uropods are shorter, the exopodite does not reach so far back as in the main species; moreover both rami are broader than in the main species and have their distal margins broadly rounded.

Other differences from the main species are: —

5. That the coxal plates of the second pereion segment are longer as compared with the length of the segment measured along the middle line, the proportion being 1.7: 1 in var. *austrogeorgiensis* and 1: 1 in the main species.

6. That the pleurae of the third abdominal segment reach as far back as those of the second abdominal segment.

7. That the sutures of the coxal plates are not continuous with each other.

8. That the triangular tips in the middle on the posterior margins of the tergites of the segments are minute.

9. That the var. *austrogeorgiensis* is not distinctly semi-translucent.

10. The shape of the setae on the lower margin of propodus of the first pereiopod is more slender than as figured by TATTERSALL (1921, Pl. VII, Fig. 3) and approximately as in *S. septemcarinata* (cf. Fig. 5 h).

[1] On the right side, however, there is a small interspace between the posterior angle of the sixth pereion epimeron and that of the second abdominal somite.

As the female of *S. glacialis* has not been described, I am unable to determine whether these differences from *S. glacialis*, as described by TATTERSALL (1921) and MONOD (1926), are due merely to difference in sex.

At any rate the specimen from the Swedish Antarctic Expedition approaches very closely to *S. glacialis;* I therefore regard it as a variety of this species.

Localities and Material.

St. 23. South Georgia, off the mouth of Cumberland Bay, lat. 54° 23′ S., long. 36° 26′ W. 64—74 m. Bottom temp. + 1.65°. $^{16}/_{3}$ 1902. Female with semi-developed oostegits. Length 10.3 mm.

Distribution. South Georgia (Sw. Ant. Exped.)

Distribution of the main species: Off Oates Land (TATTERSALL 1921), East Antarctic, lat. 71° S., long. 87° W. (MONOD 1926).

Serolis (*Serolis*) **exigua** n. sp.

Pl. I Fig. 2; Text Figs. 4 a—c, 6 e, 17 a—i, 18 a—h.

Diagnosis. Head with anterio-lateral angles slightly prolonged in a lateral direction; greatest width of the head at the front margin. Coxal plates marked off by dorsal sutures on the second to fourth pereion segments. The posterio-lateral angles of the coxal plates of the pereion segments and pleural plates of the second and third abdominal segments all reaching beyond those of their preceding segments. Anterior masticatory process on the left mandible not expanded and without cutting edge. Inner lobe of first maxilla expanded distally. Outer lappets of outer lobe of the second maxilla each provided with two apical setae. Maxilliped with the distal epipodite fused with the basipodite in its entire length. Palp of maxilliped consisting of three joints, of which the second is approximately cordiform. Basipodites of the first three pairs of pleopods with their inner proximal angles projecting and furnished with setae. Endopodite of fourth pleopod entire (not bifid). Exopodite of the fifth pleopod with the lateral margin furnished with two long plumose setae.

Description.

Type. Female with young, about 7 mm. in length.

Shape of body and sculpturing (Pl. I Fig. 2, Text fig. 17 a). The head, except a submarginal part at its front margin, the tergites of the pereion segments and the free abdominal segments, except the greater part of their pleurae, are elevated as compared with the lateral parts of the body. A dorsal longitudinal carina along the mid-line passes from the centre of the head (= from a spot between the front margins of the eyes) along the body to the distal end of the pleotelson. Posterior margin of the tergites of the pereion segments and the free segments of abdomen all with a small backward-directed triangular tip in the middle line, (very indistinct on the first pereion segment).

Head (Pl. I Fig. 2, Text fig. 17 a). Slightly broader than it is long, posteriorly in the middle continuous with the first pereion segment without trace of any suture. The longitudinal keel in the middle line is faint, yet distinct in the posterior part of the head, as well as on the first pereion segment. The lateral parts of the posterior margin of the head are divided from the first pereion segment only by a slight groove, which develops anteriorly into a distinct suture. Front margin, in the middle, with a very small rostrum; laterally from the rostrum on either side it is somewhat concave;

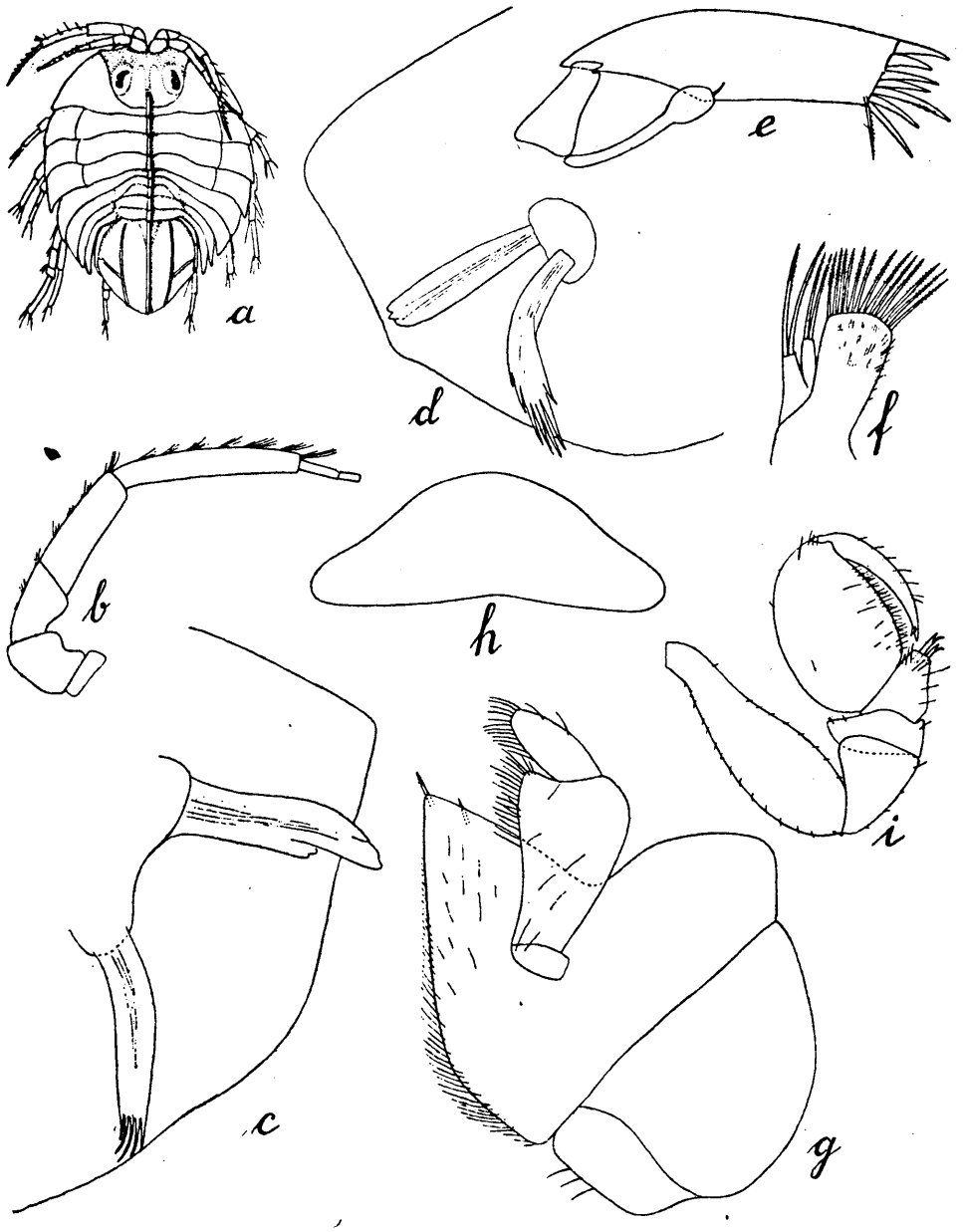

Fig. 17. *Serolis exigua*, n. sp., ♀. a. Female, from above, 5.3 ×. b. Peduncle and two proximal joints of the flagellum of the right antenna, 13 ×. c. Inner part of the left mandible, seen from above, 240 ×. d. Inner part of the right mandible, seen from above, 240 ×. e. Right first maxilla, 80 ×. f. Right second maxilla, 80 ×. g. Left maxilliped, 80 ×. h. Upper lip, 80 ×. i. First periopod, 80 ×.

between the first and second peduncular joints of the antennulae the front margin forms a small triangular point, which extends somewhat further in front than the rostrum. The anterio-lateral angles of the head are triangularly prolonged and slightly bent downwards. The eyes are small, reniform; the distance between the eye and the anterior margin of the head is about the length of one eye. Between the eyes and the longitudinal keel in the middle line there is, on either side, a short indistinct longitudinal ridge.

Pereion (Pl. I Fig. 2, Text fig. 17 a). The first pereion segment, ventrally, with a distinct longitudinal suture passing through the sockets for the first pereiopods. The ventral part of the segment is covered by the marsupium.

Second, third, and fourth segments, in the middle, of about equal length, the fifth and sixth in the middle each about half as long as the fourth. Posterior margin of the tergites of all the segments with a small backward-directed triangular tip in the mid-line (indistinct on the first segment).

Coxal plates demarcated by dorsal sutures on the second to fourth segment; the sutures are curved and not quite in a line with each other; on the second, third, and fourth segments there is a convexity of the posterior margins medially from the coxal plates; a similar convexity is also to be observed on the first segment. Lateral margins of the epimera of the first to fourth segments continuous with each other; only the extreme tips of the coxal plates of the fourth, fifth, and sixth segments protrude freely.

The ventral surface of the pereion segments is almost entirely covered by the marsupium.

Abdomen (Pl. I Fig. 2, Text fig. 17 a). On the first three segments the longitudinal keel along the mid-line is very distinct, whilst the triangular points in the middle of the posterior margins are small and indistinct.

From the median keel the dorsal surface slopes slightly; on the first segment to its lateral margins, on the second and third segments to their pleural plates. The lateral parts of the pleural plates of second and third segments have their posterior margins somewhat elevated compared with their anterior margins. The posterio-lateral angles of the pleural plates of the third abdominal segment extend further back than those of the second abdominal segment, reaching to about two-thirds the length of pleotelson.

The sternites of the first three abdominal segments are posteriorly protracted into one long point in the middle, and two short lateral points, one on each side; the sternites are sculptured, with a longitudinal ridge along the middle line.

Pleotelson, broadly cordiform. The longitudinal carina along the middle line is distinct. Anterior parts of the lateral margins each with a marginal ridge extending somewhat further back than the pleural plates of the second abdominal segment. Between these ridges and the longitudinal carina in the middle there is on either side yet another, longitudinal and somewhat curved, ridge, slightly concave on its inner side. These ridges and the marginal ridges are connected by a short ridge. The part of the pleotelson which is marked off distally by the latter ridge, medially by the ridge situated laterally from and nearest to the middle keel, and laterally and proximally delimited by the marginal ridge, is subtriangular and somewhat elevated.

Antennulae. The peduncle is longer than the flagellum and consists of four joints. Second peduncular joint slightly longer than the first. Third joint narrower and about

as long as the second plus half the first. Fourth joint short, about two-fifths as long as the third. The flagellum consists of 16 joints, each joint carrying a sensory filament.

Antennae. (Fig. 17 b). First joint of the peduncle short and visible only from below. Second and third joints of about equal length, forming an angle with each other. Second peduncular joint proximally with a faint incomplete suture on the ventral side, but without suture dorsally. Fourth peduncular joint half again to twice as long as the third; fifth joint slightly longer and narrower than the fourth. Ventral surface of the third, fourth, and fifth joints, near the rostral margin, exhibits groups of setae forming transverse rows. On the distal part of the third joint there are two such rows, each consisting of two groups, on the fourth three rows, each, as a rule, with three groups of setae, on the fifth joint there are five rows.

The flagellum is slightly longer than the last peduncular joint and consists of ten joints. There is a row of prolonged triangular scale-processes along the rostral margin of the ventral surface on the central joints of the flagellum.

Mandibles (Figs. 17 c and d). Left mandible (fig. 17 c) with the rostral masticatory process stronger than the weak, caudal one, which is prolonged distally into bristle-like processes. Right mandible with two weak masticatory »setae».

Setae on the second and third joints of the mandibular palp with oblong-ovate end-knobs.

First pair of maxillae (Fig. 17 e). Distal margin of outer lobe with eleven setae, situated in two rows. Distal end of inner lobe elliptically expanded.

Second pair of maxillae (Fig. 17 f). Inner lobe much broader and longer than both lappets of outer lobe; its distal margin with about fifteen setae, situated in two rows. Lappets of outer lobe each with two apical setae.

Maxillipeds (Fig. 17 g). Distal epipodite fused with the basipodite in its entire length. Composite setae on the distal margin of the basipodite approximately as in *S. paradoxa.*

Upper lip (Fig. 17 h). Normal.

First pair of pereiopods (Fig. 17 i). Basipodite longer than ischium, merus and carpus together. Ischium markedly widening towards its distal end, about as long as the meral and carpal joints together. The merus is short, almost trapezoidal and somewhat broader than the carpus.

For the two composite setae at the upper distal angle of the carpus see Fig. 6 e. Close to the upper distal angle of the carpus there is a group of simple setae on the caudal surface, and on the distal margin there are hair-like points devoid of a setal canal (see Fig. 6 e).

The propodal joint is somewhat shorter than the ischium, merus and carpus together. On the lower margin of propodus there is only one row of composite setae, each seta consisting of a triangular scale which, proximally, is fused with a simple seta (see Figs. 4 a, b, c). The usual caudal row of leaf-like setae is replaced by a row of projecting, anteriorly rounded scales (Fig. 4 c). Close to the lower margin of the propodus on the caudal side there is a submarginal row of simple setae. The caudal and rostral surfaces of the propodus exhibits scattered shorter setae of the same non-composite kind.

The other pereiopods (Figs. 18 a, b). Carpal and propodal joints increasing in length from the second to the seventh pereiopod. Together they are shorter on the third pereiopod than the basipodite, but on the seventh longer than that joint. Upper margin of the

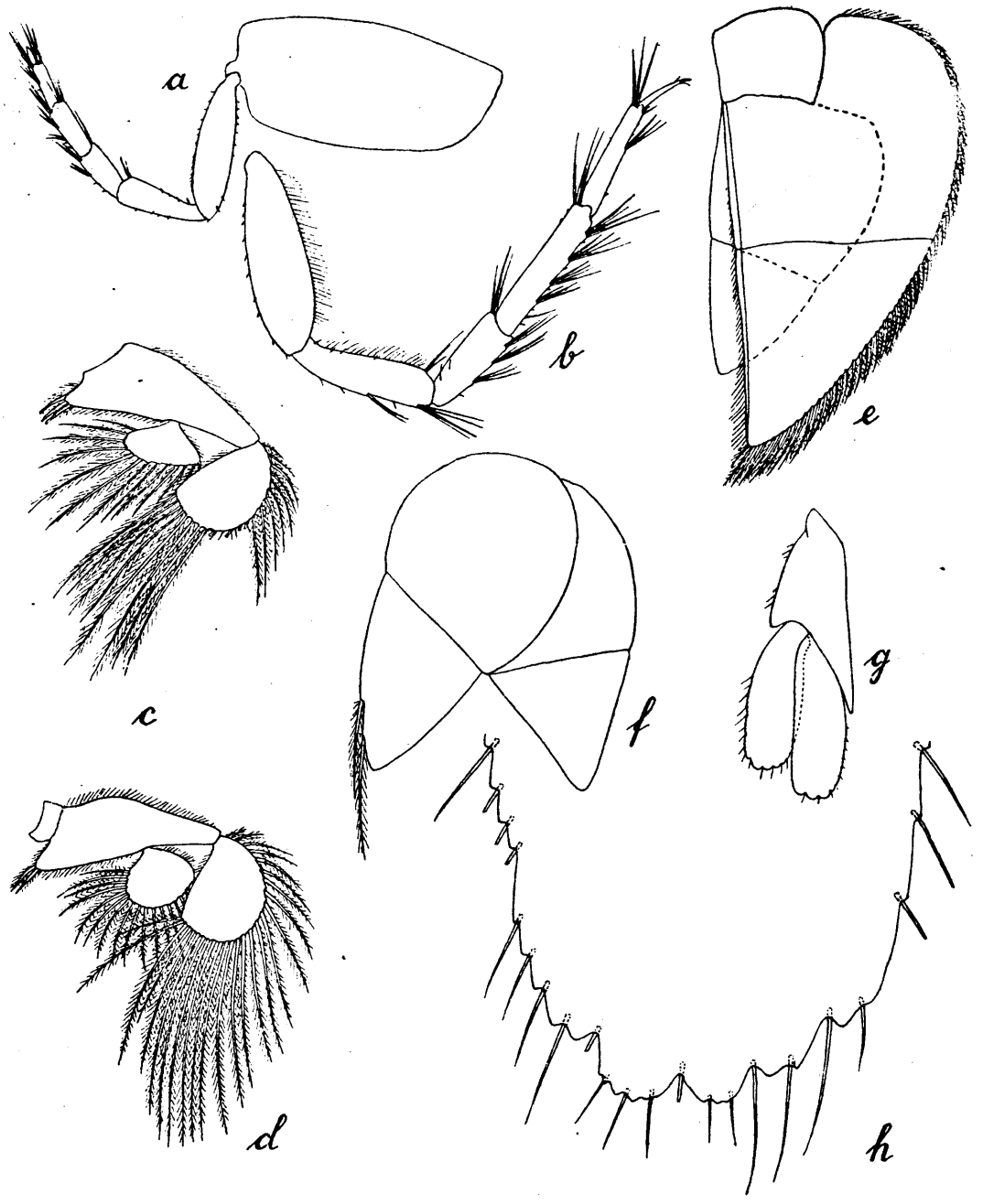

Fig. 18. *Serolis exigua* n. sp. ♀. a. Third pereiopod, 17.5 ×. b. Seventh pereiopod, 30 ×. c. Left first pleopod, 30 ×. d. Left third pleopod, 30 ×. e. Right fourth pleopod, 30 ×. f. Right fifth pleopod, 30 ×. g. Left uropod, 30 ×. h. Tip of the exopodite of the uropod, 240 ×.

basipodite on the second to fourth pereiopods has delicate »hairs» lacking a setal canal; on the fifth to seventh pereiopods such »hairs» occur also on the upper margin of the ischium. The »hairiness» of the limbs increases from the second to seventh, where the hairs cover almost the whole upper margin of the basipodite and the ischium.

First three pairs of pleopods (Figs. 18 c, d). Inner angle of the basipodite of the first pair exhibits three (two in one specimen) setae; on the second and third pairs two setae. Endopodite on the first and second pairs oval in outline, on the third almost circular.

Fourth pair of pleopods (Fig. 18 e). Exopodite and endopodite triangular, the endopodite somewhat smaller than the exopodite; both are divided by an almost transverse suture, somewhat distally from the middle. Lateral margin of the exopodite provided with plumose setae, its proximal margin and distal part of its inner margin furnished with hair-like setae. Margins of endopodite smooth.

Fifth pair of pleopods (Fig. 18 f). Exopodite divided by a transverse suture somewhat distally from the middle; its lateral margin close to the distal end furnished with two long plumose setae. Endopodite likewise divided by a transverse suture; about one-third of the joint is situated posteriorly from the suture.

Uropods (Figs. 18 g and h). Exopodite and endopodite subequal in length, but the exopodite does not extend quite as far back as the endopodite. Both the rami are broadly oval in outline and have their distal margins broadly rounded. Outer and inner margins serrate, distal margins (Fig. 18 h) serrate and in addition provided with some large incisions.

Remarks. In its general shape the new species most resembles *S. glacialis, septemcarinata* and *polita,* but is easily distinguishable, especially by the different sculpturing of the head and the pleotelson.

The single row of composite setae on the lower margin of the propodus of the first pereiopods and the two long plumose setae on the lateral margin of the exopodite of the fifth pleopod are features peculiar to the species, which have not been found in any other member of the genus.

Localities and Material.

St. 39. Falkland Islands, Port William, lat. 51° 40′ S., long. 57° 41′ W. 40 m. Sand and small stones with algae. $^{4}/_{7}$ 1902. 2 females possessing marsupia. Length of the specimens 6.8 and 6.5 mm.

St. 49. Falkland Islands, Berkeley Sound, lat. 51° 35′ S., long. 57° 56′ W. 25—30 m. Shells and stones. $^{10}/_{8}$ 1902. Mature female with its marsupium filled with young. Length about 7 mm (type specimen).

Distribution: Falkland Islands (Sw. Ant. Exped.).

Subgenus *Serolis*, Group IV[1].

Serolis (*Serolis*) **gaudichaudi** AUDOUIN et MILNE EDWARDS, 1840.

Text. figs. 3 e—g.

S. gaudichaudii. AUDOUIN and MILNE EDWARDS, in MILNE EDWARDS, 1840, p. 232; AUDOUIN and MILNE EDWARDS, 1841, p. 22—25, Pl. 1 Figs. 1—16, Pl. 2 Figs. 1—7; NICOLET, 1849, p. 282; CUNNINGHAM, 1871, p. 498; GRUBE, 1875, p. 231—232, Pl. V Figs. 4 and 4 a, Pl. VI Figs. 4 and 4 a.

Diagnosis: Anterio-lateral angles of the head prolonged in a lateral direction, so that the head has its greatest width anteriorly. Coxal plates marked off by dorsal sutures on the second to fourth pereion segments. Posterio-lateral angles of the coxal plates of the second to sixth pereion segments each successively reaching further back than those of the preceding segments. Posterio-lateral angles of the pleurae of the second and third abdominal segments extending to the lateral margins of the pleotelson. The pleotelson shows three faint longitudinal diverging ridges, of which the median one is interrupted in the middle; tip of pleotelson truncate. Inner lobe of the first maxillae narrowly rounded (not expanded) distally. Outer lappet of outer lobe of second maxillae with seven, inner lappet of the same lobe with eight apical setae. Distal epipodite of the maxilliped marked off from the basipodite by a suture; the palp consists of three joints, the last one small. Basipodite of the first three pairs of pleopods with its inner proximal angle prolonged and furnished with setae. Endopodite of the fourth pair of pleopods entire (not bifid). Setae on the lower margin of the propodus of the first pereiopod different in females and adult males.

Supplementary Description.

Pereion. The coxal plates are marked off by dorsal sutures on three segments only; on the fifth pereion segment there is no trace of any suture. The figures by AUDOUIN and MILNE EDWARDS (1841)[2] are in this respect inaccurate. Ventral surface of first pereion segment with four longitudinal sutures, exhibiting the arrangement usual, the lateral ones passing through the articular sockets for the first pereiopods; the left lateral suture has been figured by AUDOUIN and MILNE EDWARDS (1841)[3].

Mandibles.[4] Normal. Left mandible with the rostral masticatory process much expanded and provided with a cutting edge, right mandible with two masticatory »setae», of which the rostral one has a narrow base, but is much expanded distally and furnished with digitiform processes.

The modified setae on the second and third joints of the palp have two rows of triangular sub-branches, which proximally are more or less fused with each other. Their endknobs are oblong, lancet-like, distally pointed.

First pair of maxillae[5]. Inner lobe not expanded distally and with a narrowly rounded end.

Second pair of maxillae[6]. Outer lappet of outer lobe with seven apical setae, inner lappet of the same lobe with eight.

[1] For diagnosis see p. 51.
[2] AUDOUIN and MILNE EDWARDS, 1841 Pl. 1, Figs. 1 and 2.
[3] AUDOUIN and MILNE EDWARDS, 1841, Pl. 2, Fig. 1.
[4] AUDOUIN and MILNE EDWARDS, 1841, Pl. 1, Fig. 7.
[5] AUDOUIN and MILNE EDWARDS, 1841, Pl. 1, Fig. 10.
[6] AUDOUIN and MILNE EDWARDS, 1841, Pl. 1, Fig. 11.

Maxillipeds[1]. Distal epipodite marked off from the basipodite by a suture. Third joint of the palp very small, but longer than in the allied species *S. convexa*.

First pair of pereiopods.[2] The setae on the lower margin of the propodus in the female, as in *S. convexa*. For those on the propodus and the carpus in the adult male see Figs. 3 e, f, and g.

Second pair of pleopods. See AUDOUIN and MILNE EDWARDS (1841, Pl. I, Figs. 14, 14', 14'', 14''', 14'''') and GRUBE (1875, Taf. V, Figs. 4, 4 a).

Uropods. See AUDOUIN and MILNE EDWARDS, 1841, Pl. 2 fig. 7.

Localities and Material.

Eugenie Expedition. Chile, Valparaiso. 7 fms. and at the surface. Sand. $^{26}/_{5}$ 1852. Males, females and immature. Length of largest specimen 27.5 mm (adult ♂).

Distribution. West Chile (AUDOUIN and MILNE EDWARDS 1841), Chile (NICOLET 1849, CUNNINGHAM 1871).

Serolis (*Serolis*) convexa CUNNINGHAM, 1871.

Text. figs. 4 d—i, 6 d, 10 d, 19 a—e.

(?) *Serolis plana*. DANA, 1852, p. 794—795, Pl. 53, Figs. 1 a—1 c.
Serolis laevis. RICHARDSON, 1911, p. 399—400, Fig. 2.
Serolis convexa. CUNNINGHAM, 1871, p. 498—499, Pl. 59, Fig. 3; STUDER, 1884, p. 9—10, Pl. 1, Figs. 1 a—d; BEDDARD, 1884, p. 37—40, Pl. VI, Figs. 9—15.

Diagnosis. Width of the head at the front margin only slightly greater than across the eyes. Coxal plates marked off by dorsal sutures on the second to fourth pereion segments. Posterior angles of the coxal plates of the third to seventh pereion segments all extending successively further back than those of the preceding segments, the pleurae of second and third abdominal segments extend about as far back as to one-third the length of the pleotelson. Pleotelson, dorsally, with three faint longitudinal ridges, of which the median one is incomplete and interrupted in the middle; the lateral ridges each ending in a terminal point. First pair of maxillae with the inner lobe scarcely expanded distally. Outer lappets of outer lobe of the second maxillae each with six apical setae, inner lobe with nine apical setae. Distal epipodite of the maxilliped marked off from the basipodite by a suture. Palp of maxilliped consists of three joints, of which the last is small and short; second joint of the palp broadest across the middle, its proximal and distal margins subequal in length. Basipodites of the first three pairs of pleopods with their inner proximal angles projecting and furnished with setae. Endopodite of third pleopod entire (not bifid). Setae on the lower margin of the propodus of the first pereiopods different in females and adult males. Endopodites of the uropods, distally, with a small rounded non-setiferous tip.

Supplementary Description.

Head. With a well developed rostrum[3]. There is a very faint ridge along the anterior margin on either side of the rostrum. Anterio-lateral parts of the head triangularly pro-

[1] AUDOUIN and MILNE EDWARDS, 1841, Pl. 1, Figs. 12, 12'.
[2] AUDOIN and MILNE EDWARDS, 1841, Pl. 1, Figs. 13, 13,' 13,'' 13'''; GRUBE, 1875, Pl. VI, Figs. 4, 4 a.
[3] See RICHARDSON, 1911, Fig. 2.

longed and slightly bent downwards, but posteriorly not delimited by a transverse ridge. Eyes reniform, comparatively small, but situated on two marked sub-conical tubercles.

Pereion. First pereion segment without transverse ridges. Second and third pereion segments with the posterior margin dorsally prolonged in the middle into a small triangular tip directed backwards; a slight indication of such a prolongation is also visible on the fourth segment[1]. Lateral margins of the coxal plates of the pereion segments continuous, except those of the fourth and the fifth; the posterior angles of the coxal plates of the fourth segment protrude freely.[2] Measured along the middle line, the second and third pereion segments are of about equal length, the fourth somewhat shorter, the fifth not more than half the length of the fourth, and the sixth segment shorter still. The dorsal sutures of the coxal plates on segments 2, 3 and 4, are not continuous, those of the third segment issuing at the anterior margin of the segment somewhat medially to those of the second, those of the fourth somewhat medially to those of the third, as figured by DANA (1852).[3]

Ventral surface of the first pereion segment divided into five areas by four longitudinal sutures, of which the most lateral ones pass through the articular sockets of the first pereiopods. The caudal part of the middle area has a semi-circular elevation, the anterior margin of the elevated part being convex and extending in the middle at its most anterior point to about one-third the length of the segment. This posterior elevation is separated by a faint furrow from an anterior, wedge-shaped, elevated part, which decreases in width anteriorly and extends in an anterior direction almost to the head.

