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## Notes on *SARCOTACES PACIFICUS*, n. sp., with Remarks on its Systematic Position.

By

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*With Plate XVII and 2 Text-figures.*

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### Introduction.

*Sarcotaces*, Olsson is a genus of peculiar parasitic crustaceans living in the muscular or connective tissue of fishes. It is maggot-like in external appearance, having no limbs at all and may measure 5—45 mm. in length. Two species are known thus far, namely, *S. verrucosus* Olsson from *Acanthurus* sp. from the West Indies and *S. arcticus* Collett from *Molva abyssorum* from Norway. The internal structure is only little known, our knowledge about it being entirely due to a short article by Hjort on the latter species published in 1895.<sup>1)</sup> The systematic position in the class is also very uncertain; while Olsson placed the genus in the Copepoda, Hjort suggested that it should be referred to the Cirripedia.

### Material.

The material of the present study was obtained from a specimen of *Antennarius* sp. caught at Misaki and preserved in formalin (Pl. XVII. Fig. 1).

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1) *Vidensk. Skrift. I. Math. naturv. Kl. 2*, pp. 1—14, pls. 2.

Also see Calman, 1909, in *Lankester's A Treatise on Zoology, Pt. VII, Appendiculate, Crustacea*, p. 137.

Fourteen examples were found in this single host, eleven from between the pectoral and anal fins, one from below the right eye, another from the right side of the caudal fin and still another from the top of the head. The parasites live imbedded in the subdermal connective tissue of the fish and appear as prominent bumps on the surface, so that one can count with ease the number of the parasites without cutting them out. Each individual is enclosed in a thin sac made up of the connective tissue of the host fitted fairly tightly to the body. There is no communication whatever from the cavity of the sac to the outside. The space between the parasite and the sac wall is filled with a fluid in which numberless minute eggs of the parasite are found floating.

#### External Features of the Parasite.

The parasite (Fig. 2) is maggot-like in appearance, elongate-ovoid, with a rounded anterior and an acute posterior extremity. It is 5-15 mm. long, and about half as broad at the broadest part near the anterior end. The entire body is divided into eleven segments, of which the anterior six segments no doubt constitute the cephalic and thoracic region and the posterior five the abdominal region. Of the segments, the second to the sixth, are nearly of the same length; the first is about 1.5 times, and the seventh about half, each of those segments. The posterior four segments, the eighth to the eleventh, are very short, the four together being no longer than one of the anterior (2nd—6th) segments.

The surface of the body is covered with small papillae (Figs. 2, 3, *p.*) with a blunt apex, of which those occurring in the posterior segments are smaller and more crowded; the last four segments are entirely naked.

At a point in the first segment, close to the articulating membrane, is found the mouth (Fig. 2, *o*), which is very small as compared with the size of the body. This is situated at the centre of a disc-shaped area consisting of four thickened cuticular plates; two reniform ones occurring on the lateral sides and two rounded ones in front and

behind the mouth aperture. Between the postoral and the lateral plate on each side is inserted a hand-shaped process which consists of a short peduncle and four or five digitiform branches arranged on the apex of the latter (*mx*). This process is possibly the maxilla. On the ventrolateral side of the second segment, close to the posterior margin, occurs another process of a similar shape, which is possibly the vestige of the maxilliped (*mxp*). Otherwise, there are no antennae nor limbs whatever. The colour of the animal is dirty yellow; the papillae are whitish. The parts between the segments are dusky, being covered with a thin articulating membrane and the contents of the alimentary sac showing through.

#### Anatomical and Histological Features.

As mentioned above, the material at my disposal was obtained from a fish preserved in formalin and was not subject to any special treatment, so that all the examples were in a rather poor condition and gave hardly any detail of minute histological features; they however revealed sufficiently the general scheme of the structure of the animal.

The small mouth-aperture leads into a tubular buccal cavity with a rectangular cross-section and lined by a thick cuticular membrane (Fig. 4 and Text-figure 1, *bc*). Some muscles are attached to the wall of the cavity, of which a pair directed posterolaterally are the longest; all of the muscles function without

doubt in expanding the buccal tube. The entrance into the cavity is guarded by a pair of triangular mandibles (*md*), whose apices project