Ventral surface of the second to fourth pereion segments smooth and without sculpturing. In the middle line they are traversed by a longitudinal groove, which also passes along the middle of the remaining posterior segments of the pereion. Ventral surface of fifth to seventh pereion segments (Fig. 10 d) almost as in *S. paradoxa*, but the suture between the last two segments is more indistinct.

Abdomen. First three abdominal segments about equal in length in the middle, and of the shape figured by RICHARDSON (1911, Fig. 2). Posterior pleural angles of the third abdominal segment extending slightly further back than the pleurae of second abdominal segment. Dorsally, in the middle, the posterior margins of the first three segments have a small triangular tip, directed backwards. The shield-like middle areas of the sterna of the free abdominal segments have their posterior margins in the middle prolonged into a triangular tip directed backwards; their posterio-lateral angles are slightly produced, but rounded.

Shape of pleotelson approximately as figured by RICHARDSON (1911, Fig. 2), but its anterio-lateral angles are somewhat more rounded than shown in the figure and in that respect agree with the figure by STUDER (1884, Pl. I, Fig. 1 a). Its dorsal side is sculptured in three longitudinal ridges, one along the middle line, which is incomplete and interrupted in the middle, and two lateral ridges, the latter each ending in a small and obtuse distal point. The distal end of the pleotelson is thus elevated by a longitudinal ridge running along the middle of the truncate tip. The ventral surface to the tip of the pleotelson is concave.

[1] See CUNNINGHAM, 1871, Pl. 59, Fig. III; STUDER, 1884, Pl. 1, Fig. 1 a; DANA 1852, Pl. 53, Fig. 1 a; the triangular tip of the fourth segment is not illustrated in RICHARDSON's figure (1911, Fig. 2.)

[2] See RICHARDSON, 1911, Fig. 2.

[3] DANA, 1852, Pl. 53, Fig. 1 a.

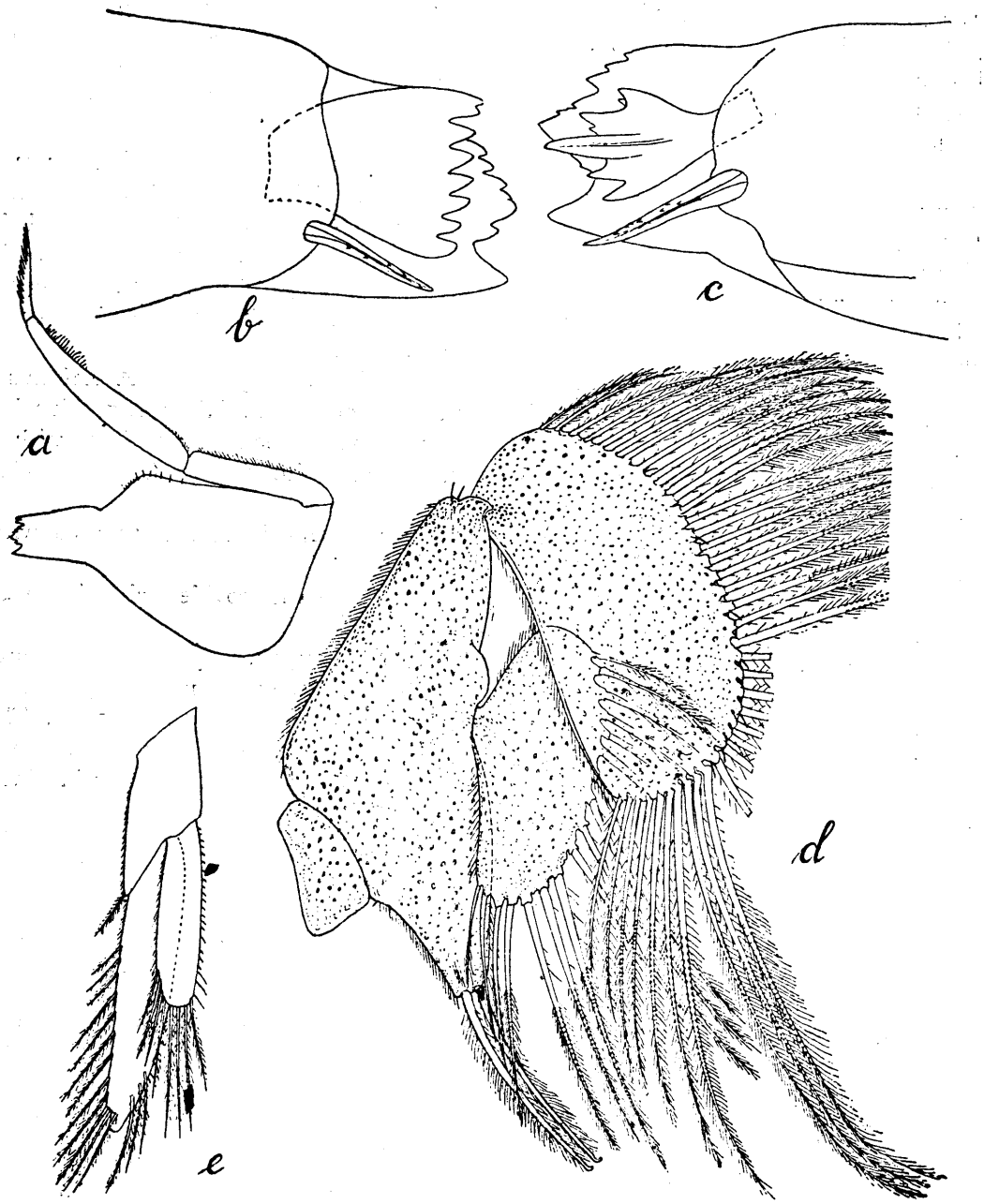

Fig. 19. *Serolis convexa*, CUNN., ♀. a. Left mandible, seen from below, 30 ×. b. Inner part of the left mandible, seen from above, 140 ×. c. Inner part of the right mandible, seen from above, 140 ×. d. Left second pleopod, 90 ×. e. Left uropod, 30 ×.

Antennulae. They extend slightly beyond the last peduncular joint of the antennae. The peduncle consists of four joints and reaches about to the distal margin of the fourth peduncular joint of the antennae. First and second joints of the peduncle subequal in length, third joint slightly longer than the second, fourth joint short, about one-third as long as the second. The flagellum consists of 15—17 joints (in the largest specimen 17 joints). On each joint there is a sensory filament.

Antennae. Extend slightly beyond the anterior margin of the third pereion segment. First peduncular joint very short, second and third joint subequal in length, each being two and a half times as long as the first; the fourth joint is about two and a half times as long as the third, and the fifth about as long as the fourth. Flagellum (in a specimen 17.8 mm. in length) consists of 17 joints. In two comparatively small specimens, 14 and 12.5 mm. in length, there are no projecting antennal scales on the joints of the flagellum, but in adult specimens[1] I could observe them.

Mandibles (Figs. 19 a, b and c). The cutting edge is markedly dentated[2]. Left mandible (Fig. 19 b) with the rostral masticatory process expanded. Right mandible with two masticatory »setae», of which the rostral one is hand-shaped and furnished with a number of finger-like processes. Setae on the second and third joints of the mandibular palp with oblong-oval, pointed end-knobs.

First pair of maxillae. Inner lobe very slightly expanded distally, furnished, with an apical seta.

Second pair of maxillae. Outer lappets of outer lobe each provided with six apical setae, inner lobe with nine apical setae.

Maxillipeds[3]. Distal epipodite marked off from the basipodite by a distinct suture. Palp consisting of three joints, of which the third is very small; second joint is broadest across the middle and has its proximal and distal margins about equal in length. The shape of the maxilliped is almost as in *S. gaudichaudi*, but the last joint of the palp is still shorter than in the latter species. The composite setae on the distal margin of the basipodite are similar to those in *S. paradoxa*.

First pair of pereiopods. The setae on the lower margin of the propodus differ in females and adult males (see Figs. 4 d—i). For the setae on the distal margin of the carpus see Fig. 6 d.

First three pairs of pleopods (Fig. 19 d). Basipodite of the first pleopod at its inner angle with three, of the second and third pleopods with two »plumose setae».

Uropods (Fig. 19 e). Inner margin of the basipodite microscopically serrate (not seen in the figure) and furnished with hair-like setae. Its inner distal angle is pointed; somewhat proximally of the tip there is a plumose seta. Endopodite almost twice as long as the exopodite and somewhat broader, distally and slightly laterally prolonged into a rounded tip; inner margin of the endopodite serrate; in each serration there is a plumose seta; distal margin, except on the tip, as well as the distal part of the outer margin, furnished with plumose setae. The exopodite has the distal margin serrate and furnished with a row of plumose setae, which are continued to the distal part of the in-

[1] The adult specimens examined were obtained by the German Gazelle Expedition and were determined by STUDER (1884) as *S. convexa*.

[2] This character is perhaps due to the immaturity of the specimen examined (cf. BEDDARD, 1884, p. 10).

[3] BEDDARD, 1884, Pl. VI, Fig. 15.

ner margin; the inner margin is furnished with dense hairs lacking a setal canal. On the dorsal side close to the lateral margin there is a sub-marginal row of hair-like setae.

Remarks. As the name *convexa* indicates, the species, according to CUNNINGHAM (1871), is distinguished by a more convex shape of body than is usually the case in the genus *Serolis*. On examining the type specimens of the species at the British Museum, I found, however, that those specimens, which consist of a female with fully developed marsupium and an immature male specimen, had the dorsal surface only slightly vaulted. The female specimen certainly had the dorsal surface of the body somewhat more vaulted than the male, but this is common also in females of other species possessing a marsupium.

S. laevis RICHARDSON (1911) must be a synonym for *S. convexa*. According to the figure by RICHARDSON (1911), the shape of its body agrees in detail with that which characterizes the type specimens of CUNNINGHAM and all the specimens which I have been able to study, inter alia two specimens from the German Gazelle Expedition determined by STUDER (1884) as *convexa*. As seen in the figure by RICHARDSON (1911, Fig. 2) the epimeral tips of the fourth pereion segment protrude freely. One of the specimens from the Gazelle Expedition formed an exception in this respect. This specimen, a female, probably the one figured by STUDER (1884), differed in having the lateral margins of all the coxal plates continuous.

According to RICHARDSON, »*S. laevis*» differs from *S. convexa* in three respects: —

1) »In the absence of the three well marked ridges» (on the pleotelson) »a median interrupted in the middle and two lateral, each terminating in a sharp point[1]». Elswhere, however, RICHARDSON states that *S. laevis* differs (from *S. gaudichaudi*) »in having the median and lateral ridges of the terminal abdominal segment almost obsolete as well as the lateral tooth on either side».

2) »In the longer lateral angles of the sixth thoracic segment[2].» In CUNNINGHAM's type specimens, however, the epimeral angles of the sixth segment reach further back than figured by CUNNINGHAM (1871), extending backwards quite as far as is shown in the figure by STUDER (1884).

3) »The shape of the last abdominal segment is also different, being less pear-shaped in the specimen from the Sandwich du Sud» (= *S. laevis*) »and truncate at the tip[3].»

This is likewise a fictive difference, since the typical shape of the pleotelson in *S. convexa* is exactly like that figured by RICHARDSON. Neither CUNNINGHAM nor STUDER has figured the pleotelson quite accurately. Its correct shape (RICHARDSON, 1911, Fig. 2) is intermediate between the one figured by CUNNINGHAM and the one shown in the figure by STUDER.

The tip of the pleotelson in *S. convexa* is, moreover, truncate when seen from above, as described by RICHARDSON (1911). The tip was figured by CUNNINGHAM as convex, by STUDER as concave.[4]

It is highly probable that *S. plana* DANA also is identical with *S. convexa*. BEDDARD

[1] RICHARDSON 1911, p. 399.
[2] RICHARDSON, 1911, p. 399.
[3] RICHARDSON, 1911, p. 400.
[4] This difference must, I think, be due to the fact that the tip of pleotelson is dorsally vaulted and furnished with a faint longitudinal ridge, but has its ventral surface concave. Thus, when seen obliquely from the front, the tip exhibits the appearance shown in the figure by CUNNINGHAM (1871), but seen obliquely from behind it appears to be concave, distally.

(1884) found it almost impossible to distinguish *S. plana* from *S. convexa* with the aid of the description and figures given by DANA (1852). On comparing what is known of *S. plana*, with our knowledge of *S. convexa*, the following differences will be revealed:

1 *S. plana:* eyes subconical; *S. convexa:* eyes reniform, but situated on subconical tubercles.

2. *S. plana:* lateral margins of the coxal plates continuous[1].

3. Behind each of the lateral ridges of pleotelson there is a tooth. In *S. convexa* the teeth are extensions of the ridges.

4. Antennae shorter in *S. plana* than in *S. convexa*, their distal ends, extending beyond the anterior margin of the second segment of the pereion, whilst in *S. convexa* they almost reach the posterior margin of the third segment.

None of the above enumerated distinctions have any great systematic importance. If therefore, on examination of the type specimen of *S. plana*, this vaguely defined species should turn out to be identical with *S. convexa*, the name of the latter species must be altered to *S. plana*.

Localities and Material.

St. 33. South Georgia, Grytviken, lat. 54° 22′ S., long. 36° 28′ W. 22 m. Clay and algae. $^{30}/_{3}$ 1902. 2 immature females, collected together with *S. paradoxa*. Length of largest specimen 14 mm; greatest width 11 mm; length of the pleotelson 4.7 mm. Length of the other specimen 12.5 mm.; width 10.2 mm.; length of the pleotelson 4.3 mm.

Swedish Magellanian Expedition. East Falkland, Sparrow Cove. Shell-gravel 11—13 m. Female with semi-developed oostegits; length 17.8 mm.; greatest width 14.8 mm.; length of the pleotelson 5.8 mm.

Distribution. Northern Tierra del Fuego (CUNNINGHAM 1871), Magellanian Region (STUDER 1884), Falkland Islands (BEDDARD 1884), South Georgia (Sw. Ant. Exped.), South Sandwich Islands (RICHARDSON 1911).

S. convexa is one of those species which are comparatively widely distributed. Having been found previously at the Falkland Islands and the South Sandwich Islands, its occurrence at South Georgia might have been expected.

Subgenus *Homoserolis.*[2]

Serolis (*Homoserolis*) **minuta** BEDDARD var. **eugeniae** n. var.

Pl. I Fig. 3; Text. fig. 11 b and 20.

Diagnosis. Anterio-lateral angles of the head only slightly prolonged in a lateral direction, so that the greatest width of the head is across the middle. Coxal plates marked off by dorsal sutures on the second, third and fourth pereion segments. Posterio-lateral angles of the epimera of the second to sixth pereion segments and of the second and third abdominal segments each reaching successively further back than those of the preceding ones. Pleotelson triangular with a longitudinal carina along the middle line;tip of pleotelson truncate. Inner lobe of first maxillae somewhat expanded distally, its distal margin straight. Outer lappets of outer lobe of second maxillae each with two apical setae. Maxilliped without suture between the distal epipodite, and the basipodite, but with

[1] Occurs exceptionally in *S. convexa* also (see p. 81).

[2] For diagnosis see p. 50.

a short distal incision between these plates; palp consisting of three joints, the second long and irregularly cordiform. Basipodites of the first three pairs of pleopods narrow proximally, with inner proximal angle not prolonged and without setae. Endopodite of fourth pair of pleopods entire (not bifid).

Description.

Type. Female with young; length 7.2 mm., greatest width 5 mm.

Colour. White-yellowish, semi-translucent.

Head. As in the main species.

Pereion. Third, fourth and fifth segments with a triangular tip in the middle of their posterior margins. Pereion segments with faint triangular elevations medially from the junction of the epimera with the terga.

The ventral surface of the first pereion segment is sculptured in the middle, in the usual manner and is traversed by four longitudinal sutures, the lateral ones passing through the articular sockets for the first pereiopods. The ventral surface of the other segments of the pereion is covered by the marsupium. In young removed from the marsupium, it can be seen that the median parts of the sternites of the fifth and sixth segments have coalesced with one other (Fig. 11 b); the suture between these segments is interrupted in the middle, being replaced by a faint groove. Compare Fig. 10 c (immature specimen taken out of the marsupium of *S. paradoxa*), where this suture is developed in its entire length.

The sterna of the free abdominal segments have their posterior margins produced into a triangular tooth in the middleline.

Antennulae and antennae. The flagellum of both the antennulae and the antennae consists of 10 joints. The usual row of prolonged scale-processes on the central joints of the antennal flagellum is missing.

Mandibles. Left mandible with the anterior masticatory process broad and expanded in the usual manner. Right mandible with weak masticatory processes. The modified setae on the second and third joints of the palp have, distally, two rows of hair-like sub-branches; their end-knobs are indistinct and broadly rounded distally.

First pair of maxillae. Inner lobe increasing in width towards the distal end, its distal margin straight and furnished with a short seta.

Second pair of maxillae. Outer lappets of outer lobe small and short, each with two apical setae.

Maxillipeds (Fig. 20). Distal epipodite coalesced with the basipodite, but there is a short distal incision between the two plates. The palp consists of three joints, the second joint being very long and widening towards the distal end.

First pair of pereiopods. Distal margin of the carpus with a row of distally rounded and freely projecting scales. Near the lower distal angle, somewhat on the caudal side, the distal margin is furnished with two sub-cylindrical composite setae, having their narrow setal part protruding freely at the distal end. The two large composite setae are surrounded by a group of slender non-composite ones.

Lower margin of the propodus with two rows of setae of the same form as those in the main species[1]. The long setae in the rostral row are characterized by having the two free

[1] See BEDDARD (1884, Pl. VII. Fig. 7).

distal lappets of their scale part subequal in length. The free distal end of the setal part is always longer than the lappets of the scale part, and thus much longer than figured by BEDDARD[1]. On the caudal side along the lower margin of the propodus there is a row of distally rounded, freely projecting scales, and also a submarginal row of non-composite setae.

Pleopods. The endopodite of the fourth pleopod is much shorter than the exopodite, which is traversed by a transverse suture.

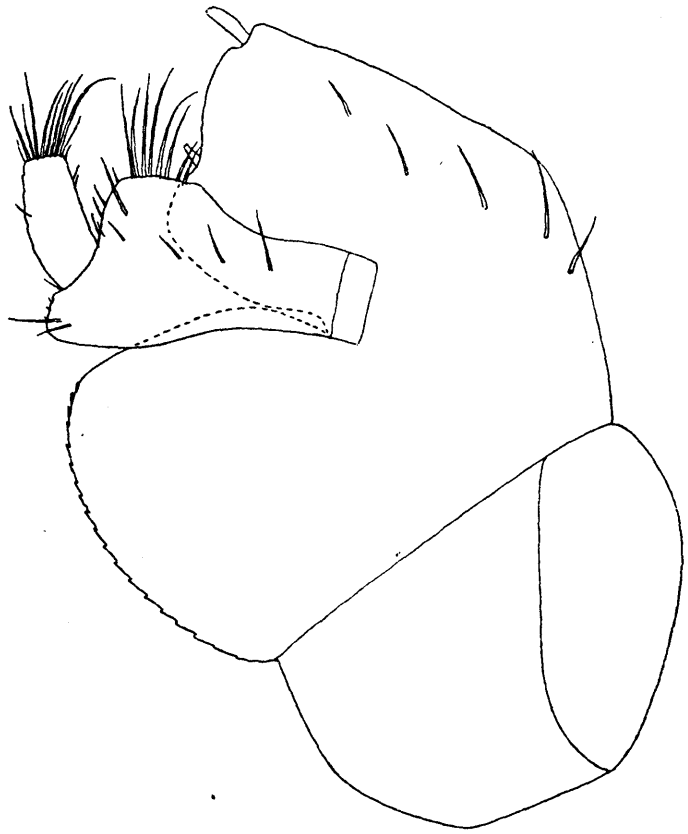

Fig. 20. *Serolis minuta* BEDD. var *eugeniae* n. var. Right maxilliped, adult female, 140 ×.

Uropods. Endopodite about twice as long as the exopodite and reaching almost to the tip of the pleotelson; its distal margin is narrowly rounded. Exopodite of a uniform width; its distal margin subtruncate and slightly serrate.

Remarks. CHILTON (1917) described as a new species the Australian form »*S. bakeri*», which is very similar to *S. minuta*, and points out that his new species may possibly be only a variety of the latter species. The above described specimen shows close resemblances to both *minuta* and *bakeri* but does not correspond exactly with either of them. I am therefore of the opinion that both *bakeri* CHILTON and the above described new form should for the present be regarded as varieties of *S. minuta*.

[1] See BEDDARD, 1884, Pl. VII, Fig. 7.

The var. *eugeniae* differs from the var. *bakeri* in the following features: —

1) in its more oblong shape of body,

2) in having a slight tuberculum on each side of the pleotelson laterally from the uropods,

3) in having the epimera of the sixth pereion segment and those of the second and third abdominal segments reaching not quite as far back as in var. *bakeri*,

4) in having faint triangular elevations medially from the junction of the terga with their coxal plates,

5) in having an angular tip dorsally in the middle on the posterior margins of the third, fourth and fifth pereion segments and of the first three abdominal segments,

6) in having the exopodite of the uropods half as long as the endopodite.

From *S. minuta* as described by BEDDARD (1884) the var. *eugeniae* differs: the following respects: —

1) in its more oblong shape of body,

2) in that the free triangular tips of the pereion segments laterally, from their epimera are lacking.

3) in having two lateral tuberculae on the pleotelson,

4) in having the triangular tip in the middle of the posterior margins of the perion segments missing on the first and second segments.

In its uropods it agrees with the main species in having the exopodite half as long as the endopodite, but the distal margin of the exopodite is a little serrate, as is also the case in the var. *bakeri*.

It seems probable that the characters by which the two varieties are distinguished may be subject to variations in the same species.

Localities and Material.

Eugenie Expedition. Port Jackson (off Sydney), the lighthouse. 12 fm. Female with young, length 7.2 mm.

Distribution: Australia (N. S. Wales).

Distribution of the main species: Australia (Port Philip, Jibbon, St Francis Island). See BEDDARD (1884) and WHITELEGGE (1901).

Distribution of the var. *bakeri:* Australia (Encounter Bay). See CHILTON (1917).

Serolis (*Homoserolis*) **pagenstecheri** PFEFFER, 1887.

Text. figs. 1 a, c and h, 5 e, 6 c, 7 c—f, 8 b, 10 e, 21 a—d.

Serolis pagenstecheri. PFEFFER, 1887, p. 73—81, Pl. II, Figs. 2 and 3, Pl. IV, Figs. 1—3; TATTERSALL, 1921, p. 231; MONOD, 1931, p. 26.

Diagnosis. Anterio-lateral angles of the head markedly elongated in a lateral direction; greatest width of the head across the front. Coxal plates marked off by dorsal sutures on the second, third and fourth pereion segments. Posterio-lateral angles of the coxal plates of the second to sixth pereion segments all reaching successively further back than those of the preceding segments. Posterio-lateral angles of the pleurae of the second and third abdominal segments not extending beyond those of the coxal plates of the sixth pereion segment. Pleotelson with five longitudinal dorsal elevations, its distal end sinuate. Inner lobe of first maxilla expanded distally. Outer lappets of outer

lobe of the second maxilla each provided with two apical setae. Maxilliped with distal epipodite marked off from the basipodite by a distinct suture; the palp consisting of four joints, the last of which is minute; second joint of the palp slightly cordiform. Inner proximal angles of the basipodite of the first three pairs of pleopods triangularly extended and furnished with setae. Endopodite of fourth pleopod entire (not bifid).

Supplementary Description.

Pereion. Ventral surface of the first pereion segment with four longitudinal sutures, the lateral ones passing through the articular sockets for the first pereiopods. The two

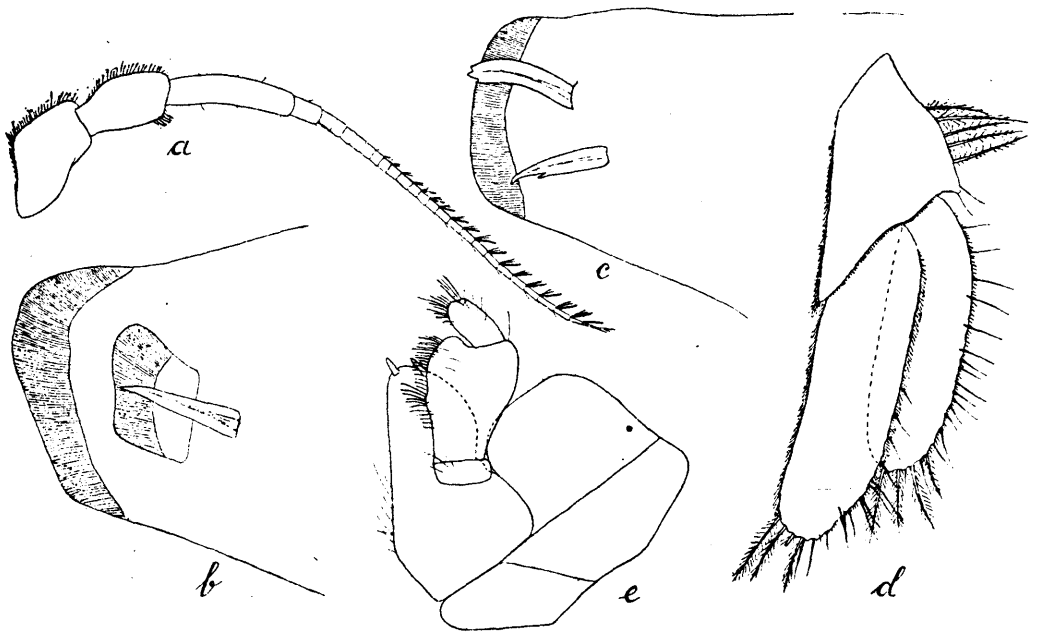

Fig. 21. *Serolis pagenstecheri* PFEFF. a. Left antennula, immature male specimen, 13 ×. b. Inner part of the left mandible, seen from above, 60 ×. c. Inner part of the right mandible, seen from above, 60 ×. d. Right uropod, in a male, 13 ×. e. Left maxilliped, of the var. *albida*, 23 ×.

other sutures are, as usual, situated one on either side of the middle line, thus marking off a middle plate of the sternite. As the longitudinal sutures are somewhat oblique, the middle plate assumes a trapezoidal shape, having the posterior margin slightly longer than the anterior. The middle plate is furnished with a crescent-shaped elevation at its posterior margin, separated by a broad furrow from an anterior rough tuberculum in the middle line. The ventral surface of the remaining segments[1] shows a furrow along the middle line.

Last three segments, as is characteristic of the subgenus, greatly coalesced with each other (see Fig. 10 e).

Antennulae (Fig. 21 a). The peduncle consists of four joints, there being a short last peduncular joint, not mentioned or figured by PFEFFER (1887).

The flagellum (in an adult male) consists of 26 joints (the proximal ones not distinctly demarcated from one another).

[1] PFEFFER, 1887, Pl. II, Fig. 3.

Antennae. Second to fifth peduncular joints provided with transverse rows of groups of setae on the rostral margin and the rostral part of the ventral surface. The distal part of the third joint has two such rows, the fourth and fifth joints six rows each.

Ventral surface of the central joints of the flagellum with a longitudinal row of prolonged spine- to bristle-like scales (see Fig. 1 h).

Mandibles (Figs. 21 b and c). Normal. The setae on the second and third joints of the palp taper towards the end and are furnished with two rows of triangular sub-branches; the setae have oblong, indistinct end-knobs.

Maxillae. Inner lobe of the first pair expanded distally. Outer lappets of outer lobe of second maxillae each provided with two apical setae. Distal margin of the inner lobe furnished with about ten setae.

Maxillipeds. For the composite setae on the distal margin of the basipodite, see Fig. 8 b and p. 36.

The palp has a minute fourth joint.

First pair of pereiopods. For the two composite setae on the distal margin of the carpus, near its lower distal angle see Fig. 6 c and p. 33. Above the lower distal angle, on the caudal surface of the joint, there is a group of slender non-composite setae.

For the composite setae on the lower margin of the propodus, see Fig. 5 e. In the short setae of the caudal row the setal part can be discerned in its entire length. In the setae of the rostral row the longest one of the free branches of the scale part is sometimes two-pointed.

Second pair of pereiopods. The lower margin of the propodus, in the female, is provided with sword-shaped setae lacking sub-branches. In the immature male there is the same kind of setae on the propodus, though smaller and more densely situated. In the adult male the propodus is provided with composite setae, arranged approximately in two longitudinal rows. Those setae which are situated proximally on the joint are of the structure illustrated in Figs. 7 c and d. Towards the distal end of the joint the setae gradually become slightly more slender and assume the structure illustrated in Fig. 7 e. On each of the caudal and rostral side, close to the lower margin of the propodus, there is a submarginal row of slender, non-composite setae (Fig. 7 f). The structural scales close to the lower margin of the propodus are prolonged and bristle-like in the adult male (Fig. 1 c).

Pleopods. Inner proximal angle of the basipodites of the first three pairs triangularly extended and furnished on the first pleopod with three »plumose» setae, on the second and third with two. Exopodite of the fourth pair with a somewhat oblique transverse suture[1]; endopodite sub-triangular, not bifid at the tip. The exopodite of the fifth pleopod is provided with a more oblique transverse suture than the exopodite of the fourth.

Uropods. See Fig. 21 d.

Secondary sexual differences. The adult males differ from the females in the usual way in their second pereiopods, and in the sternites of the first three abdominal segments. Further, the seventh pereiopods in adult males differ slightly from those of the females in having a stronger and more curved dactylus.

The penial filament in the adult male reaches almost to the distal margin of the pleotelson.

[1] PFEFFER, 1887, Pl. II, Fig. 3.

The sternites of the first three abdominal segments have been described by PFEFFER[1].

In the adult male (Fig. 10 e) the usual longitudinal ridges on the middle area of the sternites are absent. The posterior margin of the middle-area of the sternites is concave on the first segment, on each of the second and third segments it has a short point in the middle, this point being longest on the third segment.

The posterio-lateral angles of the sixth pereion segment reach slightly further back in the adult male than in the adult female. The male is also more circular in outline, while the adult female has a more oval shape. Very small immature specimens are oval in outline; in the sub-adult specimens the shape of body slightly oval, almost circular.

Localities and Material.

St. 20. South Georgia, Antarctic Bay, lat. 54° 12′ S., long. 36° 50′ W. 250 m. Small stones. $^{6}/_{5}$ 1902. 4 specimens. Length of largest specimen 40 mm., female with 12 embryos. One of the specimen is in moulting stage, the moulting having already occurred on the posterior part of the body, but not anteriorly.

St. 22. South Georgia, off May Bay, lat. 54° 17′ S., long. 36° 28′ W. 75 m. Bottom temp. +1.5°. Clay, also some stones. $^{14}/_{5}$ 1902. 5 specimens. Length of largest specimen 25 mm. (sub-adult male). One immature female specimen 12 mm. in length already had minute oostegits developed.

St. 26. South Georgia, off Grytviken, lat. 54° 22′ S., long. 36° 27′ W. 30 m. Stony bottom overgrown with algae, outside the Macrocystis formation. $^{24}/_{5}$ 1902. Immature male specimen with very short penial filaments, and the second pereiopods not transformed. Length about 19.5 mm.

St. 28. South Georgia, mouth of Grytviken, lat. 54° 22′ S., long. 36° 28′ W. 12—15 m. Sand and algae. $^{24}/_{6}$ 1902. 3 specimens (2 males and 1 female). Length of the largest specimen 43 mm. (adult male). The female specimen has a »chela» of a second pereiopod of an adult male firmly fastened to the lateral margin of the left coxal plate of the first pereion segment. The specimen has semi-developed oostegits and measures 32.5 mm. in length.

St. 30. South Georgia, Morain Bay, lat. 54° 24′ S., long. 36° 26′ W. 125 m. Bottom temp. — 0.25°. Clay with sparse stones. 8 immature specimens. Length of largest specimen 17 mm.

St. 31. South Georgia, South Bay, off the Nordenskjöldglacier, lat. 54° 24′ S., long. 36° 22′ W. 210 m. Bottom temp. + 1.5°. Blue-gray clay with a few small stones. $^{29}/_{5}$ 1902. Adult male specimen, in moulting stage (the abdomen and the posterior part of pereion from the fifth pereion segment covered with fresh chitinous tegument, the old tegument still covering the head and first four segments of pereion). Length 32.5 mm.

St. 34. South Georgia, off the mouth of Cumberland Bay, lat. 54° 11′ S., long. 36° 18′ W. 252—310 m. Bottom temp. + 1.45°. Gray clay with a few stones. $^{5}/_{6}$ 1902. 2 immature female specimens with minute oostegits. Colour uncommonly light, yellowish to whitish. Length of the largest specimen about 14.8 mm.

South Georgia, Grytviken, at the rock off the Bay. 15—25 m. Stony bottom with algae. $^{14}/_{6}$ 1902. 4 specimens, males and females. Length of largest specimen, adult male, 46 mm.

Swedish Magellanian Expedition South Georgia, Grytviken. 10 m. Stones. 4 specimens.

Material collected by E. SÖRLING. South Georgia, Cumberland Bay, Grytviken. March 1905. 2 adult males. Length of largest specimen, 44 mm.

Distribution. South Georgia (PFEFFER 1887, TATTERSALL 1921, MONOD 1931).

Serolis (*Homoserolis*) **pagenstecheri** PFEFFER var. **albida** n. var.

Pl. I, Figs. 4 and 5, Text fig. 21 e.

This variety differs from the main species in its smaller size and different colour. The adult specimens are about 23—24 mm. in length, whereas in the main species adult specimens are usually about twice as long. The colour is slightly yellowish, almost whitish. The adult male (Pl. I Fig. 4) has a slightly more oblong shape of body than the main species, in which the body of the adult male is almost circular in outline. The shape of the body in the adult female (Pl. I, Fig. 5) agrees with that of adult female specimens of the main species, thus being more oblong than in the adult male.

[1] PFEFFER, 1887, p. 80, Pl. II, Fig. 3.

In other features the variety agrees with the main species. For the maxilliped see Fig. 21 e.

Localities and Material.

St. 17. Between Falkland Islands and South Georgia, on the Shag Rock Bank, lat. 53° 34′ S., long. 43° 23′ W. 160 m. Bottom temp. + 2.05°. Gravel and sand. $^{19}/_{4}$ 1902. 18 specimens, males, females, and immature. Length of the largest specimens, adult male 23 mm., ovigerous female 21.8 mm. (type specimens).

Distribution. Shag Rock Bank (Sw. Ant. Exped.).

The main species has only been found off South Georgia.

Serolis (*Homoserolis*) **bouvieri** RICHARDSON, 1906.

Text. figs. 5 i and 11 a.

Serolis bouvieri. RICHARDSON 1906, p. 7—10, Pl. 1, Fig. 1, Text figs. 12 and 13; 1913, p. 8—9.

Diagnosis. Anterio-lateral angles of the head prolonged in a lateral direction, so that the greatest width of the head occurs anteriorly. Coxal plates marked off by dorsal sutures on the second, third and fourth pereion segments. Posterio-lateral angles of the coxal plates of the second to sixth segments of the pereion all extending further back than those of the preceding ones. Posterio-lateral angles of the pleural plates of the second and third abdominal segments reach not quite as far back as to the posterio-lateral angles of the coxal plates of the sixth pereion segment. Pleotelson with five longitudinal ridges, one long in the middle, the others short; tip of pleotelson sinuate. Inner lobe of first maxilla expanded distally. Outer lappets of outer lobe of second maxilla each with two apical setae. Distal epipodite of the maxilliped marked off from the basipodite by a distinct suture; palp consisting of four joints, the fourth minute, the second approximately cordiform. Inner proximal angle of the basipodite of first to third pleopods triangularly prolonged and furnished with setae. Endopodite of fourth pleopod entire (not bifid). Uropods very small.

Supplementary Description (Immature male specimen).

Head. Front margin of the head, posteriorly from the first peduncular joints of the antennulae, with a transverse ridge behind which there is a groove. The ridge and the groove continue in a lateral direction, thus demarcating the somewhat down-turned anterio-lateral parts of the head.

Pereion. Ventral surface of the first segment with four longitudinal sutures, the lateral ones passing through the articular sockets for the first pereiopods. The two other sutures, which mark off the median part of the sternite are somewhat curved, having their concave sides directed laterally. In the middle of the median part of the sternite there is a broad transverse groove. Anteriorly from this groove the part along the middleline rises into a pronounced oval elevation with ridge-like lateral margins.

Along the middle line of all the other segments of the pereion there is, ventrally, a longitudinal groove.

The ventral surface of the second pereion segment is provided with two sharp longitudinal ridges, one on each side of the middle line. The ridges are curved, with their convex sides directed laterally; the ends of the ridges meet both anteriorly and posteriorly. Each of the rostral ends of the ridges forms a free wing-like projection, which protrudes below the posterior part of the first pereion segment.

On the third and fourth segments, the ventral surface is sculptured in the same way by two curved ridges, between which there is a lower area, which on the third segment is approximately cordiform and on the fourth approximately elliptical.

Sculpturing comprising two longitudinal ridges occurs also on the following segments though more indistinctly (see Fig. 11 a). The sternites of last three segments, as is characteristic of the subgenus *Homoserolis*, are strongly coalesced.

Antennulae. These differ somewhat from the description by RICHARDSON (1906), inasmuch as they extend a little further than the peduncles of the antennae; the flagellum consists of 21 joints. In RICHARDSON's, much larger, specimen the peduncle was a little shorter, but the flagellum also consisted of 21 joints.

Antennae. The flagellum consists of 17 joints. Antennal processes small and indistinct, not much longer than typical structural scales. They are situated in a longitudinal row.

Maxillae. Inner lobe of the first maxilla strongly expanded distally; its distal margin convex. Outer lappets of outer lobe of the second maxillae each provided with two apical setae.

Maxillipeds. Distal epipodite marked off from the basipodite by a distinct suture. The palp has a minute fourth joint. The third joint of the palp is approximately cordiform; the setae on the inner margin of this joint are situated in two groups near each other.

First pair of pereiopods. Distal margin of carpal joint close to the lower distal angle provided with two composite setae and with a group of non-composite setae on the caudal side near the same angle. For the composite setae on the lower margin of propodus see Fig. 5 i.

Fourth pair of pleopods. Exopodite with a transverse suture at a distance from its proximal margin of about one-third the length of the joint.

Uropods. See RICHARDSON (1906, Fig. 13). Exopodite and endopodite minute.

Localities and Material.

St. 6. Graham Region, S. W. of Snow Hill Island, lat. 64 °36′ S., long. 57° 42′ W. 125 m. Stones and gravel. $^{20}/_{1}$ 1902. One immature male specimen, with very short penial filaments and with propodal joint of the second pereiopod not transformed.

Distribution: South Shetland Islands (RICHARDSON 1913), Graham Region (RICHARDSON 1906).

Subgenus *Heteroserolis*[1].

Serolis (*Heteroserolis*) **australiensis** BEDDARD, 1884.

Serolis australiensis. BEDDARD, 1884, p. 69—71, Pl. VI, Figs. 3—8; WHITELEGGE, 1901, p. 237; CHILTON, 1917, p. 396—397, Fig. 10.

Diagnosis. Anterio-lateral angles of the head only slightly produced in a lateral direction, so that the greatest width of the head is across the middle. Coxal plates marked off by dorsal sutures on the second, third and fourth pereion segment. Posterio-lateral angles of the coxal plates of the second to sixth segments of the pereion each extending successively further back than those of the preceding segment; those of the sixth segment of the pereion

[1] For diagnosis see p. 50.

reaching further back than the posterio-lateral angles of the second and third abdominal segments. Dorsal surface of the body strongly tuberculated. Inner lobe of first maxilla not expanded distally and with distal margin narrowly rounded. Outer lappets of outer lobe of the second maxilla each with two apical setae. Distal epipodite of the maxilliped marked off from the basipodite by a distinct suture; palp consisting of three joints, its second joint with inner margin convex and outer margin concave (not cordiform). Basipodites of the first three pairs of pleopods narrow proximally, with proximal part of the inner margin slightly convex and without setae. Endopodite of the fourth pair of pleopods entire (not bifid).

Supplementary Description.

Pereion. Coxal plates separated by a suture from the tergites only on the second, third and fourth segments, but not, as was stated by BEDDARD (1884 p. 69) on the fifth and sixth segments.

Antennulae and antennae. The flagella of both pairs are broken off at the tip. The prolonged scales on the central joints of the flagellum of the antennae are spine-like and situated in a longitudinal row on the ventral side of the fourth to tenth joints.[1]

Mandibles. The masticatory edge of the mandible corpus with two strong teeth, posteriorly[2]. Each mandible is furnished with two slender weak masticatory processes.

The setae on the second and third joints of the palp have lancet-like and pointed end-knobs and are furnished with two rows of short sub-branches.

Maxillae. Inner lobe of first maxilla not expanded distally; distal margin narrowly rounded; near the tip there is a short seta.

Outer lappets of the outer lobes of the second maxillae each furnished with two apical setae.

Maxillipeds.[3] The lateral margin of the second joint of the palp is concave, its inner margin is convex and setiferous.

First pair of pereiopods. Distal margin of the carpus devoid of projecting scales; it is provided with two conical composite setae near the lower distal angle, but lacks the non-composite kind. The free distal part of the setal portion is very short in one of the setae and missing in the other.

Lower margin of the propodus with two rows of composite setae of the usual kinds. The leaf-like setae in the caudal row are oblong-oval, narrowing distally. Their distal margin and the distal half of their lateral margins are strongly lobated. The free setal part, which protrudes at the tip of the scale part, is very short, not extending so far distally as the free lobes of the scale part and only differing from these lobes in being traversed by the setal canal which ends in a pore.

The long setae in the rostral row are narrow and, as usual, trilobate distally. The free setal part is somewhat longer and much narrower than the free lappets of the scale part, its distal tip is still narrower, the distal margin narrowly rounded. The free lappets of the scale part are a little flattened and subequal in length. Their lateral margins are slightly convex, their inner margins are straight, their distal ends narrowly rounded.

[1] BEDDARD (1884), p. 70) observes »the upper surface of the third to tenth joints has a row of short blunt tubercles».

[2] See also BEDDARD, 1884, p. 70.

[3] BEDDARD, 1884, p. 71, Pl. VI, Fig. 6.

On the caudal side there is close to the lower margin a submarginal row of distally rounded, projecting scales.

The other pereiopods. Only very few of the setae are provided with sub-branches.

Uropods. The endopodite extends almost to the tip of pleotelson; its distal end is narrowly rounded. The exopodite is shorter than the endopodite; its distal margin is straight and distinctly crenulate.

Localities and Material.

Eugenie Expedition. Port Jackson (off Sydney), the lighthouse. 12 fathoms. Female with embryos, length 16.5 mm. Colour yellowish.

Distribution. Eastern and Southern Australian coast (BEDDARD 1884, WHITELEGGE 1901, CHILTON 1917).

Serolis (*Heteroserolis*) longicaudata BEDDARD, 1884.

Serolis longicaudata. BEDDARD, 1884, p. 72—74, Pl. VII, Figs. 8—10, Pl. VIII, Figs. 1—2; WHITELEGGE, 1901, p. 238; CHILTON, 1917, p. 397, Fig. 11.

Diagnosis. Anterio-lateral angles of the head only slightly prolonged in a lateral direction so that the greatest width of the head is across the middle. Coxal plates marked off by dorsal sutures on the second, third and fourth pereion segments. Posterio-lateral angles of the epimera very slightly produced backwards. Pleotelson long and narrow. Inner lobe of first maxilla not expanded distally, with its distal end narrowly rounded. Outer lappets of outer lobe of second maxillae each with two apical setae. Distal epipodite of the maxilliped marked off from the basipodite by a distinct suture; palp consisting of three joints of which the second has its inner margin convex and outer margin concave. Basipodites of the first three pairs of pleopods with the proximal part of their inner margin slightly convex. Endopodite of fourth pleopod entire (not bifid).

Supplementary Description.

Antennulae and antennae. The flagellum of the antennula consists of eleven joints.

The flagella of the antennae were both broken off at the tip. Ventral surface of the first to the ninth joints of the antennal flagellum provided with a longitudinal row of projecting non-typical pectinate scales. They differ from typical pectinate scales in having their central and most projecting point larger than the others and of a spine-like appearance. On the first joint there are only two such transformed scales, situated distally, the proximal one being small and indistinct, the distal one provided with only two points, both of which are large and spine-like.

Mandibles. Both mandibles are similar; each mandible being furnished with two weak masticatory processes.

The modified setae on the second and third joints of the palp have no distinct end-knobs, but are broadly rounded distally.

Maxillae. Inner lobe of the first maxilla with narrowly rounded end. Outer lappets of outer lobes of the second maxillae each provided with two apical setae.

Maxillipeds. Distal epipodite marked off from the basipodite by a distinct suture. Palp consisting of three joints, the large second joint being about half as long again as it is wide; the proportion between its length and breadth is 20: 14. It is about equally wide

throughout, except for an abrupt constriction at its junction with the first joint. Its lateral margin is concave, inner margin convex and furnished with a row of setae.

First pair of pereiopods. Distal margin of the carpus devoid of projecting scales. The two composite setae near the lower-distal angle are conical with a narrow setal part protruding freely at the distal end of the scale part. Non-composite setae at the lower distal angle of the carpus are missing.

The setae on the lower margin of the propodus are characteristic. They are similar to those in *S. pallida* as figured by BEDDARD (1884)[1]. The leaf-like setae in the caudal row are broad distally and lobated marginally. Close to the lower margin, on the caudal side, there is a submarginal row of large distally rounded scales and also a row of sparse non-composite setae.

The other pereiopods. According to BEDDARD (1884), all the setae are branchless. This is, however, not quite correct, as there also occur sparse branched setae of the usual type. The branchless setae are somewhat expanded and blade-like near their pointed distal ends.

Localities and Material.

Eugenie Expedition. Port Jackson (off Sydney), the lighthouse 12 fms. Female with embryos, length 10.8 mm.

Distribution: Eastern and Southern Australian coast. (BEDDARD 1884, WHITELEGGE 1901, CHILTON 1917).

SECTION IV.

Sub-Order Valvifera.

BARNARD (1920), in an analytical table, deduces the principal characters of the four families of this sub-order, viz *Idotheidae, Pseudidotheidae, Amesopodida* and *Arcturidae*. He does not mention the families *Chaetilidae*, proposed by DANA (1852) (embracing the single genus and species *Chaetilia ovata* DANA) or *Hologнathidae*, proposed by THOMSON (1904) embracing the single genus and species *Hologнathia stewarti* (FILHOL).

Chaetilia ovata is inadequately known. It closely approaches, however, my new subfamily *Macrochiridotheinae* (see p. 104) within the *Idotheidae*.

The genus *Hologнathia* THOMSON resembles very close *Cleantis* DANA, agreeing with that genus in all features, except that the mandibles are provided with a distinct, three-jointed palp. In my opinion this characteristic, though very remarkable, is not alone sufficient ground for a separation of *Hologнathia* from the *Idotheidae*.

As regards the family *Amesopodidae*, it is still inadequately known and requires further investigation, especially with reference to the penis and first male pleopods. It was proposed by STEBBING (1905) and embraces the single genus and species *Amesopus richardsonae* STEBB. STEBBING (1905) states that the second pereiopod in this species displays only five joints. In his figure of the pereiopod (STEBBING 1905, Pl. XI, gn. 2) a minute

[1] BEDDARD 1884, Pl. VIII, Figs. 14 and 15.

sixth terminal joint is, however, discernable; it is, exactly as in the first pereiopod (STEBBING 1905 Pl. XI gn. 1), though still smaller.

The transformed uropods in the Valvifera afford, as a rule, good indications for the characterizing of the families in regard to the presence or absence of a second ramus (see BARNARD, 1920). The *Arcturidae* are characterized by having two rami on the uropods. Within this family I found an exception in this respect in *Microarcturus digitatus* (described on p. 167—171), which agrees with the *Idotheidae* in having uropods provided with a single ramus.

CALMAN (1909) holds that the small upper ramus of the uropods is the exopodite, on the hypothesis that the present position of the uropods is due to a movement of rotation. TAIT (1918), in his detailed report on *Glyptonotus antarticus*, is of the opinion that CALMAN's assumption does not tally with the detailed structure of the articular foramen of the uropods. His interesting investigations, however, bear out the view that the sternal foramen for the uropods has actually undergone a rotation, presumably whilst moving from its more primitive position on the lateral margin to its present ventral position. Nevertheless this does not settle the problem whether the uropods have been folded below the pleotelson. Both TAIT's and CALMAN's theories are possible explanations.

I. Fam. **Idotheideae.**[1]

A. Subfam. **Idotheinae,** DANA 1849, MIERS 1881.

Genus **Idothea** FABRICIUS, 1798.

For diagnosis see G. O. SARS (1899, p. 79), RICHARDSON (1905, p. 356), COLLINGE (1917, p. 736—737).

Idothea metallica BOSC, 1802.

For synonymy and literature see MIERS (1881, p. 35—36), RICHARDSON (1905, p. 362), COLLINGE (1917, p. 746).

Locality and Material.

Eugenie Expedition. Straits of Magellan, York Bay. Surface of water. One small specimen.

Distribution. Almost universal (see RICHARDSON 1905, THIELEMANN 1914, COLLINGE 1917).

Antarctic and sub-antarctic localities: Patagonia (CUNNINGHAM 1871), Magellanian Region (Eug. Exp.), Near Cape Horn (DOLLFUS 1891), Antarctic Seas south of Australia (DANA 1852), (South Africa, TATTERSALL 1913).

Genus **Edotia** GUÉRIN—MÉNÉVILLE, 1829—1844.

Edotia. GUÉRIN-MÉNÉVILLE, 1829—1844; MIERS, 1881; OHLIN, 1901.
Desmarestia. NICOLET, 1849.
Epelys. DANA, 1852; HARGER 1878.
Edotea. RICHARDSON, 1905.

For diagnosis see RICHARDSON (1905, p. 394). RICHARDSON states in her diagnosis »epimera of all the segments of the thorax firmly and perfectly united with the

[1] COLLINGE (1918 a) divides the Valvitera into the two groups *Idotheinia* and *Astacillinea*, but he does not give any specific characters for his groups.

segments». In some species, however, the pereion is traversed by two lateral and parallel grooves on each side; the most laterally situated of these grooves mark off the epimera. This is the case in *Edotia bilobata* (Pl. I Fig. 6, Text figs. 24 a and b) and *Edotia oculata*[1]. In *E. bilobata* the grooves demarcating the epimera are deepest and narrowest on the last three segments. These grooves are indistinct in *E. tuberculata*[2], and usually they are entirely absent: *E. lilljeborgi*[3], *acuta*[4], *triloba*[5], *montosa*[6], *magellanica*[7], and *doello-juradoi*[8]. Even the more medially situated grooves on the pereion are lacking in *E. lilljeborgi* and *acuta*.

Edotia tuberculata GUÉRIN—MÉNÉVILLE, 1829—1844.

Text. figs. 22 a—d and 23 a.

For synonymy and literature see OHLIN, 1901, p. 292.
It may be added:
Edotia tuberculata. STEBBING, 1914, p. 353; GIAMBIAGI, 1925, p. 12—13, Pl. III Fig. 1.

Diagnosis. Segments of the pereion each with a dorsal tuberculum in the middle line and with two lateral longitudinal grooves on each side, the most lateral grooves often incomplete or indistinct. Abdomen with all segments coalesced with one another, but with two anterior segments indicated, the first by a transverse groove, the second by a short lateral suture or incision. Uropods[9] slightly hollowed distally with lower part of the sympodite and its ramus not bent upwards so as to form a secondary ventral border; ramus triangular, not even half as long again as it is broad.

Supplementary Description.

Oostegits. The number of oostegits in the full-grown female is four pairs. They are all fused with each other by a thin chitinous tegument. The first three pairs are subrectangular, somewhat broader than long; the anterior margin of the small first pair (belonging to the first pereiopods) is not fused anteriorly with the sternum. The second and third pairs are large, the second being subrectangular and broader than it is long, the third subquadrate. The fourth pair is also subrectangular, narrowing backwards, but about twice as long as it is broad; its posterior margin is fastened to the sternum by a thin chitinous tegument.

Antennulae[10]. Anterior margin of the flagellum, in the male, provided with a large number of sensory filaments and with scattered setae; in the female the filaments are fewer in number and only situated distally.

Mandibles[11] (Figs. 22 a and b). Molar tubercle sometimes furnished with spines. Left mandible with a lacinia. Setal row with only one or two setae.

[1] OHLIN, 1901, Pl. XXIV, Fig. 13.
[2] OHLIN, 1901, Pl. XXIII, Figs 10 and 10 c.
[3] OHLIN, 1901, Pl. XXIV, Fig. 12.
[4] RICHARDSON, 1905, Fig. 439.
[5] RICHARDSON, 1905, Fig. 441.
[6] RICHARDSON, 1905, Fig. 443.
[7] GIAMBIAGI, 1925, Fig. 2.
[8] GIAMBIAGI, 1925, Pl. IV.
[9] As regards the uropods of the Valvifera, I have thought it advisable to describe them in their outbent position. That surface which is directed ventrally when the uropods are bent below the pleotelson is thus denoted as the lateral surface, and so on.
[10] See OHLIN, 1901, p. 293, Pl. XXIII, Fig. 10 a_1.
[11] See OHLIN, 1901, Pl. XXIII, Fig. 10 m.

Second pair of pleopods, male[1]. See Figs 22 c and d.
Uropods[2] (Fig. 23 a). Ramus short, triangular.

Remarks. The species may attain a length of 29—30 mm. (MIERS 1881, OHLIN 1901.) The specimens obtained by the Swedish Antarctic Expedition are much smaller, but nevertheless most of them are mature individuals. There are adult specimens of a length of only 9—10 mm. (female with young 9.1 mm. in length, male with fully developed penial filaments 10 mm. in length).

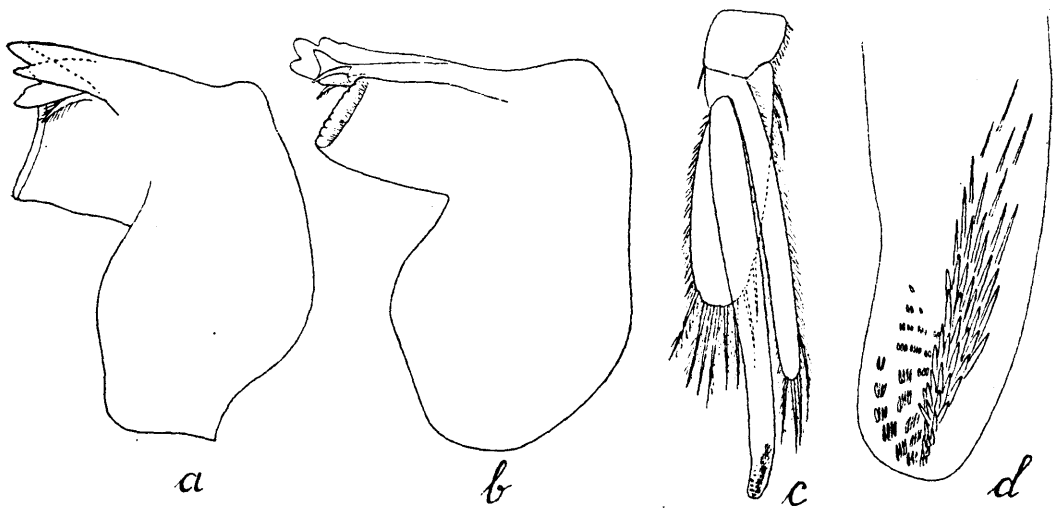

Fig. 22. *Edotia tuberculata*, GUÉR.-MÉN. a. Left mandible, female, 80 ×. b. Right mandible, female, 80 ×. c. Left second pleopod, male 30 ×. d. Distal part of the penial filament of the same pleopod, 235 ×.

OHLIN (1901), who examined a comparatively large amount of material, points out that the individuals vary rather considerably in the configuration of the cephalon and the shape of the abdomen. In the few specimens I have examined I found a less variation in these respects than was indicated by OHLIN. The configuration of the head is illustrated by OHLIN (1901, Pl. XXIII Fig. 10 a). The eyes are placed on large tubercles, the lateral margins of the head are somewhat concave, and the dorsal side of the head has four tubercles, situated approximately in such wise as to form the corners of a square. Usually the front margin of the head is furnished with two small tuberculae. These are not illustrated in OHLIN's figures (1901), but are shown by DOLLFUS[3] (1891) and GIAMBIAGI[4] (1925).

Localities and Material.

St. 22. South Georgia, off May Bay, lat. 54° 17′ S., long. 36° 28′ W. 75 m. Bottom temp. + 1.5°. Clay and also some algae. $^{14}/_{5}$ 1902. 3 specimens, (2 adult females, 1 immature). Length of largest specimen about 9 mm.

St. 34. South Georgia, off the mouth of Cumberland Bay, lat. 54° 11′ S., long. 36° 18′ W. 252—310 m. Bottom temp. + 1.45°. Gray clay with a few stones. $^{5}/_{6}$ 1902. 3 specimens. Length of largest specimen 10 mm. (male). An ovigerous female had a length of 7 mm.

[1] See OHLIN, 1901, Pl. XXIII, Fig. 10 plp_2.
[2] See OHLIN, 1901, Pl. XXIII, Fig. 10 u.
[3] DOLLFUS, 1891, Pl. VIII a, Fig. 12.
[4] GIAMBIAGI, 1925, Pl. III, Fig. 1.

Distribution. Patagonia (OHLIN 1901), Tierra del Fuego (OHLIN 1901, GIAMBIAGI 1925), Magellan Straits (CUNNINGHAM 1871, OHLIN 1901), Southern Fuegian Archipelago (OHLIN 1901), near Cape Horn (DOLLFUS 1891), Falkland Islands (MIERS 1881, STEBBING 1914), South Georgia (Sw. Ant. Exp.)

The species has not previously been recorded from South Georgia.

Edotia magellanica CUNNINGHAM, 1871.

Text. fig. 23 b.

Edotia magellanica. CUNNINGHAM, 1871, p. 499, Pl. 59, Fig 6; MIERS, 1881, p. 74; OHLIN, 1901, p. 295—297, Pl. XXIV, Fig. 11 and Pl. XXIII, Fig. 11 a.

Edotia cf. *magellanica.* GIAMBIAGI, 1925, p. 13—14, Fig. 2.

Diagnosis. Head and pereion devoid of tuberculae. Pereion segments with a faint laterally situated longitudinal groove on each side. Abdomen with two anterior segments indistinctly marked off by grooves, the second on each side ending in a free lateral tip. Uropods markedly hollowed distally, with the lower part of the sympodite and its ramus bent upwards, so as to form a small ventral secondary border; ramus triangular about twice as long as it is broad.

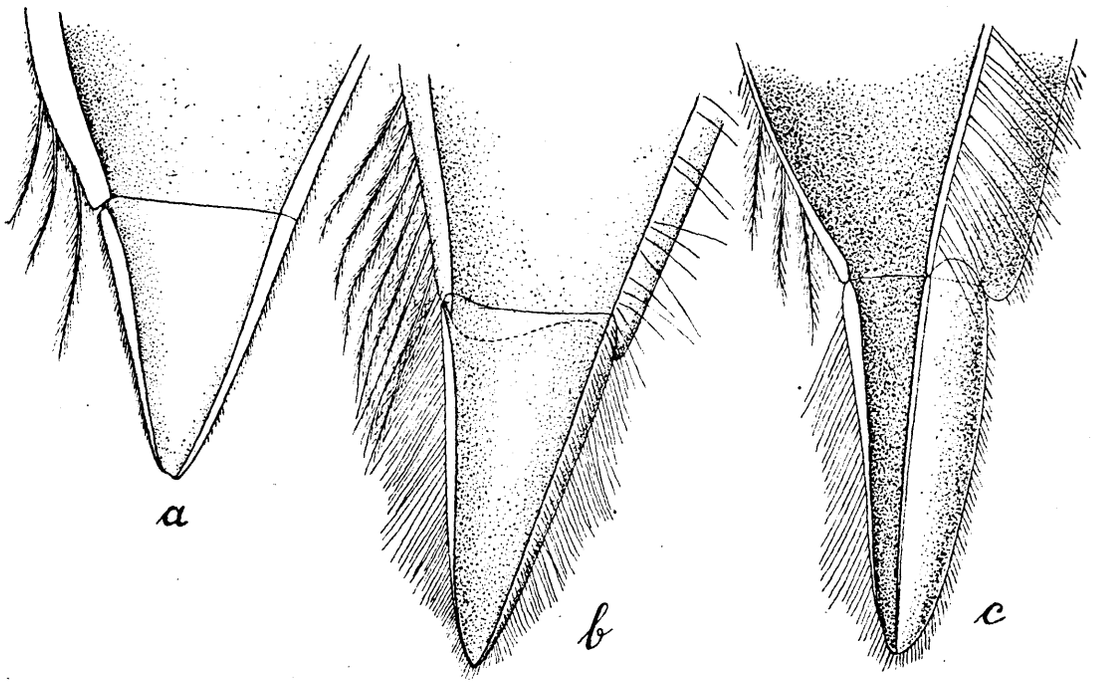

Fig. 23. Uropods in *Edotia*. a. Tip of the left uropod, seen from the inner side, *E. tuberculata*, GUÉR.-MÉN., 80 ×. b. Tip of the left uropod, seen from the inner side, *E. magellanica*, CUNN., 80 ×. c. Tip of the left uropod, seen from the inner side, *E. bilobata* n. sp., 80 ×.

Supplementary Description.

Head. The head is elevated, except at its frontal and lateral margins. The anterio-lateral angles are pointed and somewhat triangularly prolonged forwards. The eyes are minute. The elevated part of the head is traversed by two curved grooves with the convexity directed anteriorly.

Pereion. Each segment laterally with a very faint longitudinal groove on each side; these grooves do not demarcate the epimera. Of sutures delimiting the coxal plates there are no vestiges.

Abdomen[1]. Two anterior segments are distinctly marked off by transverse furrows. The lateral tips of the second segment are free and pointed and separated laterally from the posterior part of the abdomen by an incision. Also a third anterior segment is slightly indicated by an incomplete transverse groove, which disappears laterally. The pleotelson is somewhat longer and moreover narrower distally than figured by OHLIN (1901, Fig. 11), its distal end being narrowly rounded. It is almost as in *E. tuberculata;* its highest part is situated anteriorly[2].

Antennae[3]. Of the peduncular joints the first is very small and only visible from below. The other peduncular joints increase in length up to the last, the relation between the length of the joints in the peduncle being 6: 7: 14: 17: 22. The flagellum consists of a long proximal joint and three very small distal ones, decreasing in length to the last, which carries a tuft of long setae.

Uropods (Fig. 23 b). Lower part of the sympodite and its ramus bent upwards, so as to form a small secondary ventral border; ramus about twice as long as it is broad.

Remarks. The description of *E. magellanica* given by MIERS (1881) makes it obvious that the specimen described above is identical with that species. It differs from the description and figures of the species by OHLIN (1901) in having a somewhat divergent shape of the abdomen. It is probable that *E. magellanica* in that respect exhibits variations in a similar way as *E. tuberculata* (see OHLIN 1901).

Localities and Material.

Eugenie Expedition. Magellan Straits, off Cape Virgines. 32 fms. Immature specimen 8.4 mm. in length. Colour yellowish to whitish.

Distribution. Patagonia (OHLIN 1901), Tierra del Fuego (GIAMBIAGI 1925), Magellan Straits (CUNNINGHAM 1871, MIERS 1881).

Edotia bilobata n. sp.

Pl. I, Fig. 6; Text. figs. 23 c, 24 a—c.

Diagnosis. Frontal margin of the head between the antennae furnished with two large rounded lobes. Head and pereion devoid of tuberculae. Segments of the pereion dorsally with distinct lateral grooves, two on either side. Abdomen with only one small anterior segment indistinctly indicated by a furrow. Uropods with distal part markedly hollowed, almost cornet-like and having, the lower part of the sympodite and its ramus bent upwards, so as to form a secondary ventral fold, being about half as wide as the ramus; the ramus is about three times as long as it is wide.

Description.

Type. Immature specimen (female?) of a length of 7.8 mm., whitish to yellowish in colour (Pl. I, Fig. 6).

[1] MIERS, 1881, p. 74; OHLIN, 1901, Pl. XXIV, Fig. 11, Pl. XXIII, Fig. 11 A, GIAMBIAGI, 1925, Fig. 2.
[2] In the specimen examined by OHLIN (1901) the highest part of the pleotelson was situated posteriorly.
[3] See OHLIN, 1901, p. 297.

Head (Fig. 24 a). Frontal margin between the antennae with two large rounded lobes; between these there lies anteriorly a deep incision. Anterio-lateral parts of the head situated lower than the rest and formed into triangular plates, which are somewhat prolonged in an anterior direction and slightly pointed anteriorly. Eyes small, black, on lateral lobes. The part between the eye-lobes is elevated and traversed by a transverse curved furrow.

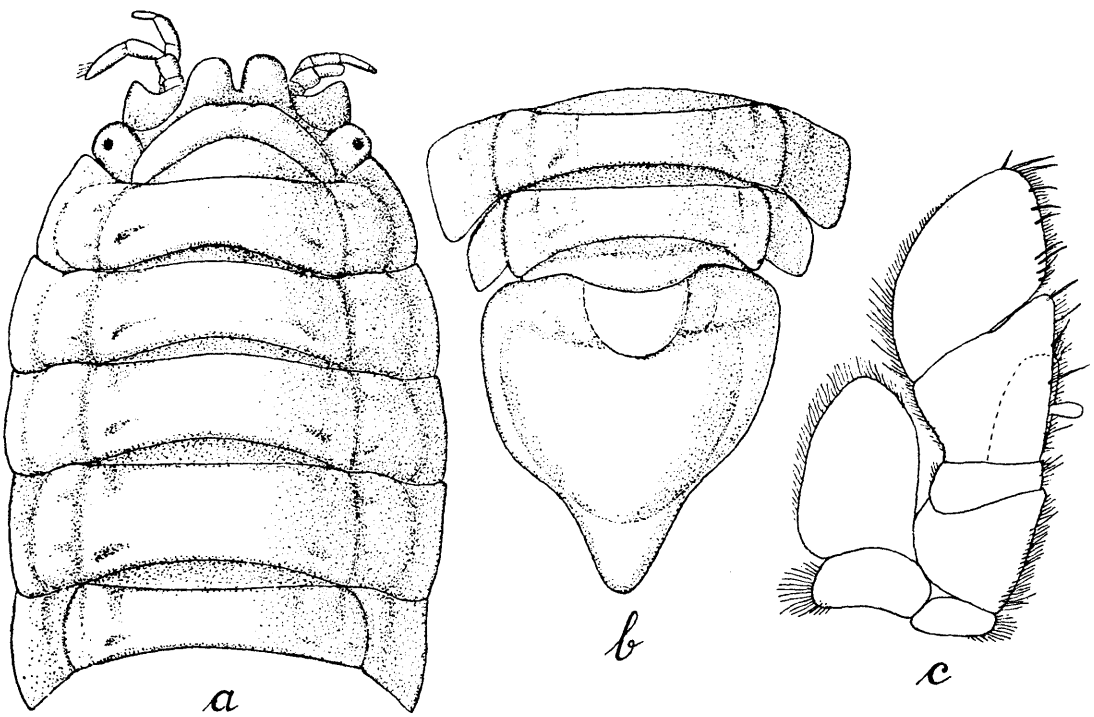

Fig. 24. *Edotia bilobata* n. sp. a. Head and first five segments of the pereion, 17 ×. b. Last two segments of the pereion and the abdomen, 17 ×. c. Right maxilliped, 55 ×.

Pereion (Figs. 24 a and b). The first four segments of the pereion subequal in length, the last three segments decreasing in length from the fifth to the seventh. The pereion traversed by two lateral longitudinal grooves on each side, the more lateral of these demarcating the epimera. The latter grooves are indistinct on the first four segments but distinct and suture-like on the last three segments. The coxal plates of the last three segments are subtriangular and directed somewhat backwards. There is a patch of more glazed pigment on each segment medially from the inner one of the two longitudinal grooves.

Abdomen. About 3 mm. in length and approximately as long as the last four segments of the pereion together. An anterior segment is indicated by a transverse groove. Posteriorly from the first segment there is a distinct semi-circular and superficially rounded elevation in the middle, laterally from which there are two lower, indistinct elevations on each side. Posteriorly from the large elevation in the middle there is a groove, which does not extend to the lateral margins of pleotelson. Remainder part of pleotelson is also elevated, except laterally and at the tip.

Antennulae. Peduncle consisting of three joints slightly increasing in length from the first to the last. The single-jointed flagellum is about as long as the last peduncular joint.

Antennae. Slightly longer than the antennulae and consisting of a five-jointed peduncle and a three-jointed flagellum. The first two joints of the peduncle are very small and subequal in length, the first visible only from below. The third joint is almost as long as the first and second together, the fourth almost as long as the second and the third together, the fifth is a little longer and narrower than the fourth. Flagellum about as long as the last peduncular joint, consisting of one large proximal joint and two very minute distal ones.

First and second pairs of maxillae. Inner lobe of the first maxillae provided with two ciliated setae. Outer lappet of outer lobe of the second maxilla with five, inner lappet of the same lobe with six, apical setae; inner lobe with about seven setae; two of them situated at the inner distal angle are stouter and furnished with long irregularly situated hairlike sub-branches, whilst the other setae are of the usual kind, being furnished with two rows of short sub-branches.

Maxillipeds. See Fig. 24 c.

Uropods (Fig. 23 c). Lower part of the sympodite and its ramus bent upwards, so as to form a secondary ventral fold, which is about half as wide as the ramus. The ramus is about three times as long as it is broad; its distal end is narrowly rounded.

Remarks. *Edotia bilobata* differs from other species of the genus in having the coxal plates of the last three pereion segments demarcated by very distinct suture-like grooves. These grooves or sutures are not in a line with those grooves which mark off the coxal plates of the anterior segments[1]; they commence at the anterior margin of the fifth segment medially from the lateral furrow on the fourth segment. The development of the coxal plates of the last three segments thus differs from that of the preceding ones. In this feature *E. bilobata* agrees with the genus *Macrochiridothea* (see p. 106—108).

Localities and Material.

St. 3. Falkland Islands New Year Island, lat. 54° 43′ S., long. 64° 8′ W. 36 m. Shingle and gravel. $^{6}/_{1}$ 1902. Immature specimen 7.8 mm. in length.

Distribution. Falkland Islands (Swed. Ant. Exped.).

Genus **Cleantis** DANA, 1849.

Cleantis. DANA 1852; OHLIN 1901; TATTERSALL 1921 a, partim.

Diagnosis. Body linear. Coxal plates distinctly marked off on all pereion segments except the first, but only those of the last three segments are large and distinctly visible in a dorsal view. Abdomen composed of more than one segment. The antennal flagellum consists of a large proximal joint, there being sometimes in addition other more or less vestigial distal joints. Mandibles devoid of palp. Palp of maxilliped five-jointed. Fourth pair of pereiopods the smallest; first pair prehensile. Uropods with two branches,

[1] The grooves which mark off the coxal plates of the last three pereion segments in *Edotia tuberculata* are likewise not in a line with those on the anterior segments; on the fifth and the anterior half of the sixth segment they are actually suture-like, though faint.

the small »secondary» ramus being furnished with dense plumose setae; lateral ramus provided with a long plumose seta at its upper proximal angle.

The above limited definition of the genus *Cleantis*, which is based on examination of the genotype *Cleantis linearis* DANA and of the allied species *Cleantis granulosa* HELLER, permits only these two species to be referred to the genus with certainty. The species previously assigned to *Cleantis*, except *strasseni* THIELEMANN (1910) and *annandalei* TATTERSALL (1921 a), are unknown as regards the structure of the uropods. The two latter species, however, differ from *Cleantis* in being devoid of the »secondary» ramus of the uropods. They should presumably be referred to *Zenobiana* STEBBING (1895), but to decide this requires an examination of the uropods in the genotype of *Zenobiana*.

TATTERSALL (1921 a) points out that the species assigned to *Cleantis* or *Zenobiana* should probably be divided into two genera, in view of the different number of joints in the palp of the maxilliped.

The genus *Hologнathus* THOMSON (1904), referred by THOMSON to a separate family of the *Valvifera*, agrees with *Cleantis* as diagnosed above, with the exception that the mandibles are furnished with a three-jointed palp.

Cleantis linearis DANA, 1849.

Cleantis linearis. DANA, 1849, p. 427; 1852, p. 708—709, Pl. 46, Figs. 9 a—9 l; MIERS, 1881, p. 81—82.

Specific Characters. Abdomen with four free segments anteriorly from the pleotelson. Distal margin of the pleotelson truncate. Antella flagellum consisting of two joints; ventral surface of the last peduncular joint as well as that of the first joint of the flagellum covered with a dense nap of fine hairs.

Supplementary Description.

Head. Broader than long. Its anterior margin is slightly sinuate in the middle. Its dorsal surface is traversed by a faint transverse groove anteriorly from the eyes. At the posterior margin of the head there is a small oval area marked off anteriorly by a curved groove with its convexity directed forwards.

Pereion. Segments subequal in width. Second to fourth segments with small coxal plates, not visible from above. Last three segments with large triangular and pointed coxal plates, visible in a dorsal view.

Abdomen. Furnished with fine hairs anteriorly on its lateral sides. Four segments are marked off anteriorly from the pleotelson. Of these the first and the fourth segments are the largest and subequal in length. The first segment is about twice as long in the middle as the second; the second is about twice as long in the middle as the very short third segment. The fourth segment is firmly fused with the pleotelson; the suture between the fourth segment and the pleotelson being indistinctly developed in the middle.

The pleotelson has its distal margin truncate.

Antennulae. The small antennulae extend to the distal margin of the third peduncular joint of the antennae. They consist of a three-jointed peduncle and a single-jointed flagellum, the latter being furnished at the tip with a tuft of sensory filaments.

Antennae. The antennae have a five-jointed peduncle; the small first joint is visible only from below. The last two peduncular joints are together slightly longer than the

rest of the peduncle. The flagellum is distinctly two-jointed, but the second joint is minute. The lower margins of the last peduncular joint and the first joint of the flagellum are furnished with a dense nap of fine hairs.

First and second pairs of maxillae. Inner lobe of first maxilla provided with three apical setae. Outer lappet of the outer lobe of the second maxilla with seven, inner lappet of the same lobe with six, apical setae.

Maxilliped. Palp five-jointed, the last joint minute; distal epipodite slightly tapering towards the end, its distal margin rounded.

Pereiopods. The fourth is the smallest, the first is prehensile. Dactyli with two claws, the ventral one minute.

Uropods. Lateral ramus provided with a long plumose seta at its upper proximal angle. »Secondary» ramus oblong-oval, furnished with plumose setae on its dorsal and its distal margin.

Locality and Material.

Eugenie Expedition. Valparaiso. Sandy bottom on roots of seaweed. 4 immature specimens of a brownish colour. Length of the largest specimen 12.5 mm.

Distribution. Coast of Central Chile (Eug. Exp.), Northern Patagonia, (DANA 1852).

Previously not recorded from Chile.

Cleantis granulosa HELLER, 1865.

Cleantis granulosa. HELLER, 1865, p. 132—133, Taf. XII, Fig. 2; MIERS, 1881, p. 82—83; OHLIN, 1901, p. 304—306, Pl. XXV, Figs. 15.

Specific Characters. Abdomen with three complete segments anteriorly from the pleotelson and a fourth indicated by lateral sutures. Pleotelson very faintly granulate; its distal margin very faintly concave in the middle. Antennae with a slingle-jointed, ventrally densely setiferous flagellum; ventral surface of the last peduncular joint of the antenna smooth.

Supplementary Description.

Head. Broader than long. Front margin in the middle slightly sinuate. The head has a transverse groove in front of the eyes and a curved groove at the posterior margin as in *Cleantis linearis*, but these grooves are fainter than in the latter species.

Pereion. Segments subequal in width.

Coxal plates on the second to fourth segments, small, subrectangular; on the last three segments triangular, pointed and visible from above.

Abdomen. Lateral sides, except the caudal third, densely setiferous. The segments are marked off anteriorly from the pleotelson by transverse sutures, but in one of the specimens the suture between the third and fourth segment is indistinct in the middle. A fourth segment is indicated by lateral sutures, which in one of the specimens are continued in the middle by a faint groove, thus, as in *Cl. linearis*, marking off a large segment. The first segment is about as long in the middle as the second and third segments together, the second and third are subequal in length. Pleotelson with distal margin very slightly concave in the middle, its posterior part slightly granulate.

Antennulae. Extending to the distal margin of the third peduncular joint of the antennae.

Antennae. As described by HELLER (1865); the second and third peduncular joints are broader than in *Cleantis linearis.* The ventral surface of the last peduncular joint is smooth. Flagellum consisting of a single joint, which is densely provided with »hairs» ventrally.

First and second pairs of maxillae. Inner lobe of the first maxilla provided with three apical setae. Outer lappet of the outer lobe of the second maxilla with five, inner lappet of the same lobe with seven apical setae.

Maxillipeds. Palp five-jointed, with the last joint minute. Epipodite tapering towards the end; distal margin a little more broadly rounded than in *Cleantis linearis.*

Pereiopods. As in *Cleantis linearis.* The fourth pair is the smallest.

Uropods. Exactly as in *Cleantis linearis.* Lateral ramus provided with a long plumose seta at its upper proximal angle. »Secondary» ramus subrectangular furnished with plumose setae on its dorsal and distal margins.

Locality and Material.

Eugenie expedition. South of La Plata, lat. 36° 50′ S., long. 55° 54′ W. Gravel and stones. $^{18}/_{1}$ 1852. 2 females of about equal length, one of them with embryos, the other with the marsupial plates semi-developed. Colour of the specimens white to yellowish. Length of the largest specimen about 15.2 mm.

Distribution. Argentina (Eug. Exp.), Tierra del Fuego (OHLIN 1901), St. Paul (HELLER 1865).

Not previously recorded from Argentina.

B. Subfamily **Glyptonotinae** MIERS.

Diagnosis[1]. Head posteriorly immersed in the first pereion segment, its lateral margins sinuate or straight. Eyes small, situated dorsally but submarginally at the lateral margins, sometimes with a minute ventral portion. Coxal plates marked off by dorsal sutures on the last three pereion segments. Abdomen anteriorly with three or four free segments. First three pairs of pereiopods prehensile, the others ambulatory.

In proposing the subfamily *Mesidoteinae,* RACOVITZA and SEVASTOS (1910) refer to this subfamily the genera *Proidotea* RAC. et SEV., *Mesidotea* RICH. and *Chiridotea* HARGER, thus leaving only the genus *Glyptonotus* EIGHTS and probably *Symnius* RICH[2]. in the subfamily *Glyptonotinae* of MIERS (1881). In its general shape of body and in its maxillipeds *Glyptonotus* agrees with *Mesidotea;* it differs from the *Mesidoteinae* only in the important characteristic of the number of dorsally delimited coxal plates.

The uropods are in *Glyptonotus* characterized by having branches of about equal length. This, however, is also the case in *Proidotea*[3]; in *Chiroditea,* on the other hand, the »secondary» branch is about half as long as the lateral one, and in *Mesidotea* it is still shorter. In *Symnius* RICHARDSON the uropods appear to be devoid of branches; possibly there is a single branch.

---

[1] Cf. MIERS, 1881, p. 9.

[2] *Symnius* RICHARDSON (1904) may probably also be referred to the *Glyptonotinae;* it differs from the *Glyptonotinae* in having only the first pair of pereiopods markedly prehensile; the second pair is faintly prehensile; the third pair remains undescribed.

[3] See RACOVITZA and SEVASTOS, 1910, p. 189, Pl. XVIII.

Glyptonotus EIGHTS, 1833.

MIERS 1881 partim, COLLINGE 1918, nec G. O. SARS 1885.

Diagnosis[1]. Lateral margins of the head sinuate. Abdomen with four free segments anteriorly from the pleotelson. Antennulae small, with a single-jointed flagellum. Antennae with flagellum many-jointed. Palp of maxilliped five-jointed. Uropods with two subequally long branches, each approximately one-fourth the length of the sympodite.

Glyptonotus antarcticus EIGHTS, 1833.

Glyptonotus antarcticus. EIGHTS, 1833, p. 331, 2 Pls.; COLLINGE, 1918, p. 65—72, Pl. I and II, Figs 1—12; TATTERSALL, 1921, p. 232—233, Pl. I, Figs 5 and 6; MONOD, 1931, p. 27.
For further literature see COLLINGE 1918, p. 65 and TATTERSALL 1921, p. 232.

The eyes are small and situated dorsally, but, as has been pointed out by PFEFFER (1887), they have also a ventral portion. In immature specimens taken out of the marsupium this ventral portion of the eye is unpigmented and indistinct.

Localities and Material.

Material collected by E. SÖRLING. South Georgia, Cumberland Bay. Found dead a long way up the shore. 3 jan. 1905. Female with young, 64.5 mm. in length.

Distribution. South Georgia (PFEFFER 1887, TATTERSALL 1921, MONOD 1931), South Shetland Islands (EIGHTS 1833), Graham Region (COLLINGE 1918).

Glyptonotus antarcticus EIGHTS var. acutus RICHARDSON, 1906.

Glyptonotus acutus. RICHARDSON, 1906, p. 10—13, Pl. 1, Figs 2—4.
Glyptonotus antarcticus var. *acutus*. TATTERSALL, 1921, p. 233—235, Pl. IX, Figs. 3—4; PESTA 1928, p. 78 and 81.
For further literature see TATTERSALL, 1921, p. 233.

The small ventral portion of the eye is very indistinct in some of the specimens.

Localities and Material.

Eastern shore of Seymour Island (off Graham Land). Found alive on the ebb-shore. 10—13 febr. 1903. 18 specimens, males and females. Length of the largest specimen 112.5 mm. — Cape Seymour. 16 jan. 1902. Thrown up on the shore. 2 specimens, male and female. Length of largest specimen 98.5 mm. (male).
St. 4. Graham Region, off Paulet Island, lat. 63° 36′ S., long. 55° 48′ W. 100—150 m. Gravel with small stones. $^{15}/_{1}$ 1902. 2 immature specimens. Length of the largest specimen 35 mm.

Distribution. South Georgia (PESTA 1928), Graham Region (RICHARDSON 1906, 1913), Victoria Land (HODGSON 1910, TATTERSALL 1921) Gauss Station (VANHÖFFEN 1914).

Macrochiridotheinae n. subfam.

Diagnosis. Head laterally expanded, its posterior part immersed in the first pereion segment. Body arched with lateral margins bent downwards. Eyes dorsal and small or wanting. Antennulae situated dorsally from the antennae and longer than the antennae; they are furnished with a single-jointed flagellum provided with minute incisions on its

[1] Cf. MIERS 1881, p. 9—10 and COLLINGE 1918, p. 64.

anterior margin or with a two-jointed flagellum, there being, in addition, a minute distal joint. Coxal plates marked off by dorsal sutures on the last three segments of pereion, those on the second to fourth segments distinctly delimited from the tergites, but not visible from above. Abdomen with three free segments anteriorly from the pleotelson. Maxillipeds with a three-jointed palp. First pair of pereiopods markedly subchelate (seroliform). Second and third pair of pereiopods weaker than the first pair, being either prehensile, with the dactylus more or less reduced, or non-prehensile with the dactylus absent.

The morphology of the coxal plates in the *Macrochiridotheinae* differs considerably from that of the other subfamilies of the *Idotheidae*. That development of the coxal plates which is characteristic of the subfamily is found in the two genera *Macrochiridothea* OHLIN (1901) and *Chiriscus* RICHARDSON (1911); these genera agree also in other respects in the characteristics given in the diagnosis. In *Macrochiridothea* the head is furnished with lateral incisions, which are wanting in *Chiriscus*, whilst the second and third pereiopods are prehensile, though weaker than the first pair. In *Chiriscus* they are not prehensile and lack the dactylus. A peculiar feature of *Macrochiridothea* is that the first pereion segment also has a small laterally and ventrally developed coxal plate, and that the uropods have a sympodite $2—2^1/_2$ times as long as the lateral ramus, which is about twice as long as the small »secondary» one. RICHARDSON (1911) did not find any coxal plate on the first pereion segment in *Chiriscus;* the uropods in *Chiriscus* have not been described.

Chaetilia ovata, DANA (1852) should presumably be referred to the new subfamily. It was referred by DANA to a separate family, the *Chaetilidae*. The morphology of the coxal plates in *Chaetilia* is, however, imperfectly known. It agrees with the *Macrochiridotheinae* in having the antennulae situated above the antennae. The uropods of *Chaetilia* are subequal with those of *Macrochiridothea*, but they differ in having a sympodite almost three times as long as the lateral ramus; the »secondary» ramus, on the other hand, is slightly longer than in *Macrochiridothea*. According to DANA[1] the first three pairs of pereiopods in *Chaetilia* are prehensile, and also the fourth is slightly prehensile[2]. The head is only very slightly expanded laterally. If the morphology of the coxae in *Chaetilia* agrees with that of *Macrochiridothea* and *Chiriscus*, the name of the subfamily must be altered to *Chaetilidae* DANA.

Genus **Macrochiridothea** OHLIN, 1901

Diagnosis.[3] Head laterally expanded; each lateral margin with a small incision. First pereion segment with distinctly defined, laterally and ventrally developed coxal plates. Abdomen provided with three free segments anteriorly from the pleotelson, whilst a fourth segment is indicated by a groove. Inner lobe of first maxilla with two apical setae. Second and third pairs of pereiopods prehensile, but with a small and faint dactylus. Uropods with sympodite $2—2^1/_2$ times as long as the lateral ramus, which is about twice as long as the »secondary» ramus.

[1] DANA, 1852, Pl. 46, Fig. 11 c.
[2] DANA, 1852, Pl. 46, Fig. 11 d.
[3] Cf. OHLIN, 1901, p. 286.

Morphology of the coxae in Macrochiridothea.

RACOVITZA and SEVASTOS (1910) emphasize the importance of the morphology of the coxae in the Idotheidean genera for the systematization, and accordingly base their new subfamily *Mesidoteinae* on characteristics derived from the morphology of the coxal plates. They write (p. 197): »La fusion progressive des épimères avec leur somites respectifs est une transformation orthogénétique qui se manifeste dans tous les groupes d'Isopodes. C'est donc une adaption parallèle dont il faut se méfier. Cependant ce caractère est utilisable pour différencier les *Chiridoteini* à sutures épiméro-tergales visibles sur les péréionites II à VII, des *Glyptonotus* qui n'ont de sutures visibles que sur les péréionites V à VII. Chez *Macrochiridothea* il semble, d'après des mauvaises figures de OHLIN (1907), que chez l'une des espèces les sutures présentent les mêmes caractères que chez *Glyptonotus*, et que chez la seconde espèce elles ont complètement disparu.»

Macrochiridothaea and *Chiriscus* have must been referred to a separate subfamily chiefly because of the peculiar development of their coxae, which agrees neither with that of the *Glyptonotinae* nor with that of the *Mesidoteinae*. I have studied the morphology of the coxae in two species of *Macrochiridothea*, viz. *michaelseni* OHLIN[1] and *stebbingi* OHLIN. In the case of *stebbingi* the new variety *multituberculata* was examined. As regards the morphology of the coxae, both the examined species agree with one another in their main features.

In *Macrochiridothea michaelseni*[2] (Fig. 25 a and b) the coxal plates on the last three segments of the pereion are distinctly delimited dorsally, whilst ventrally, as usual, no suture-lines are visible at all. The coxal plate on the last segment is small, developed only dorsally and rounded posteriorly. It is retroverted and covers the anterior half of the first abdominal segment.

Viewed from above (Fig. 25 a), the coxal plate of the sixth segment is large and subtriangular. Its dorsal suture is curved and has the concave side laterally directed. The posterior angle of the coxal plate is produced into a sharp point, and extends somewhat further back than the posterior angle of the seventh coxal plate. Viewed from the lateral side (Fig. 25 b), it appears that the coxal plate also has a ventrally directed lateral part, forming a right angle with the dorsal surface of the coxal plate. Viewed from above (Fig. 25 a), the lateral margin is very slightly elevated into a ridge; viewed from the lateral side (Fig. 25 b), this ridge forms a very distinct longitudinal carina. The flat ventral side of the coxal plate passes over into the sternite without any suture.

The coxal plate on the fifth segment is developed, as on the sixth, but its posterior angle is more obtuse and its dorsal surface is more vaulted; the ventrally directed lateral side of the coxal plate thus forms a more obtuse angle with the dorsal surface; also the longitudinal carina is consequently weaker.

The pereiopods on the fifth to seventh segments are fixed in sockets on the ventral surface of the coxal plates; the basipodite of the pereiopods has its proximal margin emarginate, and the emargination is provided with a spur originating in the posterior margin of the sockets (see Fig. 25 c).

The coxal plates on the second to fourth segments differ from those on the last three segments. As the lateral parts of the segments are markedly vaulted and the

[1] The specimens of *M. michaelseni* were kindly sent to me from the Museum at Hamburg.
[2] Cf. OHLIN (1901, Pl XXI, Fig. 8).

lateral margins of the segments are directed ventrally, the coxal plates are not visible in a dorsal view. They are distinctly delimited from the tergites; posteriorly they have a vertically directed projection, and their height decreases continuously from their posterior to their anterior ends. Their ventral surfaces are not delimited from the sternites.

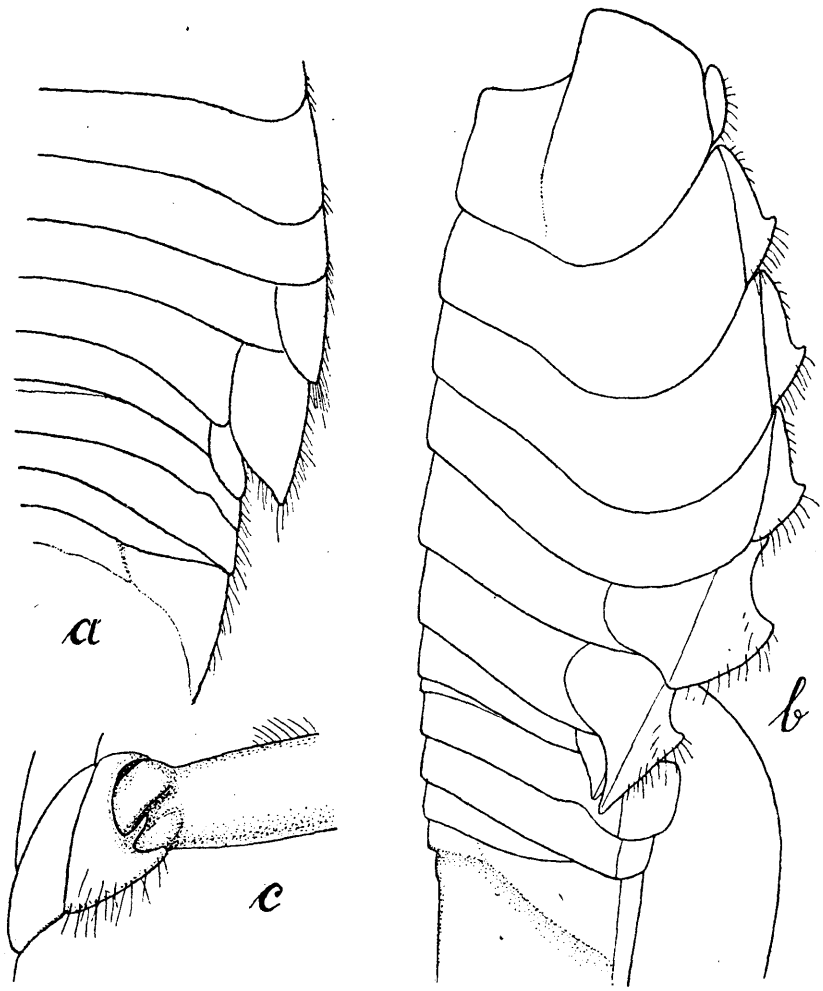

Fig. 25. *Macrochiridothea michaelsenii* OHLIN. a. Right half of the third and following pereion segments and of the anterior part of the abdomen, seen from above, 17 ×. b. Pereion and anterior part of the abdomen in a lateral view, 20 ×. c. Coxal plate of the fourth pereion segment and the proximal part of the basipodite of the right pereiopod, seen from the ventral side, 21 ×.

The pereiopods are attached to the coxal plates much in the same way as on the last three segments, but the spur fitting into the proximal emargination of the basipodite is situated posterio-laterally.

Also on the first segment there is a coxal plate, which is distinctly delimited from the tergite. It is small and sub-rectangular and developed only at the posterior part of the segment. The first pereiopod is attached by the posterior projection of the basipodite

to the coxal plate, by its anterior projection to the tergite itself; the small spur fitting into the emargination between the two proximal projections of the basipodite likewise originates from the tergum. Thus the coxal plate on the first segment can be homologous only with the posterior parts of the coxal plates on the other segments, the anterior part of the original coxa having coalesced with the tergum.

It should be noted that the lateral parts of the second and third abdominal segments (not of the third), as also the lateral parts of the pleotelson, are bent downwards in the same way, like the coxal plates of the fifth and sixth pereion segments. Thus, in a lateral view, a sharp ridge is noticeable on the second and third abdominal segments, as well as on the pleotelson.

Macrochiridothea stebbingi var. *multituberculata* has the last three coxal plates distinctly marked off from the tergum by dorsal sutures.[1] They are similar in shape to those in *M. michaelseni*, the lateral and dorsal surfaces of the fifth and sixth pairs thus forming a sharp angle with each other. They differ from the corresponding coxal plates in *M. michaelseni* in having their posterior angles, viewed dorsally, more pointed and posteriorly somewhat upwardly directed, thus presenting the appearance of spiniform projections. The posterior angles of the coxal plates of the sixth segment extend further back than in *M. michaelseni*[2].

The coxal plates on segments 2—4 have the same shape and position as in *M. michaelseni;* this is also the case with the small coxal plate on the first segment. The pereiopods are likewise fastened in the same way as in that species.

In *M. stebbingi*, var. *multituberculata*, the pereion segments 1—4 differ in shape from the corresponding segments of *M. michaelseni*; their posterio-lateral angles are pointed and upwardly directed, so that they present the appearance of spiniform projections. We thus get a lateral row of spiniform projections on the pereion, but, whereas on the first four segments the spines are situated on the actual segments, on the last three segments the spiniform projections emanate from the coxal plates.

The lateral row of spines is continued also on the first and second abdominal segments. The lateral parts of these segments are bent downwards, and the angle between the dorsal surface and the lateral surface is posteriorly elongated into a retroverted spine-like projection. The pleotelson has on either side two longitudinal submarginal ridges.

Affinities of the subfamily Macrochiridotheinae, with special reference to the genus Macrochiridothea.

The characters of the subfamily *Macrochiridotheinae* indicate that it should be assigned a place intermediate between the *Glyptonotinae* and the *Mesidoteinae*. It agrees with the *Glyptonotinae* in having coxal plates marked off dorsally only on the last three segments of the pereion. On the other hand, the subfamily agrees with the *Mesidoteinae* in having coxal plates developed also on the second to fourth segments, though in contradistinction from the *Mesidoteinae*, the coxal plates of these segments are not visible from above. The genus *Macrochiridothea* agrees with the *Mesidoteinae* in having the lateral margins of the head expanded and cleft.

[1] In the case of *M. stebbingi* these sutures have not been figured by OHLIN (1901). Cf. OHLIN's Pl. XXII, Fig. 9 a.

[2] See OHLIN, 1901, Pl. XXII, Fig. 9.

Features exclusively peculiar to the subfamily are that the coxal plates on segments 2—4 are situated laterally and ventrally; that the sutures which separate them from the tergites are not continuous with those on the last three segments; that the first pereiopods are strongly subchelate and much stronger than the two succeeding, likewise prehensile, pereiopods; and that the dactyli of second and third pereiopods are either more or less vestigial or missing. An important characteristic, which has only been found in *Macrochiridothea*, is that the first pereion segment is provided with a distinct coxal plate, situated laterally and ventrally.

OHLIN (1901) assumed the existence of a close relationship between *Macrochiridothea* and *Chiridotea* in view of the fact that the first three pairs of pereiopods are subchelate and the maxillipeds have a three-jointed palp. RACOVITZA and SEVASTOS (1910), being unable to determine with certainty the morphology of the coxal plates in *Macrochiridothea* from OHLIN's imperfect investigations, contended that *Macrochiridothea* should be assigned to the subfamily *Glyptonotinae*. »*Les Mesidoteini* littoraux septentrionaux sont d'une autre lignée que *Glyptonotus* littoral austral avec lequel ils ont été réunis à tort.»

»C'est également à tort que OHLIN (1907) rapproche son genre subantarctique littoral *Macrochiridothea* de *Chiridotea* littoral subarctique» (RACOVITZA and SEVASTOS, 1910, p. 196).

The morphological type of coxal plates, which is characteristic of the subfamily *Macrochiridotheinae* is not found in the other subfamilies of the *Idotheidae*, but it shows a close affinity to the one characteristic of the family *Arcturidae*. In the Arcturidean genera the coxal plates on segments 2—4 are small and not visible from above; and the sutures which separate them from the tergites are laterally situated, whilst those on the last three segments are large and firmly incorporated with the lateral parts of the tergites. In the spiny species of the genus *Antarcturus*, just as in *Macrochiridothea stebbingi*, the lateral rows of spines on the pereion are situated on the coxal plates of the last three segments, whilst those on the second to fourth segments are mounted on the tergum. In *Antarcturus* the lateral margin of the first pereion segment is always provided with an incision, a feature which may be interpreted as an indication of the coalescence of the coxal plate with the tergite. We thus apparently find a slight trace of at least the posterior part of the coxal plate of the first segment (see Fig. 32 a). In *Antarcturus* the coxal plates on the second to fourth segments are usually provided with an incision, a feature which is common in Isopods and is especially marked in many Parasellids (e. g. *Ianira*).

As pointed out above, the morphology of the coxae in *Macrochiridothea* most closely resembles that which is characteristic of the fam. *Arcturidae*. In both the *Macrochiridotheinae* and the *Arcturidae* the coxae on the second to fourth segments to a great extent form incomplete rings around the proximal ends of the basipodites of the pereiopods. They have thus reached only a comparatively primitive stage of development.[1]

[1] Another explanation of the ventral position of the coxal plates in *Machrochiridothea* is that the pereion is vaulted; the ventral position may thus result from this shape of the pereion. The laterally and ventrally situated coxal plates in *Macrochiridothea* may then be presumed to have arisen from forms with dorsally situated coxal plates, as in *Mesidotea*; that is to say, the vaulting of the pereion, it may be supposed, has given a ventral position to the coxal plates of the second to fourth segments, whilst only the lateral parts of the last three coxal plates have been directed ventrally.

The vestige of a coxal plate found on the first pereion segment in *Macrochiridothea* must likewise be regarded as a primitive feature.

OHLIN'S assumption of a close affinity between *Macrochiridothea* and *Mesidotea* is negatived by the fact that the dorsal sutures of the coxal plates of the last three pereion segments are not in a line with the sutures of the coxal plates of the preceding segments, and that in *Macrochiridothea*, in contradistinction from *Mesidotea*, the posterior part of the coxae remains on the first pereion segment.

The view held by RACOVITZA and SEVASTOS (1910) that *Macrochiridothea* is more closely related to GLYPTONOTUS than to *Mesidotea* is supported by the comparatively primitive development of the coxae on segments 2—4. The coxae on these segments are very small in *Glyptonotus*, though distinctly delimited from the segments. In contradistinction from *Macrochiridothea*, the epimera of segments 2—4 in *Glyptonotus* are mainly formed by the lateral sides of the segments themselves. This feature shows that the transformation of the original coxae of the second to fourth segments in *Macrochiridothea* has preceded along another line of development than in the *Glyptonotinae*. The remnant of a coxal plate on the first segment shows still more clearly that the coxae on this segment have been differently transformed in *Macrochiridothea* and *Glyptonotus*.

Macrochiridothea stebbingi OHLIN var. **multituberculata** n. var.

Pl. I Fig. 7, Text figs. 26 a and b.

Description.

Head. Its general shape agrees with that of the main species, but the head is much shorter, being two and a half to three times as broad as it is long. Posterior part of the head not so deeply immersed intothe first segment of the pereion as is the case in the main species. The dorsal surface of the head is tuberculated, there being about 14 small tuberculae, of which four in the middle are situated in such wise as to form the corners of a square.

Pereion. Lateral margins of the first four segments, as well as those of the coxal plates of the last three segments, provided with short, sparse setae.

The general shape of the pereion agrees with that of the main species. Thus the posterio-lateral angles of the segments are prolonged into hook-like points directed backwards and upwards, which increase in length from the first to the sixth segment; those on the seventh segment being small, with a slightly upward direction and covering the anterior half of the first abdominal segment. The points of the last three segments are situated on the coxal plates. For the coxal plates see p. 108.

The first segment is, measured along the middle line, about as long as the head; it slightly increases in length laterally, so as to be about one-third longer laterally than in the middle. In the main species the segment is about three times longer laterally than in the middle.[1] Second pereion segment about two-thirds as long as the first. The other segments of the pereion are slightly shorter and subequal in length.

The pereion is furnished with a greater number of tuberculae than in the main species, but the larger tuberculae are situated as described by OHLIN in *M. stebbingi*. The first to fourth pereion segments are traversed by nine longitudinal rows of tuberculae, there

[1] See OHLIN, 1901, Pl. XXII, Fig. 9 a.

being nine tuberculae on each of the second to fourth segments; also the large first segment is furnished posteriorly with a transverse row of nine tuberculae. Each segment is furnished in the middle at the posterior margin with a tuberculum, increasing in size up to the seventh segment, where this tuberculum forms a tip directed backwards. On all the segments except the small seventh we find, on either side of the tuberculum in the middle, one dorso-lateral and one lateral tuberculum; on the seventh segment the lateral ones are developed, but the dorso-lateral are missing. On the first to fourth segments we find between the dorsal tuberculum in the middle and the dorso-lateral tuberculae, as also between the latter tuberculae and the lateral ones, yet another tuberculum, thus increasing the number of tuberculae on the segments to nine. The fifth segment, as mentioned above, is furnished only with seven tuberculae, the seventh only with three. On the first segment anteriorly there are three tuberculae in a transverse row, one in the middle and one on either side of the middle line. The first segment is as mentioned above, provided with nine tuberculae in a transverse row along its posterior margin; anteriorly from the lateral ones of these tuberculae there are three more tuberculae in a longitudinal lateral row. There are also other tuberculae on the first segment, but they are more irregularly situated.

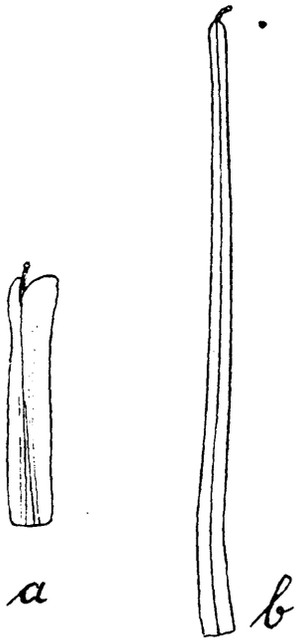

Fig. 26. *Macrochiridothea stebbingi* OHLIN var. *multituberculata* n. var. a. Seta from the lower margin of the propodus of the first pereiopod, 350×. b. Seta from one of the submarginal rows close to the lower margin of the first pereiopod, 350 ×.

Abdomen. The first two segments are bent downwards laterally in a sharp angle to the dorsal surface. Their posterior angles are pointed and directed backwards. The third segment is enclosed by the second and the pleotelson; laterally it is not bent downwards unlike the other two free segments. In the middle it has a small tuberculum.

The anterior part of the pleotelson is elevated and furnished with a conspicuous tuberculum in the middle and two smaller lateral tuberculae on each side, situated close to one another. The pleotelson is furnished with a longitudinal carina along the middle line. The somewhat flattened tip of pleotelson is triangular and terminates in a narrowly rounded, almost pointed end. The lateral margins of the pleotelson, except at the tip, are bent downwards, so that a submarginal ridge is formed, which is only visible in a lateral view. Medially from this ridge there is yet another submarginal ridge, separated from the other by a groove. This latter ridge can be seen when viewed both laterally and from above.

Antennulae. Almost exactly as in the main species, differing only in having the second peduncular joint longer. This joint is longer than the last peduncular joint and the flagellum taken together, and almost twice as long as the third joint; the flagellum has a very minute terminal joint.

Antennae. Almost as the in main species, but the third peduncular joint is slightly longer, being almost as long as the second. The flagellum has seven joints in the right antenna, ten in the left.

Maxillipeds. As the in main species.

First pair of pereiopods. Exactly as in the main species. Lower margin of the propodus covered with irregularly[1] situated short setae. The setae (Fig. 26 a) terminate in three points. On both the caudal and rostral side, close to the lower margin, there is a submarginal row of long setae of the shape illustrated in Fig. 26 b.

The other pereiopods. Most of them broken. Second and sixth pereiopods as in the main species. Dactylus of second pereiopod vestigial.

Uropods. As in the main species. Sympodite about twice as long as the lateral ramus.

Remarks. I have examined only a single specimen, a female with fully developed oostegits (13 mm. in length). As the specimen differs in some features from *Macrochiridothea stebbingi* as described by OHLIN, I have thought it advisable to describe it as a new variety of that species. I am not convinced that the species does not exhibit variation in the characteristics by which the new variety is distinguished.

The variety *multituberculata* differs from the main species in the following characteristics:

1. Eyes totally lacking. In the main species they are small and black.
2. Head measured along the middle line about as long as the first segment. First pereion segment only slightly increasing in length laterally. Of *M. stebbingi* OHLIN says that the head is nearly as long as the first three segments of the pereion; the first pereion segment in the main species is three times as long laterally as in the middle.
3. It is more tuberculated than the main species, the pereion being furnished (on the first four segments) with nine rows of tuberculae.
4. The second peduncular joint of the antennula is longer than the third peduncular joint and the flagellum taken together, whilst in the main species it is only about as long as the third peduncular joint plus half the flagellum.

Macrochiridothea kruimeli (NIERSTRASZ, 1918) comes close to *M. stebbingi* OHLIN. It differs in being less tuberculated, in having the second joint of the antennular peduncle more than twice as long as the third peduncular joint plus the flagellum, and in having a very short antennal flagellum, consisting of two about equally long joints. *M. kruimeli* agrees with *M. stebbingi* var. *multituberculata* in its long first pereion segment. Vestigial eyes are found in this species.

Locality and Material.

Swedish Magellanian Expedition. Falkland Islands. Rocks at Port William. 1907. Female with empty marsupium, 13 mm. in length.

Distribution. Falkland Islands (Sw. Mag. Exp.). Distribution of the main species: Tierra del Fuego (OHLIN 1901) and Falkland Islands (STEBBING 1914).

Fam. **Pseudidotheidae,** OHLIN 1901, STEBBING 1905, BARNARD 1920.

For diagnosis see OHLIN (1901, p. 274) and BARNARD (1920 p. 381). It may be added that the penis is in a single piece, which is distally cleft or bilobate.

[1] Situated approximately in three parallel longitudinal rows.

The family comprises the three genera *Arcturides*[1] STUDER (1884), *Pseudidothea* OHLIN (1901) and *Holidotea* BARNARD (1920). The number of joints in the antennal peduncle is stated by OHLIN (1901), in his diagnosis of the family, to be four. In *Arcturides* there are four joints (STUDER 1884), in *Holidotea*, however, five (BARNARD 1920). In *Pseudidothea* the peduncle also is better described as consisting of five joints, but the short proximal joint is indistinctly marked off on the ventral side from the second (cf. OHLIN, 1901).

The three genera of the family all agree with one another in the structure of the penis, being also in this respect intermediate between the *Idotheidae* and the *Arcturidae*. The penis of *Pseudidothea* is described below. After examining some specimens of *Arcturides cornutus* at the British Museum, I found that the penis is distally cleft also in that genus. In *Holidotea* the penis is distally bilobate.

The uropods of *Arcturides* have not been described. Moreover BARNARD (1920, p. 384) was unable to show whether one or two rami are present in the uropods of. *Holidotea*. In *Pseudidothea*[2] the uropods are characteristic; as in the genus *Neastacilla* (cf. p. 118) the »secondary» ramus is provided with one long seta at the tip. The uropods being unknown in the other genera belonging to the family, it is impossible to say whether this characteristic is common to the whole family.

The fam. *Pseudidotheidae* approaches most closely to the fam. *Amesopodidae*[3], a family containing a single species, likewise intermediate between the *Idotheidae* and the *Arcturidae*.

Genus **Pseudidothea** OHLIN, 1901.

Diagnosis. Head fused with the first segment of the pereion, being separated from the latter only by a faint groove. Eyes small, situated laterally. Coxae developed as incomplete, not very distinct, rings around the proximal ends of the basipodites of the second to seventh pereiopods. All segments of abdomen fused into one piece. Antennae with a two-jointed flagellum. Maxillipeds with a five-jointed palp. First pair of pereiopods prehensile. Penis cleft distally. Second male pleopod with the exopodite transformed and traversed by a diagonal channel. Uropods with two branches, the »secondary» branch being about three-fourths the length of the lateral one and provided with a single large seta at the tip.

OHLIN (1901) points out that the genus may perhaps be congeneric with *Arcturides* STUDER (1884). *Pseudidothea* is, however, clearly distinguished from *Holidotea* (BARNARD, 1920), by having no lateral notches, indicating two anterior segments, on the abdomen, by having the endopodites of the first pair of pleopods well developed, not as in *Holidotea* reduced in size, and by the characteristic shape of the penis. Another characteristic feature of *Pseudidothea* is that the tip of the »secondary» ramus of the uropods is furnished with a long conspicuous seta. Neither *Pseudidothea* nor *Arcturides* have lateral incisions on the abdomen. Whether *Pseudidothea* and *Arcturides* are congeneric cannot be decided without an examination of the uropods and first pair of pleopods in the latter genus.

[1] If the name of the family is to be in conformity with that of the oldest genus within the family it should be *Arcturidoidae* (see OHLIN 1901, p. 276).

[2] See OHLIN, 1901, Pl. XXI, Fig. 6 u^x.

[3] See STEBBING 1905, p. 43—44 and BARNARD 1920, p. 381.

Pseudidothea bonnieri OHLIN, 1901.

Text fig. 27.

Pseudidothea bonnieri. OHLIN, 1901, p. 276—281, Pl. XX and XXI, Figs. 6.

Supplementary Description.

Mandibles. Cutting edge with three teeth. Lacinia (on the left mandible) with three teeth. Posteriorly from the cutting edge on each mandible there are three setae.

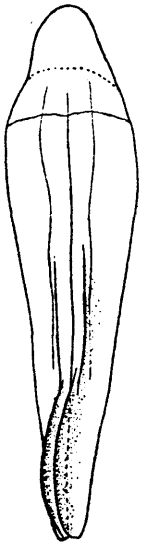

Fig. 27. *Pseudidothea bonnieri*, OHLIN. Penis, 95 ×.

Penis (Fig. 27). Distally cleft, but the two free distal lobes are situated close together. From each of the lobes there projects from the medial margin a thin flap.

Uropods[1]. »Secondary» ramus provided with a long apical seta.

Remarks. According to OHLIN (1901), possibly identical with *Idothea miersi* STUDER[2] (1884).

Localities and Material.

St. 58. South of West Falkland, lat. 52° 29′ S., long. 60° 36′ W. 197 m. Bottom temp. + 4.1°. Sand and gravel. $^{11}/_{9}$ 1902. 5 specimens (1 male, 4 females). Length of largest specimen 8.2 mm. (female with fully developed marsupium).

Distribution. Patagonia (OHLIN 1901), Falkland Islands (Sw. Ant. Exped.).

Not previously recorded from the Falkland Islands.

[1] See OHLIN, 1901, Pl. XXI, Figs. 6 u and 6 u[x].

[2] See OHLIN, 1901, p. 274.

III. Fam. **Arcturidae.**

Syn. *Astacillidae*, STEBBING, 1905.

For diagnosis see G. O. SARS, 1899, p. 86; RICHARDSON, 1905, p. 323.

This family at present includes the following genera: *Astacilla* CORDINER 1795, *Arcturus* LATREILLE 1829, *Arcturella* G. O. SARS 1899, *Antarcturus* ZUR STRASSEN 1902, *Pleuroprion* ZUR STRASSEN 1903 (= *Antares* ZUR STRASSEN 1902), *Arcturina* KOEHLER 1911, *Arcturopsis* KOEHLER 1911 (= *Arctopsis* BARNARD 1920), *Dolichiscus* RICHARDSON 1913, *Neoarcturus* BARNARD 1914, *Idarcturus* BARNARD 1914, *Neastacilla* TATTERSALL 1921, *Pseudarcturella* TATTERSALL 1921, *Parastacilla*, HALE 1924. To these genera I must add the genus *Microarcturus* (see p. 128).

The genera have been established chiefly on the basis of differences in the following morphological features:

1. Shape of body.

The fourth segment of the pereion in *Astacilla, Neastacilla, Arcturella, Arcturopsis, Arcturina* and *Parastacilla* is of a considerably greater length than in the other genera; in *Arcturella, Arcturopsis* and *Arcturina* it is, in the female, also much broader than the other segments. As a rule, there is a marked articulation between the fourth and fifth pereion segments; this articulation is lacking in the genera *Pleuroprion, Neoarcturus* and *Idarcturus*.

2. The degree of fusion between the head and the first pereion segment.

The first pereion segment has become more or less firmly fused with the head. There is but little information regarding this fusion, and the figures do not always afford reliable guidance in this respect.

As a characteristic feature of the genus *Idarcturus*, BARNARD (1914 a, p. 430) states that the head is fused with the first pereion segment, whilst the sutures are distinct laterally.

In *Pleuroprion* the head and the first pereion segment are separated laterally by a groove, which vanishes on the dorsal side (see ZUR STRASSEN, 1902, p. 687).

In the genus *Arcturus* there is at least usually a distinct suture or furrow between the head and the first pereion segment, as can be seen from figures of the different species. In *A. baffini* (SABINE) I found a very distinct dorsal furrow, passing laterally into a distinct suture; the lateral margin had an incision between the head and the first pereion segment.

In *Antarcturus* there is no suture, but generally a shallow groove. In some species the groove has vanished. This is the case also with *floridanis* RICHARDSON[1], the generic position of which is not settled; according to STEBBING (1908) it probably belongs to *Antarcturus*.

In figures of the species for the genera *Arcturella, Arcturopsis, Arcturina* and *Neoarcturus* a distinct suture is seen between the head and the first pereion segment (cf. G. O. SARS 1899, KOEHLER 1911, BARNARD 1914). On examining *Arcturella dilatata* G. O. SARS, I found that such a suture exists exactly as figured by SARS (1899).

As regards *Astacilla*, the observations are incomplete. In G. O. SARS' figures (1899) of *A. longicornis, arietina, affinis* and *pusilla* there is a distinctly marked suture between

[1] RICHARDSON, 1905, Fig. 366.

the head and the first pereion segment. On examining *A. longicornis*, I found that SARS' figure of this species gives a somewhat misleading impression. In reality the first pereion segment is firmly fused with the head, though the segment is separated from the head by a well-marked furrow, which becomes a real suture only quite close to the lateral margin.

TATTERSALL (1921) points out that in his new genus *Neastacilla* the first segment is firmly fused with the head; but as this is the case also in *Astacilla*, the characteristic cannot be taken as the basis of a generic difference between these two genera.

In *Parastacilla* a faint lateral suture is seen between the head and first pereion segment (HALE, 1924, Figs. 1 and 2).

3. Abdomen (number of distinguishable segments and length).

All segments of the abdomen are fused with one another, but generally three anterior segments are indicated, more or less distinctly, by grooves or lateral incisions. Exceptions are:

Pleuroprion with only one anterior segment, and *Idarcturus* without indication of abdominal segmentation.

A very long abdomen is characteristic of the genus *Dolichiscus*, whilst, on the other hand, *Pleuroprion* is characterized by its very short abdomen.

In *Antarcturus* the three anteriorly discernable segments are, as a rule, separated by transverse grooves, but these are sometimes very faint, the three segments thus being indicated almost solely by their transverse spine-rows. In *A. hodgsoni*[1] the usual groove between the third segment and the pleotelson is entirely absent. In *A. brunneus* var. *spinulosus* (Pl. II, Fig. 11) this groove is very faint, sometimes almost entirely missing.

4. Shape of the lateral parts of the head and first pereion segment.

One of the chief differences between *Arcturus* and *Antarcturus* is that in the former genus the lateral margins of the head and first pereion segment are expanded so as to cover the mouth-organs, when viewed laterally. A lateral anteriorly directed lobe from the first pereion segment is characteristic of typical members of the genera *Astacilla*, *Arcturella*, *Arcturopsis* and *Parastacilla*. One important difference between *Neastacilla* and *Astacilla* is that in the former genus the lateral parts of the first pereion segment are not expanded downwards and forwards so as to cover the mouth-organs in a lateral view.

5. Antennulae.

Arcturina, *Arcturopsis* and *Idarcturus* are characterized by having a flagellum provided with very few sensory filaments, all issuing from the tip of the antennular flagellum. In some Arcturidean genera the males have a greater number of sensory filaments than the females. This sexual difference characterizes *Astacilla* (see G. O. SARS, 1899) and *Neastacilla* (see TATTERSALL, 1921), but occurs also in *Antarcturus* and *Microarcturus*, viz. in *A. franklini* and *M. rugosus*.

6. Antennae.

The flagellum of the antennae exhibits two different types in the family *Arcturidae*. In the one type the flagellum is very short and consists normally of three joints, of which

[1] RICHARDSON, 1913, Fig. 1.

the terminal one is furnished with a claw. Such a short, as a rule three-jointed, flagellum is characteristic of the genera *Astacilla*, *Neastacilla* and *Arcturella*, and also of *Pleuroprion*, *Arcturopsis*, *Arcturina* and *Neoarcturus*. It also characterizes the genus *Pseudarcturella*, whose flagellum consists of »two joints terminated by a strong spine» (TATTERSALL, 1921) and *Idarcturus*, of which BARNARD says (1914 a, p. 431) »flagellum a little shorter than 5th joint, 4-jointed in ♂».

A long flagellum consisting of a great many joints occurs in the genera *Arcturus*, *Antarcturus* and *Dolichiscus*. Some of the species referred to *Antarcturus* differ, however, in having a short, as a rule three-jointed, flagellum (exceptionally two- or four-jointed). I refer these species — which also have other characteristics in common — to the separate genus *Microarcturus* (see p. 128).

In the genus *Dolichiscus* the flagellum attains an uncommonly great length.

7. Pereiopods.

The difference in length of the dactylus of the first pereiopods is an essential difference between *Arcturus* and *Antarcturus* (see ZUR STRASSEN, 1902). The first pereiopod is always shorter and broader than the three following pairs, except in the genus *Arcturina* (KOEHLER, 1911), where the first three pairs are broad and strong, similar to each other and different from the weak fourth pair.

8. First pair of pleopods in male.

The genera *Antarcturus*, *Dolichiscus* and *Neoarcturus* are characterized by having the posterior surface of the exopodite traversed by a diagonal furrow. In *Pseudarcturella* the exopodite is bifurcate[1].

9. The presence of a characteristic chitinous outgrowth on the ventral surface of the third and fifth pereion segments, in the male.

The presence of such a chitinous outgrowth in the male is the main characteristic of the genus *Arcturopsis*[2] and distinguishes that genus from the allied genus *Arcturella*. BARNARD (1920) points out that a small chitinous process is present on the ventral surface of the third pereion segment in the male in both *Arcturella danmoniensis* and *dilatata* as also in *Astacilla longicornis*. BARNARD therefore cancels the genus *Arcturopsis* and refers its species to *Arcturella*, with one exception: for the single species referred by KOEHLER to *Arcturopsis*, which has the process on the fifth pereion segment instead of the third, he creates a new genus *Arctopsis*. As this species has already been named *Arcturopsis* by KOEHLER there is no need for a new name.

The genus *Arcturopsis* is, however, even with the restricted definition of BARNARD (1920) not satisfactorily etablished as it is founded solely on characters of the male. Not having examined any species of *Arcturopsis* I have retained the genus, but I am of the opinion that it should be identified with *Arcturella*, as I found that the presence of a chitinous process on the fifth segment of the pereion is a common characteristic of *Antarcturus*. In *Antarcturus* this process is spine-like, not bifurcate as in *Arcturopsis*[3]; bifurcate spines, however, occur exceptionally in *Antarcturus* though they are situated only dorsally. In *Antarcturus*, the whole spine-armature (including the spine on the

[1] TATTERSALL, 1921, Pl. X, Fig. 10.
[2] KOEHLER, 1911, p. 8.
[3] KOEHLER, 1911, Figs 20 and 21.

sternite of the fifth pereion segment) undergoes a considerable individual variation in the same species, sometimes to such an extent that the characteristics of spine-armature are not entirely reliable even as distinguishing features of the species.

10. Number of marsupial plates.

The information supplied by various authors as to the number of marsupial plates in the Arcturidean genera differs greatly[1]. Only few species of different genera have hitherto been sufficiently examined in regard to the number of oostegits. Four pairs appear, however, to be the rule.

This was observed by HANSEN (1916) in regard to *Astacilla* and *Arcturella*, by RICHARDSON (1913) in respeat of *Dolichiscus*, by BARNARD (1920) in regard to *Astacilla* and by TATTERSALL (1921) as regards *Antarcturus*. *Arcturus baffini*, on the other hand, has five pairs of oostegits (HANSEN 1916). HANSEN (1916) states that in *Pleuroprion* the number varies in different species from (usually) five to only four. The number of oostegits therefore presumably cannot be employed as a generic characteristic.

A smaller number than four pairs has not been reliably demonstrated in the case of any Arcturidean species. I found four pairs of oostegits in two species of *Neastacilla*, viz. *falclandica* (OHLIN) and *magellanica* (OHLIN), in six species of *Antarcturus* and three species of *Microarcturus*.

Genus **Neastacilla** TATTERSALL, 1921.

Diagnosis. First pereion segment coalesced with the head, but separated from the head by a mere groove, which is sometimes missing dorsally. Lateral parts of the first segment of the pereion not expanded forwards and downwards. Abdomen with three segments indicated by shallow grooves anteriorly from the pleotelson. Dactylus of first pereiopod not expanded, tapering towards the end; claw missing. »Secondary» ramus of uropod furnished with a very long apical seta.

This genus was diagnosed by TATTERSALL (1921, p. 243) as follows: »The second thoracic somite is fused with the head and its lateral parts are not expanded downwards and forwards to cover partially the mouth-organs. The abdomen is unsegmented, all the segments being fused into one piece.» TATTERSALL refers to the genus only the two species *falclandica* and *magellanica* (OHLIN, 1901).

Astacilla differs from *Neastacilla* in having a short lateral suture between the head and first pereion segment (established in *A. longicornis* (see p. 116); but this is only a minute difference and perhaps varies in different species.

Moreover *Astacilla* differs from *Neastacilla* in having the lateral parts of the first pereion segment expanded. In some species of *Astacilla* these expansions — judging by the literature on the subject — appear to be indistinct or quite absent. Thus *A. mediterranea* KOEHLER[2] has no expansion of the lateral margin of first pereion segment, in e. g. *A. deshaisii* STEPHENSEN[3] this expansion is indistinct.

The degree of fusion of the abdominal segments is little known in *Astacilla*. G. O. SARS (1899) says in his diagnosis of *Astacilla:* »Metasome with only a single segment distinctly separated from the terminal one»; but it can be seen from his figures of *A. lon-*

[1] See HANSEN (1916, p. 191—192) and BARNARD (1920, p. 384—385).
[2] KOEHLER, 1911, Figs. 26 and 28.
[3] STEPHENSEN, 1915, Fig. 9.

gicornis that three anterior segments are indicated, the line between the first and second being only indicated by a lateral incision. On examining *A. longicornis*, I found that the lines between the second and third segments and between the third segment and the pleotelson figured by SARS are not sutures but mere grooves. Thus in *Astacilla longicornis*, exactly as in *Neastacilla*, all abdominal segments are fused into one piece. Otherwise the abdomen is characteristic in the four species of *Astacilla* figured by SARS (1899), as they all have a lateral incision between the first two segments, and the lateral parts of the third segment project freely. This configuration of the abdomen is also found in *A. kerguelensis* VANHÖFFEN. Of the two species *A. marionensis* BEDD. and *kerguelensis* VANH. TATTERSALL (1921, p. 243) says »that they are closely allied to *Neastacilla falclandica*, OHLIN, but the composition of the pleon will not allow them to be referred to my new genus». As has been pointed out above, the differences in the degree of fusion between the abdominal segments in *Astacilla* and *Neastacilla* is only a minute one; in my opinion it should not, for the present be taken as a generic character.

The first pereiopods are characteristic in both *N. falclandica* and *magellanica;* the dactylus is not expanded and tapers towards the setiferous end; claw is absent. In both the species above mentioned the uropods too are very characteristic, the »secondary» ramus being furnished with one long apical seta. The two characteristics just mentioned I have included in my diagnosis.

The genus as restricted by my diagnosis will include the species *falclandica* (OHLIN), *magellanica* (OHLIN) and probably *amblyura* (STEBBING). In the latter species both the first pereiopods[1] and the uropods[2] agree with *Neastacilla*, and STEBBING (1905) points out that no transverse dorsal divisions could be discerned on the abdomen.

It will perhaps be possible to refer *A. marionensis* and *kerguelensis* to *Neastacilla* when their first pereiopods and uropods have been examined. Most of the species referred to *Astacilla*, however, are imperfectly known as regards characteristics which are distinctive of the genus *Neastacilla*. It may therefore be asked whether there may not be some species intermediate between *Astacilla* and *Neastacilla*, thus perhaps rendering the genus *Neastacilla* superfluous.

Neastacilla falclandica (OHLIN, 1901).

Text. figs. 28 a—c.

Astacilla falclandica. OHLIN, 1901, p. 266—267, Pl. XX, Fig. 1.
Astacilla falclandicus. STEBBING, 1914, p. 353.
Neastacilla falclandica. TATTERSALL, 1921, p. 244, Pl. X, Figs. 1—3.

Supplementary Description.

Head and pereion. The specimens are covered with dark dots of pigment. A very shallow groove indicates the dividing line between the first segment and the head. Eyes large and black, subtriangular.

Second and third pereion segments subequal in length, each being shorter than the first segment. The lateral parts of the second and third pereion segments, as well

[1] As regards the first pereiopods of *A. amblyura*, STEBBING (1905, p. 47) states »The seventh joint has one conspicuous spine among many that are smaller».

[2] The "secondary" ramus of the uropod appears to have an additional minute seta on its upper margin (STEBBING, 1905, Pl. XI B. urp.).

as the anterio-lateral parts of the fourth pereion segment are traversed by longitudinal grooves, one groove on each side. No dorsal tuberculae on the fourth pereion segment. Seen from above the anterio-lateral angles of the fourth pereion segment are slightly projecting.

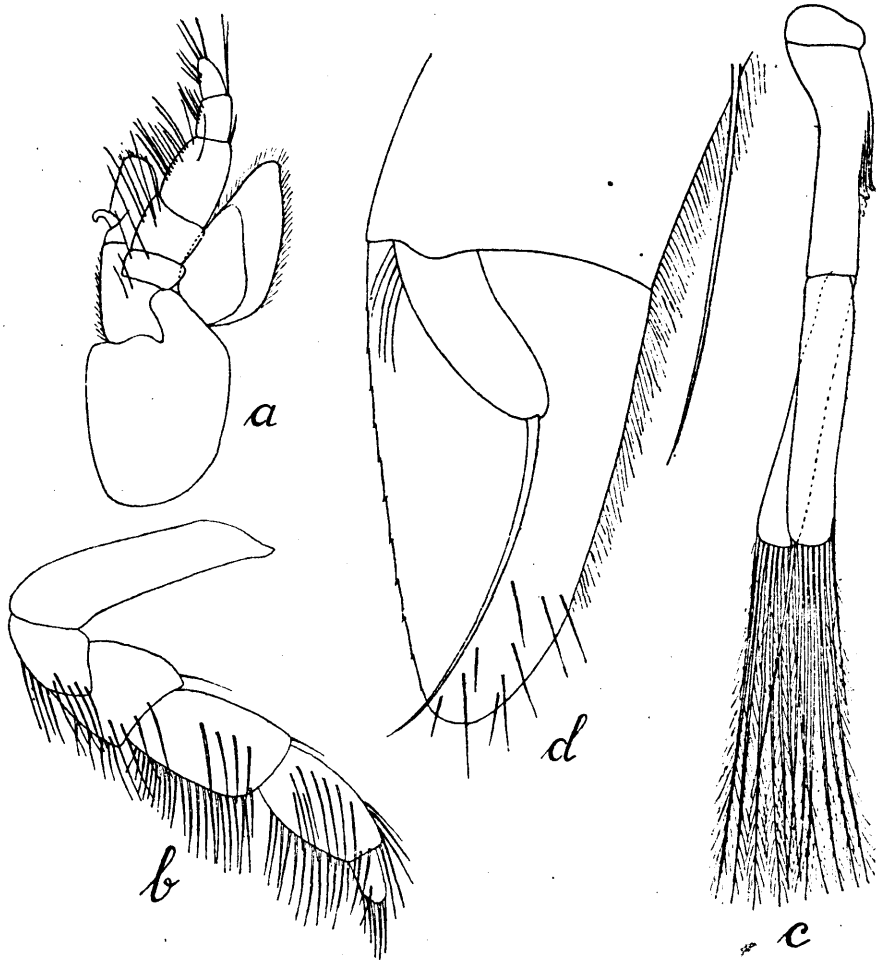

Fig. 28. *Neastacilla falclandica*, (OHLIN). a. Right maxilliped, female with a marsupium, 90 ×. b. Left first pereiopod, female, 90 ×. c. Right first pleopod, female, 90 ×. d. Tip of the right uropod, seen from the inner side, female, 280 ×.

Coxae on the second to fourth pereion segments small and subrectangular, not visible from above; those on the fourth segment almost subquadrate. Coxal plates of last three segments subtriangular.

Antennae. First peduncular joint very short, second about twice as long as the first. Third joint about half as long again as the second, fourth joint twice as long as the third, fifth joint shorter than the fourth and about as long as the second and third joints together. The short flagellum is about two-thirds the length of the last peduncular joint

and consists of three joints, which decrease in length. The third and following joints of the peduncle, as well as the flagellum, are furnished with short and sparse setae.

Maxillipeds (Fig. 28 a). Normal. Coxopodite in the mature female expanded into a thin lobe, directed backwards.

First pair of pereiopods (Fig. 28 b). Dactylus characteristic, tapering towards the end and furnished with setae on its distal margin; claw absent.

First pair of pleopods, female (Fig. 28 c). Coxopodite and basipodite together slightly shorter than the exopodite and endopodite, which are subequal in length. Basipodite with five coupling-setae. For further details see the figure.

Uropods (Fig. 28 d). »Secondary» ramus two-fifths as long as the other ramus, its distal margin provided with a single very long seta, which is almost twice as long as the ramus itself.

Remarks. My specimens differ from those described and figured by OHLIN (1901) and TATTERSALL (1921) in the following details:

1. There is a faint groove between the head and the first pereion segment (not figured by OHLIN (1901, Pl. XX, Fig. 1), but observable in the figure given by TATTERSALL (1921, Pl. X, Fig. 1).

2. The first three abdominal segments are faintly indicated by grooves, as figured by TATTERSALL (1921), but not by OHLIN (1901). Just as in *Astacilla longicornis* (cf. p. 116) a furrow between the first and second segments is developed only laterally, and the third segment protrudes when seen from above laterally like a faint tooth.

3. The third peduncular joint of the antennae is somewhat longer than the second peduncular joint. OHLIN (1901, p. 266) says of the antennae: »second and third joints of about the same length»; in the figure by TATTERSALL (1921, Pl. X, Fig. 1) the third joint is somewhat longer than the second.

STEBBING (1914) is of the opinion that *N. falclandica* (OHLIN) is synonymous with *N. magellanica* (OHLIN).

N. falclandica is closely allied to *Astacilla marionensis*[1] BEDDARD, but it differs in 1) having the fourth pereion segment longer (in *marionensis* the length of the fourth segment is only about equal to the length of the head and the first three segments together); 2) in having the third peduncular joint of the antennae shorter (in *marionensis* the third peduncular joint is almost twice as long as the second); 3) and in being devoid of lateral tuberculae on the pleotelson.

Another closely allied species is *Astacilla kerguelensis*[1] VANHÖFFEN, a species which TATTERSALL (1921) assumes to be identical with *Astacilla marionensis*. This is probably not the case, because *Astacilla kerguelensis* differs from the latter species in having the fourth segment of the pereion longer and about as long as in *Neastacilla falclandica*. *Astacilla kerguelensis* differs from *Neastacilla falclandica* in being larger, attaining a size approximately double that of *N. falclandica*, in having a more distinct groove between the head and first pereion segment, in a slightly different configuration of the first three abdominal segments, and in having a lateral tuberculum on each side of the pleotelson.

Localities and Material.

St. 43. Falkland Islands, Port Louis, Greenpatch, near the bridge, lat. 51° 33′ S., long., 58° 9′ W. A few m. Off the inner border of the *Macrocystis*-zone. Stony bottom with algae. $^{28}/_{7}$ 1902. Female with empty marsupium, length 6 mm.

[1] This species probably belongs to *Neastacilla*.

St. 46. Falkland Islands, Port Louis, Carenage Creek, lat. 51° 32′ S., long. 58° 7′ W. 1 m. Sand bottom with abundant *Codium*. $^{9}/_{8}$ 1902. Ovigerous female, length 5.5 mm.

Distribution. Falkland Islands (OHLIN 1901, STEBBING 1914) New Zealand (TATTERSALL 1921).

Neastacilla magellanica (OHLIN, 1901).

Astacilla magellanica. OHLIN, 1901, p. 267—268, Pl. XX, Fig. 2.

The two specimens of this species which I have examined agree well with the figure and description by OHLIN (1901). The second and third peduncular joints of the antennae are subequal in length. The first pereiopod agrees with the same appendage in *N. falclandica.* The »secondary» ramus of the uropods, just as in *N. falclandica*, is furnished with a long apical seta.

The colour varies slightly in the species. One of the specimens is of a uniform yellowish colour, just as described by OHLIN, but with sparse brownish dots of pigment. The other specimen has a large brownish spot on the fourth segment and is brownish also on the posterior part of the abdomen, and on the uropods. Moreover the specimen is covered with minute dots of brown pigment.

Localities and Material.

St. 39. Falkland Islands, Port William, lat. 51° 40′ S., long. 57° 41′ W. 40 m. Sand and small stones. $^{4}/_{7}$ 1902. Female specimen devoid of marsupial plates, length 5 mm.

St. 53. Falkland Islands, Port William, lat. 51° 40′ S., long. 57° 47′ W. 12 m. Sand and gravel. $^{3}/_{8}$ 1902. Female specimen devoid of marsupial plates, length 4.1 mm.

Distribution. Magellan Straits (OHLIN 1901), Falkland Islands (Sw. Ant. Exped.).

Not previously recorded from the Falkland Islands.

The Antarcturus group and a revision of the genus Antarcturus zur Strassen.

Diagnosis of the group. First pereion segment completely fused with the head, separated from the head by a mere groove. All abdominal segments fused into one piece, but three segments anteriorly from the pleotelson are, as a rule, indicated by shallow grooves. Lateral parts of the head and the first pereion segment not expanded downwards and forwards to cover partially the mouth-organs. Dactylus of the first pereiopod long, forming with the propodus a strong »chela». Exopodite of the first male pleopod transformed and traversed by a diagonal furrow, which is often partially closed so as to form a canal.

The group corresponds to the genus *Antarcturus* as defined by ZUR STRASSEN (1902). It comprises the genus *Antarcturus* ZUR STRASSEN, *Dolichiscus* RICHARDSON and the new genus *Microarcturus*, which is defined below. Though they differ in some features these three genera agree with each other in many essential characters, so that they may be treated together as a group within the family.[1]

As mentioned above (p. 115), the members of the genus *Arcturus*, in contradistinction from those of the *Antarcturus* group, have a distinct furrow between the head and the first pereion segment, sometimes developing laterally into a suture.

[1] In my opinion it is a matter of taste whether they ought to be regarded as subgenera or genera. But as *Dolichiscus* has already been established as a genus, I prefer to give them generic value.

The third abdominal segment in the *Antarcturus* group is, as a rule, not as distinctly marked as the others. Exceptionally it is not demarcated at all (see p. 116). Often it differs in having its median part situated somewhat more anteriorly and marked off by distinct grooves from the lateral parts of the segment.

The genera of the *Antarcturus* group have the first male pleopod characteristically transformed and traversed by a diagonal furrow. The male pleopods in *Arcturus* have not been much studied, but a transformed exopodite of the first pleopod in the male has never been found in the genus. In *Arcturus baffini* (SABINE) I observed that the exopodite of the first pleopod in the adult male was not transformed in the manner which is characteristic of the *Antarcturus* group, and that it was similarly shaped to the corresponding pleopod exopodite of the female.

The *Antarcturus* group comprises a great many species. Most of them have been referred to the genus *Antarcturus*. To *Dolichiscus* belong two species, or according to TATTERSALL (1921) possibly only one.

I shall now make some observation on the general morphology of the species belonging to the *Antarcturus* group and discuss the characters usually taken as a basis for classification.

The segments of the pereion are approximately semi-cylindrical in transverse section, having their dorsal surfaces vaulted, their ventral surfaces flat. The first four segments are furnished with a posterior transverse ridge, which widens out laterally to embrace the whole segment. Thus anteriorly and dorsally a transverse oval area is formed, which is often traversed by a row of spines, or in non-spinous species, by a more or less distinct ridge. The lateral parts of the second, third and fourth segments are somewhat triangularly prolonged, so as to partially project laterally from the pereiopods. These lateral parts are marked off medially by a longitudinal groove. On the first pereion segment the lateral parts are very slightly, or not at all, prolonged outwardly. The first pereion segment differs frequently from the three following in having its anterior dorsal area traversed by two transverse rows of spines or by two transverse ridges.

The coxal plates on the second to fourth segments are not visible in a dorsal view. Seen from the lateral side they are sub-rectangular; seen from the ventral side they form incomplete rings around the proximal ends of the basipodites of the pereiopods; they are fused medially with the sternum. Often they are incompletely divided into two parts by a ventral incision or incomplete suture. The coxal plates of the fourth pereion segments in the ovigerous female have their posterior portions elongated in a median direction into a long prolongation. The points of these, often spine-like, prolongations meet, or almost meet posteriorly from the marsupium. The coxal plates of the second and third segments also are slightly prolonged posteriorly in the ovigerous female (Figs. 36 a, 37 d and 38 d).

On the first pereion segment the coxae are not marked off by sutures from the tergum. As a rule, there is a slight incision in the epimeral margin of the segment (Fig. 32 a) exactly as on the coxal plates of segments 2—4. This incision I deem homologous with the incisions on the coxal plates of the pereion segments 2—4. In that case the tergal border situated posterior to the incision would be homologous with the posterior portion of the second to fourth coxal plates.

The last three pereion segments are traversed by a transverse ridge across the middle. As in the anterior segments, the ridge widens laterally to comprise the whole segment, leaving anteriorly and, in a slight degree posteriorly, a smooth area in the middle.

The coxal plates of the last three segments are large and subtriangular and are marked off by lateral sutures from the tergites.

The development of coxal plates in the *Antarcturus* group is thus rather similar to that in *Macrochiridothea* (see p. 109); it differs in being devoid of delimited coxal plates on the first segment, and in having the coxal plates of the last three segments marked off from the tergum by lateral sutures (not by dorsal).

The above described morphological features of the body are characteristic of the *Antarcturus* group as a whole. In details there are considerable differences in the different species. The most easily discernable of these differences are those of the spine-armature, though as will be shown below, in this respect also the spinous species agree with one another in their main features.

Only seldom are the two terminal spines situated caudally on the pleotelson lacking (e. g. *Microarcturus digitatus*, see p. 167). These, often very large, spines occur also in species where all other real spines are wanting (e. g. *Antarcturus antarcticus*) and where, instead, the body is granulate. Some species are provided with only a few large tuberculae or spines (e. g. *A. americanus*). In most of the species the body, however, is extremely spinous.

Hodgson (1910) distinguishes on the body (in *A. franklini*) three pairs of spines, one pair of dorsal spines, one dorso-lateral and one lateral pair. This spinearrangement occurs in all spinous or tuberculated species, though they may usually in addition be covered with a number of spines or tuberculae, these being, however, usually smaller than the three main pairs of spines. The typical spinearrangement is the following: dorsally on the head there are four spines, situated so as to form the points at the angles of a square. The posterior pair of these spines is often wanting, but in such cases it is, as a rule, indicated by faint tuberculae. Often there is a small spine at the anterio-lateral angle of the head. The posterior ridge of the first four pereion segments is provided on either side of the middle line with one dorsal, one dorso-lateral, and one lateral spine. The lateral spines are situated on the »pleurae».

The same spines occur on the last three pereion segments, one dorsally, one dorso-laterally, and one laterally, situated on either side of the middle, and on the abdomen the larger spines have the same arrangement. But while the lateral spines of the first four segments are situated on the »pleurae», on the last three segments they are situated on the coxal plates. The same arrangement (of tuberculae) was described in *Macrochiridothea stebbingi* (see p. 108). In the spinous species the body is thus traversed by six longitudinal rows of spines. This arrangement is especially prominent in *Microarcturus digitatus*, in which species all the spines on the first five pereion segments are strongly developed, except the dorsal pair on the fifth segment.

In the classification of the species appertaining to the *Antarcturus* group the differences in spine-armature and other differences in the sculpturing of the body have played a leading part. In the few cases where diagnoses of the species have been given (OHLIN 1901, HODGSON 1910) the distinctive characteristics have, almost exclusively (HODGSON 1910), or at any rate to a large extent (OHLIN 1901), been based on the spine-armature or other external sculpturing.

Differences of spine-armature and sculpturing of the body have, however, a very limited value for purposes of classification. As pointed out above, the arrangement of spines is similar in its main features in all the spinous species. In addition, there is considerable individual variation of the spine-armature within the different species. RICHARDSON (1913, p. 11) states that in one specimen of *A. coppingeri* the terminal spines were wanting and of the species *A. furcatus* var. *polaris* the same writer says (p. 10): »Il y a par conséquent, dans cette espèce, une tendance à la variation dans la taille, la position et le nombre des épines.» As regards the additional spines on the body, RICHARDSON (1913) and TATTERSALL (1921) state with reference to *Antarcturus furcatus* var. *polaris* that the small spines increase in number with age.

In all species, in regard to which I have had access to a large number of specimens. I found a considerable variation in the arrangement, number and size of the small spines or tuberculae, even in individuals subequal in size. The occurrence of a small spine at the anterio-lateral angle of the head (a distinction given by HODGSON (1910) as a specific characteristic of *A. franklini*) is liable to individual variation. Thus in *Microarcturus stebbingi* (p. 159) I found a spine in some specimens, whilst in others there was a tuberculum, which in other cases again was entirely missing. In this species the large spines vary even in specimens subequal in size, there being in some specimens only faint tuberculae, in others distinct spines (see p. 159). A similar variation was recorded by BARNARD (1925) in *Microarcturus similis*. This author states (p. 396): »Thus the development of the granules varies, as may also their shape; in some young ♀♀ all the granules are sharply pointed, in other specimens they are all blunt, so that at first sight one would suspect there to be two species[1].»

A still more noticeable variation in the spine-armature has been mentioned as occurring in *Antarcturus franklini*, a species which was described by HODGSON (1902 and 1910) and has since been recorded by RICHARDSON (1913) and TATTERSALL (1921). HODGSON (1910) and TATTERSALL (1921) state, that the females in *Antarcturus franklini* are markedly spinous, whilst in the male sex all spines on the pereion are lacking. After examining material of *A. franklini* at the British Museum, I came, however, to the conclusion that the males previously described as *franklini* must belong to another species, most probably to *A. adaraneus* (HODGSON) (see p. 149).

The differences in spine-armature in different specimens within the same species is only in a very small degree due to sex. Some slight differences in spine-armature between males and females I found, however, to be constant in *Antarcturus franklini*, *Microarcturus stebbingi* and *rugosus*. In these three species the males always differ from the females in having a smaller number of small additional spines on the pereion.

Another character, which varies in individuals of the same species is the length of the fourth segment of pereion (e. g. in *A. furcatus*, p. 130).

Though it slightly varies in length in different individuals, the fourth segment is sometimes consistently longer in the males than in the females. This I found to be the case in *Antarcturus furcatus*, *franklini* and *granulosus* and in *Microarcturus stebbingi*.

[1] A similar considerable variation in spine-armature was early found in the allied genus *Arcturus*: OHLIN (1895) points out that individuals of *Arcturus baffini* vary as regards their spine armature from being strongly spinous to tuberculated. On the basis of his observations OHLIN merged two previously established species into the single species *Arcturus baffini*.

The antennae differ considerably in different species in the length and number of joints of the flagellum. Either the flagellum is long and consists of a great many joints, or short and consist, as a rule, of only three joints.

The mouth-organs are similar in the different species. The mandibles have not been described or figured in detail. The incisive part of the left mandible (Fig. 32 c) has two teeth, a dorsal and a ventral one, and two other teeth in a row laterally from the dorsal tooth. The lacinia is provided with three brown-coloured proximally fused teeth. Dorsally from the lacinia there is a projecting area of thin membranous skin carrying setae. The molar tubercle is strong and subquadrate in a transverse section and, as a rule, dentated distally. In the right mandible (Fig. 32 d) a lacinia is missing. The projecting area of membranous skin behind the incisive part is large and provided with a number of digitiform processes, of which the first three are the strongest, whilst the others are setiform. Since the ventral part of the chitinous projection with its three non-setiform points is thicker than the dorsal part, this anterior part may perhaps correspond to the lacinia on the left mandible. This view is supported by the fact that the three ventral processes of the right mandible are sometimes brown-coloured, as is occassionally also the ventral margin of the projecting area.

The maxillipeds of the ovigerous female in all the species I examined have the coxopodite posteriorly expanded into a thin lobe directed backwards (see Fig. 32 f). In all specimens examined the marsupial plates were four in number (see p. 118).

As has been pointed out above, differences in spine-armature and sculpturing are of very little value for purposes of classification. On the other hand, distinguishing characteristics other than those based on the spine-armature and sculpturing have seldom been found. This is, however, due to the incompleteness of the descriptions. In *Antarcturus* the pereiopods have been incompletely described; the length of the claws is only rarely to be seen from the figures. The pleopods are still incompletely described, and the uropods have been totally neglected.

An examination of the appendages in *Antarcturus* and *Microarcturus* reveals the existence of more important characteristics, more reliable as bases for classification than the spine-armature and sculpturing. The pereiopods, for example are very dissimilar in different species, there being great differences especially in the length of the dactylus and its claws.

As regards the pleopods, the transformed exopodite of the first male pleopod was for the first time observed by BARNARD[1] (1914) in *A. kladophorus*. TATTERSALL[2] (1921) makes out in detail this transformation in *A. furcatus*. He points out that the exopodite is transformed in a similar way in all species of *Antarcturus*[3] and *Dolichiscus*[4] which he examined. All species of *Antarcturus* and *Microarcturus* examined by me have the exopodites transformed in the adult male. I am therefore of the opinion that the transformation of the first male pleopod in the male sex is a character which probably characterizes both these genera.

In details, however, the exopodite of the first male pleopod is dissimilar in the different species. But also the first pleopods in the female, which agree with those of the

[1] BARNARD, 1914, Pl. XVIII, B. plp. 1.

[2] TATTERSALL, 1921, Pl. VIII, Figs. 1 and 2, Text fig. 1 A.

[3] *Antarcturus furcatus, furcatus* var. *polaris*, (?) *adaraneus* (regarded by TATTERSALL, 1921, as the male of *franklini*), *hiemalis, lilliei* and *horridus*.

[4] *Dolichiscus meridionalis*.

male (except that the exopodite has not been transformed), are characters which will be found useful for classification. The basipodite of the first pleopods, for example, differs in regard to the spines on its lateral margin, which differ in size, shape and number in the different species. In the species of *Microarcturus* examined by me, the endopodites of the first pleopods likewise differ, being reduced in size in varying degrees. The first pleopods, especially those of the males, are thus very useful characters for purposes of classification. I observe likewise that the first male pleopod in *Microarcturus stebbingi* was soon typically developed in an immature male, which was lacking in spine-armature and in which the last pereiopod not yet fully out-grown.

The second to fifth pairs of pleopods differ very slightly; as a rule, not at all, in the the different species.

The uropods, on the other hand, serve as a basis for a reliable diagnosis of the species. The size of the exopodite and the number of its apical setae differs in different species. It is a remarkable fact that in one of the species, *Microarcturus digitatus* (p. 171), the "secondary" ramus is absent, a feature which only otherwise occurs in the family *Idotheidae* of the Valvifera.

The penis is, as a rule, similarly shaped in the different species; usually it consists of a chitinous plate which tapers towards the rounded end (Fig. 35 b). In *A. americanus* its shape is divergent (see Fig. 31 e). BARNARD (1925) points out that the penis also in *Microarcturus similis* has a characteristic shape, being distally bilobate (see BARNARD 1925 Fig. 1 pen.).

STEBBING (1908) enumerates the species of *Antarcturus* known up to that date, in a list containing 29 species. To this list he adds with some hesitation the species *floridanus* (RICHARDSON); at the same time he establishes his new species *kladophorus*. Since 1908 the following species have been added: *antarcticus* BOUVIER (1910), *hiemalis* HODGSON (1910), *hodgsoni* RICHARDSON (1913), *gaussianus* and *drygalski* VANHÖFFEN (1914), *lilliei* and *horridus* TATTERSALL (1921), *similis* BARNARD (1925), *belgicae* and *acanthurus* MONOD (1925) and *hirticornis* MONOD (1926).

To the genus *Dolichiscus* only two species have been referred, viz. *pfefferi* RICHARDSON (1913) and *meridionalis* (HODGSON, 1910); TATTERSALL (1921) suspects that these two species are identical.

The genus *Dolichiscus* is characterized by having the antennae provided with a very long flagellum (it being almost twice as long as the last peduncular joint), and by its very long abdomen where the first segment, in particular, is very elongated. In all other characteristics given in the diagnosis of the genus by RICHARDSON (1913) *Dolichiscus* agrees with *Antarcturus*. Thus the characters »Tête unie au premier segment du thorax. Sur la face ventrale du corps se voient de chaque côté un long processus de l'article basal des pattes de la quatrième paire, processus qui se rencontrent presque au centre» (RICHARDSON, 1913, p. 13—14) are likewise characteristic of *Antarcturus* and *Microarcturus*, the last feature being characteristic of the ovigerous female in both genera.

Just as *Dolichiscus* deviates from *Antarcturus* in its long abdomen and long antennal flagellum, so do other species, previously referred to *Antarcturus*, deviate in an exactly the reversal way. These divergent species are provided with short antennae and especially with very short antennal flagellum, consisting, as a rule, of only three joints (exceptionally two or four), a characteristic which is a generic distinction of *Pleuroprion*

and *Astacilla* and some other allied genera (see p. 117). The abdomen in these species is short, reminiscent of that in *Pleuroprion*, but differs in having three distinguishable, though fused, segments anterior to the pleotelson. All the species are moreover, like *Pleuroprion*, small forms. One of the species, *simplicissimus* (WHITELEGGE) is still more like *Pleuroprion;* of this species WHITELEGGE (1904, p. 406) says that it is, exactly as *Pleuroprion* »apparently without the usual power of flexure between the fourth and fifth segments of the peraeon».

For the species hitherto referred to *Antarcturus*, which, owing to their short abdomen and short three-jointed flagellum of the antennae, show a distinct resemblance to the genus *Pleuroprion*, I propose the new genus:

Microarcturus.

Diagnosis. Antennae shorter than the body, with a short flagellum consisting of three joints (occasionally two or four). Abdomen short, never longer than the last four pereion segments together, (pleotelson posteriorly pointed or cleft). Small forms.

In accordance with the diagnosis of *Microarcturus*, the genus *Antarcturus* may be confined to comprise forms which have the antennae at least equal in length to the body, the flagellum of the antennae in adult specimens, at least consisting of five joints, and the length of the abdomen not exceeding the length of the last five segments of the pereion together. As a rule, the length of the antennae is greater in *Antarcturus* than the length of the body, and the flagellum consists of a greater number of joints than five. In *Microarcturus*, on the other hand, the abdomen is, as a rule, still shorter than described in the diagnosis. The three species of *Microarcturus* which I have examined agree with one another in yet another respect. They all have the endopodite of the first pleopod in both male and female more or less reduced in size; its distal margin is furnished with sparse setae or is even smooth, whilst its outer and inner margins are always devoid of setae.

To the new genus *Microarcturus* the following species should be referred: *stebbingi* BEDDARD (1886), *oculatus* BEDDARD (1886), *patagonicus* OHLIN (1901), *kophameli* OHLIN (1901), *simplicissimus* WHITELEGGE (1904), *nodosus* WHITELEGGE (1904), *serratulus* WHITELEGGE (1904), *similis* BARNARD (1925), *acanthurus* MONOD (1925), *hirticornis* MONOD (1926), and the new species *rugosus* and *digitatus* which are described below. To this list should probably be added the species *dentatus* and *alcicornis* WHITELEGGE (1904), in regard to which the number of joints in the antennal flagellum is unknown.

The following are the remaining species of the genus *Antarcturus: coppingeri* (MIERS, 1881) *furcatus* (STUDER, 1882) with its variety *polaris* (HODGSON, 1902), *glacialis* (BEDDARD, 1884), *spinosus* (BEDDARD, 1884), *anna* (BEDDARD, 1884), *cornutus* (BEDDARD, 1884), *spinifrons* (BEDDARD, 1884), *purpureus* (BEDDARD, 1884), *abyssicola* (BEDDARD, 1884), *myops* (BEDDARD, 1884), *studeri* (BEDDARD, 1884), *americanus* (BEDDARD, 1884), *tenuispinis* (BENEDICT, 1898), *multispinis* (BENEDICT, 1898), (?) *floridanus* (RICHARDSON, 1900), *caribbaeus* (RICHARDSON, 1901), *adaraneus* (HODGSON, 1902), *franklini* (HODGSON, 1902), *oryx* ZUR STRASSEN (1902), *kladophorus* STEBBING (1908), *antarcticus* BOUVIER (1910), *hiemalis* HODGSON (1910), *hodgsoni* RICHARDSON (1913), *gaussianus* VANHÖFFEN (1914), *drygalski* VANHÖFFEN (1914), *lilliei* TATTERSALL (1921), *horridus* TATTERSALL (1921), *belgicae* MONOD (1925).

To these 28 species the new species *A. granulosus*, described below (p. 153) should be added.

Genus **Antarctures** ZUR STRASSEN, 1902.

Diagnosis[1]. First pereion segment coalesced with the head, but separated from it by a shallow groove. Lateral margins of the first pereion segment not prolonged downward and forward; the mouth-organs are visible in a lateral view. Abdomen with three segments anterior to the pleotelson, which are indistinctly marked off by shallow grooves. Length of abdomen not exceeding the length of the last five pereion segments together. Antennae at least equal in length to the body; its flagellum in adult specimens consisting of at least five joints. First pereiopods prehensile; carpus small, subtriangular; dactylus long and narrow. Exopodite of the first pleopod in the male provided with a diagonal furrow on its posterior surface.

Antarcturus furcatus (STUDER, 1882).

Text. fig. 29.

Arcturus furcatus. STUDER, 1884, p. 12—15, Pl. I, Figs. 3 a, b, c, d; BEDDARD, 1886, p. 85—86, Pl. XXV, Figs. 6, 7.

Antarcturus furcatus. ZUR STRASSEN, 1902, p. 686; VANHÖFFEN, 1914, p. 519; TATTERSALL, 1921, p. 238—240, Pl. VIII, Figs. 1, 2.

Diagnosis. Body densely covered with spines, most of them small. Dorsal surface of the head with a pair of anterio-laterally directed large spines, situated medially from the eyes; posteriorly from these spines there is a transverse row of small spines. First four pereion segments posteriorly with a pair of large spines on the pleurae and with a pair of dorso-lateral spines, which sometimes are almost as long as the pleural spines. Anteriorly the segments are provided with one or more transverse rows of small spines. Fourth pereion segment subequal in length to the third, but varying in length in different specimens. Ventral surface of seventh pereion segment with a spine or tuberculum in the middle line. Pleotelson covered with small spines, of which a pair of terminal spines are always the largest. Tip of pleotelson between the terminal spines slightly rounded, its distal margin provided with spines. Antennae in adult specimens somewhat longer than the body, in young specimens subequal in length to the body. Second to fourth pereiopods always with a spine at the upper distal angle of the basipodite, ischium, merus and carpus and an additional spine on the upper margin of the basipodite; propodus slightly shorter than the carpus; dactylus slightly more than half as long as the carpus; its dorsal claw very short. Last three pereiopods with dactylus a little less than three fourths the length of the propodus, its dorsal claw short. Basipodite of the first pair of pleopods with 7—10 large lateral spines; exopodite in the male subrectangular, of a uniform width, only very slightly curved, with outer margin slightly concave and inner margin slightly convex; diagonal furrow narrowing towards its distal end; latero-distal angle of the exopodite prolonged into a rounded lobe, issuing from the anterior side; distal margin and distal half of the inner margin of the exopodite furnished with long plumose setae; endopodite in both male and female about as large as the exopodite and furnished with long plumose setae. Lateral ramus of the uropods longer than broad, subtriangular and pointed, more than twice as long as the »secondary» ramus, which has its distal margin provided with four setae.

[1] Cf. ZUR STRASSEN (1902, p. 683—686), STEBBING (1908, p. 52—53).

Supplementary Description.

Body and spine-armature.

Pereion. Ventral surface of the fifth pereion segment in the middle with a spine directed ventrally. Ventral surface of the seventh pereion segment posteriorly in the middle with a spine directed backwards.

Fourth pair of coxal plates in the ovigerous female posteriorly prolonged into medially directed spine-like projections, each furnished with a spine on its ventral margin. In the male the coxal plates of the fourth segment are fused ventrally with the sternum; the ventral surface of the fourth segment is furnished with two spines, probably corresponding to the spines on the spine-like prolongations of the coxal plates in the ovigerous female.

Abdomen. Ventral surface of the first abdominal segment anteriorly with two transverse parallel rows of small spines.

Variation.

The small additional spines on the body vary greatly in number in different specimens, being —, as was pointed out by RICHARDSON (1913) and TATTERSALL (1921) in regard to the var. *polaris* (HODGSON) — less numerous in smaller specimens. The length of the dorso-lateral pairs of spines on the pereion vary, even in specimens subequal in length and from the same locality. Thus in a female with marsupium, 35 mm. in length, they were scarcely longer than the other small spines covering the surface, whilst in another female specimen likewise with marsupium and 25 mm. in length, they were almost as long as the large pleural spines. As a rule, they are a little longer than the small additional spines. The pleotelson has often a pair of dorso-lateral spines longer than the other spines, except the terminal pair; this variation occurs in specimens subequal in size and from the same locality. The length of the terminal pair of spines on the pleotelson likewise varies, being also from $^1/_6$ to $^1/_9$ the length of the specimen.

The length of the fourth segment varies in different specimens. As a general rule, however, in the adult female, it is subequal in length to the third; in the adult male I found it always longer than the third[1]. In the adult female it varied in length, being sometimes longer, sometimes shorter than the third segment. In immature male specimens the third and fourth segments are subequal in length.[2]

Appendages.

Antennulae. Not quite reaching the distal end of the third peduncular joint of the antennae. Second peduncular joint the shortest. Flagellum about $^1/_5$ longer than the second and third peduncular joints together.

Antennae. In adult specimens somewhat longer than the body; in immature specimens subequal in length to the body. Second and third peduncular joints with a row of spines on the caudal (lateral) margin; the spines at the distal angles of the joints being the longest. Flagellum consisting of 9—11 joints (in adult specimens), the first joint long and corresponding to three or four joints.

Maxillipeds. Distal margin of the distal epipodite narrowly rounded. Coxopodite in the ovigerous female in the usual way expanded into a posteriorly directed thin and rounded lobe, which has its inner margin provided with setae.

[1] Cf. STUDER, 1884, Fig. 3.

[2] Cf. TATTERSALL, 1921, Pl. VIII, Figs. 3 and 4.

First pair of pereiopods. Carpus, propodus and dactylus densely covered with long setae, those on the propodus two-pointed and furnished with two rows of short triangular sub-branches. Dactylus approximately two-thirds as long as the propodus. Length of the dorsal claw not quite one-third the length of the dactylus. Ventral claw less than half as long as the dorsal one. Between the claws there is one seta.

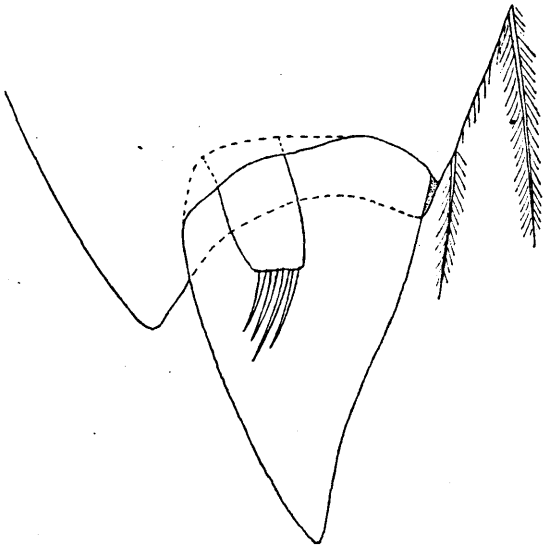

Fig. 29. *Antarcturus furcatus* (STUD.). Tip of the right uropod, seen from the inner side, 95 ×.

Second, third and fourth pairs of pereiopods. Basipodite increasing, but propodus decreasing in length from the second to the fourth pereiopod. Basipodite, ischium, merus and, as a rule, also the propodus, with a spine at its upper distal angle, the basipodite being furnished also with an additional long spine on the upper margin and a few other small spines or tuberculae. Propodus on the second to fourth pereiopods slightly shorter than the carpus, being on the fourth pereiopod about one-third shorter than the carpus. Dactylus slightly more than half the length of the propodus. Length of the dorsal claw (on the second pereiopod) about one-fourth the length of the dactylus; the ventral claw is about one-fourth as long as the dorsal one.

Fifth, sixth and seventh pairs of pereiopods. Basipodite decreasing in length from the fifth to the seventh pereiopod, its upper margin with numerous small spines. Ischium and merus with their upper distal angles prolonged into spines. Dactylus slightly less than three-fourths as long as the propodus. Length of the dorsal claw about one-fifth the length of the dactylus and about five times as long as the minute ventral claw.

First pair of pleopods. Coxopodite about twice as broad as it is long. Basipodite with a lateral row of 5—7 large spines plus 2—5 smaller spines; its inner margin with 11—13 coupling-setae. Exopodite and endopodite in the female large and subequal in length, provided with long plumose setae on the distal, lateral and inner margins.

Exopodite in the adult male subrectangular, of a uniform width, slightly curved, with inner margin slightly convex and outer margin slightly concave, distal margin

convex. Inner proximal angle provided with short »hairs». Distal margin and distal part of the inner margin furnished with long plumose setae, lateral margin with long branchless setae. Diagonal furrow narrowing towards its distal end, almost closed at its mouth. At the latero-distal angle of the exopodite anteriorly from the mouth of the diagonal furrow there is a characteristic projecting rounded lobe.[1] Laterally from the proximal end of the furrow there is a shallow cavity on the posterior surface. Endopodite in the male exactly similar to that in the female.

Second pair of pleopods. Coxopodite short; basipodite wider than it is long, its lateral margin lacking spines, but provided with some plumose setae. Exopodite reaching a little further back than the endopodite. Penial filament (in a 32.5 mm. long specimen) reaching the distal margin of the exopodite.

Third pair of pleopods. Exopodite with a small incision in its lateral margin (as in *A. franklini* (HODGSON), cf. Fig. 33 d); the lateral margin is furnished with some short setae (of the plumose type, but only provided with sparse and short sub-branches).

Fourth and fifth pairs of pleopods. Exopodite and endopodite similar to each other, margins with sparse and short setae.

Uropods (Fig. 29). Lateral surface of the sympodite with scattered spines. Lateral ramus longer than it is broad, with a pointed end, and about three times as long as the small, »secondary» ramus, which is furnished with four branchless setae.

Remarks. TATTERSALL (1921, p. 239) states that *A. furcatus* (STUD.) »is very closely related to *A. polaris* (HODGS.), but may be distinguished from that species by the different armature of the body, the longer second antennae and the longer terminal spines on the abdomen». It may be inferred from the descriptions of *A. furcatus* by STUDER (1884) and BEDDARD (1886), compared with the figures of the same species (STUDER 1884), that in *furcatus* the pairs of dorso-lateral spines on the first four pereion segments attain a considerable size, exactly as in *polaris*. I found that this pair of spines on the first four pereion segments was liable to a considerable degree of variation, being in some specimens almost as large as the pleural pair, whilst in other specimens they were scarcely longer than the small surrounding spinules (see p. 130).

Even the lengths of the terminal spines on the pleotelson vary to a degree which makes it impossible to take the length of these spines as basis of distinction between *furcatus* and *polaris*.

As regards the antennae they are always longer than the body in adult specimens of *furcatus*; in young specimens they are, however, subequal in length to the body. TATTERSALL (1921, Pl. VIII, Figs. 3 and 4) figures a young specimen of *polaris* having in one figure the antennae shorter, in the other slightly longer, than the body. Small specimens of *furcatus* of about the same length as the specimen figured by TATTERSALL agree well with one of his figures and differ only from his other figure in having the antennae slightly longer. HODGSON (1902) figures his species *polaris* with the antennae appreciably shorter than the body.

The first pleopods and the uropods are very characteristic in *A. furcatus*. In the structure of these appendages, as well as in the length of the joints of the pereiopods and their claws, both the young and the adult specimens of *furcatus* agree with one another.

[1] TATTERSALL, 1921, Pl. VIII Fig. 2.

On comparing the pereiopods and the first male pleopods in *furcatus* and in specimens of *polaris* from the British Antarctic Expedition, I could find no differences. The uropods also are very similar in *furcatus* and *polaris*, the only difference being that in *polaris* the »secondary» ramus is slightly longer. In the specimen of *polaris* examined

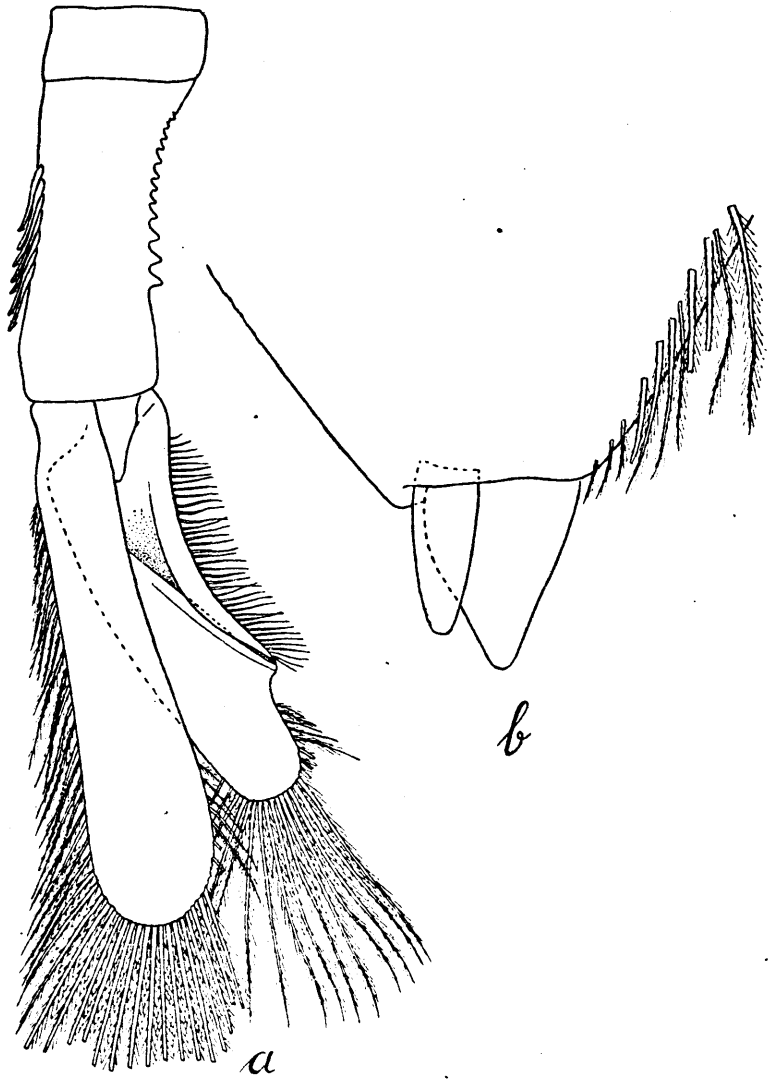

Fig. 30. *Antarcturus spinosus* (Bedd.). a. Right first pleopod of an adult male, from the caudal side (specimen from the »Challenger» Expedition), 15 ×. b. Tip of the right uropod, seen from the inner side (ovigerous female from the »Challenger» Expedition), 35 ×.

it was about half as long as the lateral ramus. The differences between *furcatus* and *polaris* are thus very small, the latter being characterized only by its slightly shorter antennae and by the slightly greater length of the »secondary» ramus of the uropod. In my opinion, therefore, *polaris* should be regarded as a variety of *furcatus*.

I found, on the other hand, that the species *spinosus* (BEDDARD)[1], which is rather similar in its spine-armature to *furcatus*, is easily recognized by its characteristic uropods and first male pleopods (Fig. 30 a and b).

Localities and Material.

St. 6. Graham Region, S. W. of Snow Hill Island, lat. 64° 36′ S., long. 57° 42′ W. 125 m. Stones and gravel. $^{20}/_{1}$ 1902. 9 specimens, males and females. Fourth pereion segment somewhat longer than the third. Dorso-lateral pair of spines on the first four pereion segments as a rule long, but varying in length, being, in the largest (35 mm. long specimen) not much longer than the surrounding small spines. Terminal pair of spines on the pleotelson short, slightly more than half as long as the pleotelson; in some of the specimens a pair of dorso-laterally situated spines on the pleotelson are longer than other spines on the pleotelson, except the terminal pair. Length of the largest specimen 35 mm (female with a fully developed marsupium).

St. 17. Between Falkland Islands and South Georgia, on the Shag Rock Bank, lat. 53° 34′ S., long. 43° 23′ W. 160 m. Bottom temp. + 2.05°. Gravel and sand. $^{19}/_{4}$ 1902. 2 specimens, female with fully developed marsupium and immature specimen. The mature female is 37 mm. in length. Its fourth pereion segment is very slightly longer than the third. Dorso-lateral pair of spines on the first four perion segments not much longer than the small surrounding spines. Terminal pair of spines subequal in length to the pleotelson. A pair of dorso-lateral spines on the pleotelson are longer than the other spines, except the terminal pair. The immature specimen is 11 mm. in length. It agrees with the figure by TATTERSALL (1921, Pl. VIII, Fig. 4.) Antennae slightly longer than the body, no small spines in a transverse row posteriorly on the head. Dorso-lateral pair of spines on the first four pereion segments almost as long as the pleural pair of spines. Pleotelson with a pair of dorso-lateral spines longer than the others, except the terminal pair.

St. 20. South Georgia, Antarctic Bay, lat. 54° 12′ S., long. 36° 50′ W. 250 m. Small stones. $^{6}/_{5}$ 1902. 2 male specimens. Length of largest specimen 32.8 mm. Fourth pereion segment slightly longer than the third. Dorso-lateral pair of spines on the first four pereion segments not very long, but distinctly longer than the surrounding small spines. Terminal spine-pair on the pleotelson not much shorter than the pleotelson. Pleotelson with a pair of dorso-lateral spines very slightly longer than the other small spines.

St. 22. South Georgia, off May Bay, lat. 54° 17′ S., long. 36° 28′ W. 75 m. Bottom temp. + 1.5°. Clay, also some algae. $^{11}/_{5}$ 1902. 2 immature specimens, the longest 11.5 mm in length. Agreeing with the immature specimen of var. *polaris* figured by TATTERSALL (1921), except that the antennae are distinctly longer than the body, being 14 mm in the specimen of a length of 11 mm. No transverse row of spines posteriorly on the head. Dorso-lateral spines on the first four pereion segments long. A pair of dorso-lateral spines on the pleotelson longer than the other spines, except the terminal pair.

St. 34. South Georgia, off the mouth of Cumberland Bay, lat. 54° 11′ S., long. 36° 18′ W. 252—310 m. Bottom temp. + 1.45°. Gray clay with a few stones. $^{5}/_{6}$ 1902. 5 specimens, males, females and immature specimens. Largest specimen, an adult male, 36 mm in length. It has the fourth pereion segment subequal in length to the third; first four pereion segments provided with about two transverse rows of small spines on the posterior transverse elevation. One sub-adult female 28.5 mm in length has long dorso-lateral spines on the first four pereion segments. A young specimen 21.5 mm in length has the fourth segment slightly longer than the third; the dorso-lateral spines on the first four pereion segments are long.

Distribution. Shag Rock Bank (Sw. Ant. Exped.), South Georgia (Sw. Ant. Exped.), Kerguelen (STUDER 1884, BEDDARD 1886, ZUR STRASSEN 1902, VANHÖFFEN 1914), Heard Island (BEDDARD 1886), Antarctic Ocean SSE of Kerguelen lat. 65° 42′ S. long. 79° 49′ E. (BEDDARD 1886), Victoria Land (TATTERSALL 1921), Graham Region (Sw. Ant. Exped.).

The species is here recorded for the first time from Shag Rock Bank, South Georgia and Graham Region.

Distribution of the var. *polaris:* Victoria Land (HODGSON 1902, TATTERSALL 1921), Ross Sea (TATTERSALL 1921), Graham Region (RICHARDSON 1913).

Antarcturus furcatus has been found at varying depths, from 10 m (VANHÖFFEN 1914) up to 1675 fathoms (by the Challenger Expedition, BEDDARD 1886).

The var. *polaris* has not been found at a greater depth than about 300 fathoms (TATTERSALL 1921). RICHARDSON (1913) records it from a depth of 200—460 m.

[1] Some specimens of *spinosus* were examined by me at the British Museum.

Antarcturus americanus (BEDDARD, 1886).

Text. fig. 31 a—g.

Arcturus americanus. BEDDARD, 1886, p. 104—105, Pl. XXIII, Figs. 5—8; BENEDICT, 1898, p. 48; OHLIN, [illegible], p. 269—270, Pl. XX, Fig. 3.

Diagnosis. Body very granular, provided with a pair of small spines on the head and two dorsal spines on each pereion segment. Ventral surface of fifth pereion segment with a spine directed downwards. Ventral surface of seventh pereion segment spineless. Dactylus of the second, third and fourth pereiopods about half as long as the propodus, its dorsal claw only about one-third as long as the dactylus. Seventh pereiopod (especially its last two joints) much stronger in the adult male than in the female. Penis basally broad and sub-rectangular, narrowing abruptly at about two-thirds of its length, where the lateral margins make an incision; distal part of the penis, narrow, tapering towards the rounded end. Lateral margin of the basipodite of the first pleopod in the male with a row of seven spines, in the female with ten spines; exopodite with a very narrow furrow, and with its inner proximal angle smooth and irregularly rounded. Lateral ramus of the uropods distally rounded, slightly more than twice as long as the »secondary» ramus, which is distally truncate and furnished with three ciliated setae.

Supplementary Description.

Coxal plates. Those on the second, third and fourth segments markedly granulate; those on the second and third segments are posteriorly produced into a small triangular elongation directed inwards and downwards. The coxal plates of the fourth pereion segment in the ovigerous female are elongated posteriorly into very long and markedly granulate triangular processes, directed inwards and supporting the marsupium. In the male these processes of the fourth coxal plates are missing and the coxal plates are posteriorly fused with the sternum.

Antennulae. Reaching approximately to the third peduncular joint of the antennae. First joint broad and dorsally granulate, ventrally flat and smooth. Second and third joints smooth and narrower than the first, together about as long as the first joint and subequal in length to the flagellum.

Antennae. First peduncular joint short and not visible from above. Second joint short, broader than the first, markedly granulate, ventrally with one rostral and one caudal triangular distal projection. Third joint about twice as long as the second, dorsally and laterally granulate. Fourth joint about two and a half times as long as the third. Fifth joint very slightly shorter than the fourth. The flagellum is only about one-third the length of the last peduncular joint (in a female having a length of 21.8 mm.).

First pair of pereiopods. Dactylus apart from the claw, not quite two-thirds the length of propodus, and provided with dense and long two-pointed setae, most of the setae furnished with two rows of short triangular sub-branches. Tip of dactylus with one long dorsal and one short ventral claw, the dorsal claw being only about one-fifth longer than the dactylus. Between the claws there are two short setae.

Second pair of pereiopods. Basipodite dorsally and caudally with small spines; ischium, merus and carpus with a dorsal row of small spines. Carpus and propodus subequal in length. Dactylus about half as long as the propodus. Tip of dactylus with three claws, a long dorsal and two short ventral ones; between the claws there are two setae. The dactylus is about three and a half times as long as the dorsal claw.

Third pair of pereiopods (Fig. 31 a). Dorsal surface of the basipodite, ischium, merus and carpus (usually also of the propodus) provided with small spines, varying, however, greatly in different specimens. Propodal joint slightly shorter than the carpus. Dactylus

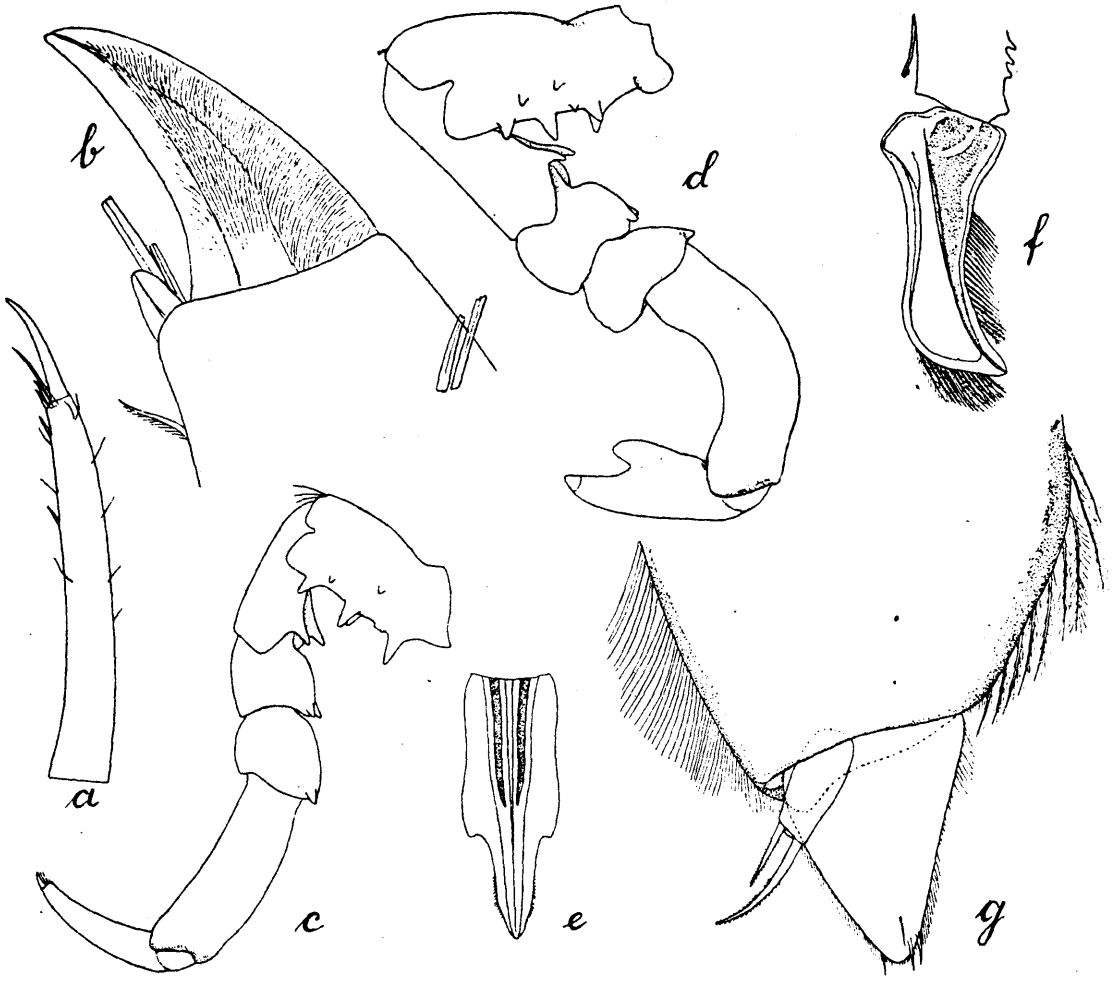

Fig. 31. *Antarcturus americanus* (BEDD.). a. Dactylus of the third periopod, female with a marsupium, 45 ×. b. Tip of the dactylus of the fifth pereiopod, immature female, 240 ×. c. Left seventh pereiopod, seen from the rostral side, in a female (the basipodite figured in a somewhat oblique position), 17 ×. d. Left seventh pereiopod, seen from the rostral side, in an adult male, 17 ×. e. Penis, 17 ×. f. Exopodite and distal part of the basipodite of the first pleopod in an adult male; seen from the caudal side, 17 ×. g. Tip of the right uropod, seen from the inner side (female), 80 ×.

about half as long as propodus. Tip of dactylus with four claws (Fig. 31 a), one long dorsal, two short ventral ones on the distal margin, and an additional claw on the ventral margin at a short distance from the distal margin. Length of the dorsal claw not quite one-third as long as the dactylus. One seta distally.

Fourth pair of pereiopods. Basipodite, ischium, merus and carpus with spines dorsally. In the ovigerous female the basipodite is somewhat curved, closely following the

marsupium. Propodus somewhat shorter than carpus. Dactylus, apart from the claw, slightly more than half the length of propodus. Distal margin of dactylus provided with one long dorsal claw and three small ventral ones. A row of four small claws, of the same kind as those on the distal margin, extends along the distal part of the ventral margin. Length of the dorsal claw about one-fourth the length of the dactylus.

Fifth and sixth pairs of pereiopods. Basipodite with a large number of small spines. Dactylus slightly shorter than the propodus. Tip of dactylus (Fig. 31 b) provided with two claws, a short and strong dorsal one and a minute ventral claw. Between the claws there are two setae. The dorsal claw is not quite one-third as long as the dactylus.

Seventh pair of pereiopods. (Figs. 31 c and d). In the *female* (Fig. 31 c) the seventh pereiopod is similar to the fifth and sixth.

In the *adult male* (Fig. 31 d) it is stronger than in the female, the merus and carpus being broader, and the propodus curved, having its lower margin concave and upper margin convex. The dactylus is broad and flattened and distally bilobate. It is probable that this transformation of the seventh pair of pereiopods in the adult male is due to their being employed for clasping the female during copulation. The curved propodus, especially, indicates that the seventh male pereiopods are used for this purpose.

Penis (Fig. 31 e). Differs from the usual type in the genus. Proximally it is broad. The distal third of the organ narrows abruptly and tapers towards the narrowly rounded end. The vasa deferentia are broad.

First pair of pleopods (Fig. 31 f). Basipodite in the male with a lateral row of seven spines, in the female ten spines. Coupling setae on the inner margin of the basipodite in the male 13, in the female 11. Exopodite of the male (Fig. 31 f) with lateral margin concave, inner margin proximally concave, and distally convex, inner proximal angle irregularly rounded and lacking »hairs». Distal margin furnished with plumose setae; lateral margin also setiferous, but only a few distally situated setae being plumose. The diagonal furrow on the exopodite is very narrow; its mouth is not surrounded by projecting lappets. The exopodite resembles the one found in *Pseudidothea bonnieri* OHLIN[1], but its outer distal angle is not so elongated and more obtuse.

The endopodite is of the usual shape in the genus; in the male it is somewhat longer than the exopodite.

Uropods (Fig. 31 g). Sympodite laterally granulate; distal part of the upper margin setiferous; distal part of the lower margin provided with plumose setae. Lateral ramus subtriangular, distally rounded; margins provided with fine »hairs» and a few short setae proper distally. »Secondary» ramus subrectangular, half as long as the lateral ramus; its distal margin straight and provided with three ciliated setae.

Remarks. The male of the species was first described by OHLIN (1901), who states that the male is smaller than the female and differs from it in having the dorsal rows of spines on the pereion much longer. The male specimen examined by OHLIN (1901), which was 12.5 mm in length, was probably not adult, since the material from the Swedish Antarctic Expedition contains an adult male specimen 25.5 mm long. This

[1] OHLIN, 1901, Pl. XXI, Fig. 6 pl 1 and 6 pl. 12.

large male specimen, however, had no longer spines than the adult female and much shorter ones than in the male specimen examined and figured by OHLIN (1901). This shows that in the species there is noticeable variation in the length of the spines.

BEDDARD (1886) points out that the species comes close to *A. coppingeri* (MIERS), from which species it differs in having two rows of dorsal spines on the pereion. These spines are, however, insignificant in *A. americanus*.

Localities and Material.

St. 39. Falkland Islands, Port William, lat. 51°, 40′ S., long. 57° 41′ W. 40 m. Sand and small stones with algae. $^4/_7$ 1902. 3 specimens: adult male, length 25.5 mm.; ovigerous female, length 25 mm; sub-adult female length 21.8 mm.

Distribution. S. Patagonia (BENEDICT 1898), Eastern part of Magellan Straits (OHLIN 1901), East of Magellan Straits (BEDDARD 1886), Falkland Islands (Sw. Ant. Exped.).

Not previously recorded from the Falkland Islands. Found at depths from 40 m—100 fathoms and known only from a comparatively restricted area. The supposition of OHLIN (1901), that a restricted distribution is characteristic of all species of *Antarcturus* has, however, not proved to be correct.

Antarcturus brunneus (BEDDARD) var. **spinulosus** n. var.

Pl. II, Fig. 11; Text. figs. 32 a—h.

Diagnosis. Body very spinous. Four spines on the dorsal surface of the head are situated in such wise as to form the points at the angles of a square. First four segments of the pereion posteriorly with a dorsal, a dorso-lateral and a lateral pair of spines and with other additional spines; first, second, and third segments with a single spine in the middle line between the dorsal spine-pair. Fourth segment with two spines between the dorsal spine-pair. Second, third and fourth segments with two spines anteriorly on the dorsal area; in addition a number of other spines laterally on the four anterior segments. Last three segments of the pereion posteriorly with a transverse row of eight spines, the most lateral ones situated on the coxal plates. The anterior three segments of abdomen each with a transverse row of about eight spines, the pleotelson covered with spines rather irregularly situated, but always with two short terminal spurs. Fifth pereion segment ventrally with a tuberculum, seventh pereion segment ventrally with a spine, directed backwards. Dactylus of second and third pereiopods rather more than two-thirds the length of the propodus, the dorsal claw about one-fourth the length of the dactylus. Basipodite of the first pleopod with a lateral row of 7 or 8 rather strong spines, those in the middle of the row being strongest. Exopodite of first pleopod in the male slightly tapering towards the broadly rounded end, its inner margin almost straight, its lateral margin concave; diagonal furrow rather broad; a faint rounded lappet on the margin distally from the mouth of the furrow. Lateral ramus of the uropod subtriangular with distal end rounded; »secondary» ramus of the uropod approximately half as long as the lateral ramus and furnished with five setae.

Description.

Types. ♀ with fully developed marsupium, length 16 mm.,
♂ length 11.5 mm.

Body and spine-armature of the female (Pl. I, Fig. 11).

Head. Fused with the first pereion segment but demarcated by a shallow groove, which almost vanishes dorsally. Anterio-lateral angles rounded, furnished with a small spine. Lateral margins straight. Eyes large, black, subtriangular. Dorsal surface of the head with four large spines situated in such wise as to form the points at the angles of a square.

First pereion segment. The posterior transverse elevation is provided with six spines, a dorsal, a dorso-lateral and a lateral (pleural) spine, one on either side of the middle line. The dorsal spines are the largest, the lateral ones the smallest. There is on either side a small spine between the dorso-lateral and the lateral spine, but situated further back. The anterior area is provided with a dorsal spine in the middle. There is, as a rule, no spine in the middle between the dorsal pair of spines on the posterior elevation, but such a spine does occur in one of the specimens. Pleural parts not much projecting, occupying about two-thirds of the segment laterally and anteriorly. Lateral margin with a small ventral incision (Fig. 32 a).

Second pereion segment. With a dorsal, a dorso-lateral and a lateral pair of spines on the posterior elevation, two large spines, on the anterior dorsal area, one on either side of the middle line, and three small spines around the large lateral spines, situated anteriorly, posteriorly and medially of the latter, (the spine situated medially from the lateral spine is likewise situated between the lateral and dorso-lateral spine, but further back). The dorso-lateral spine-pair is larger than that of the first segment. The dorsal pair of spines on the posterior elevation is situated at a greater distance from each other than on the first segment. A large spine is situated in the middle line between the dorsal pair of spines. The triangular pleurae comprise about three-fourths of the length of the segment anteriorly.

Coxal plates with a ventral incision, smooth or with two small submarginal spines.

Third pereion segment. The longest. Spine-armature much as on the third segment, but the posterior dorsal pair of spines, as well as the two spines on the anterior dorsal area, are situated at a greater distance from each other than on the second segment. Around each of the large lateral (pleural) spines there are four small spines, two anteriorly and two posteriorly. Pleurae triangular, comprising anteriorly about two-thirds of the length of the segment.

Coxal plates smooth, divided into an anterior and a posterior part by an incision, which passes into a distinct suture.

Fourth pereion segment. More spinous than the preceding segments. The two spines on the posterior elevation, which on the preceding segments are situated dorsally, are on the fourth segment situated further apart from one another, thus assuming a dorso-lateral position. Between the two spines are two smaller spines close to each other, one on either side of the middle line, instead of the single spine in the middle on the preceding segment. The pair of spines corresponding to the dorso-lateral pair on the preceding segments is represented by two adjacent spines on either side, situated in a longitudinal row. Lateral (or pleural) pair of spines as on the preceding segments. Posteriorly from the lateral spines there are two smaller spines, one of them situated at the posterio-lateral

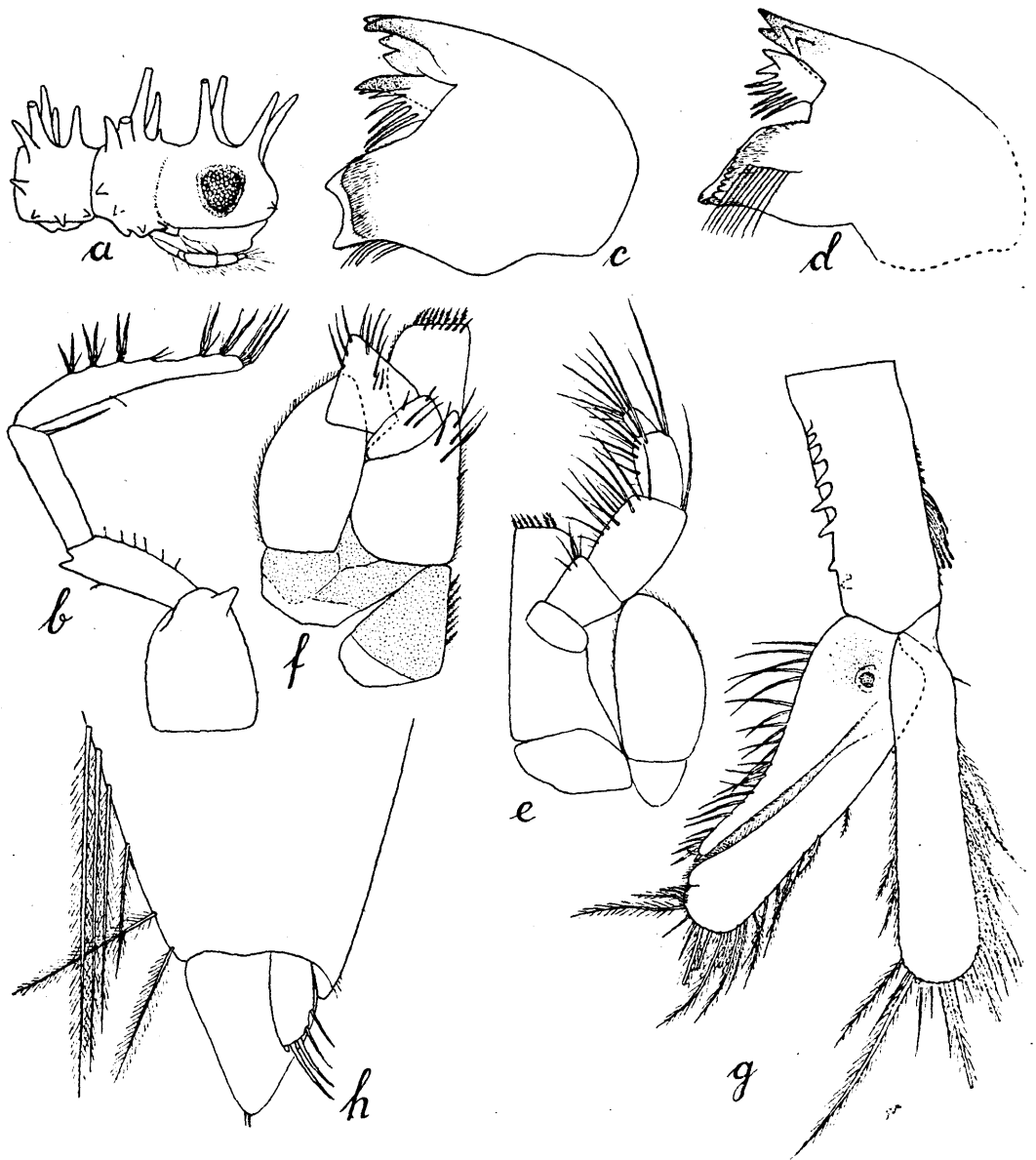

Fig. 32. *Antarcturus brunneus* (BEDD.) var. *spinulosus* n. var. a. Head and first two segments of the pereion, in a lateral view, immature specimen, 8 ×. b. Right antennula, in a female, 30 ×. c. Left mandible, seen from the posterior side, 80 ×. d. Right mandible, seen from the anterior side, 80 ×. e. Left maxilliped, male, 45 ×. f. Right maxilliped (except the last three joints of the palp), female with marsupium, 30 ×. g. First pleopod, (except the coxopodite), in a male; from the caudal side, 35 ×. h. Tip of the left uropod, seen from the inner side, 80 ×.

angle of the segment. The anterior part of the segment is provided with a transverse row of eight spines, of which the two dorsal ones, one on either side of the middle line, are the largest. Two spines of the row on each side are situated anteriorly from the large pleural spines. The pleurae on this segment comprise about half of the lateral sides of the segment.

Coxal plates often spinous, furnished with a small ventral incision. In the female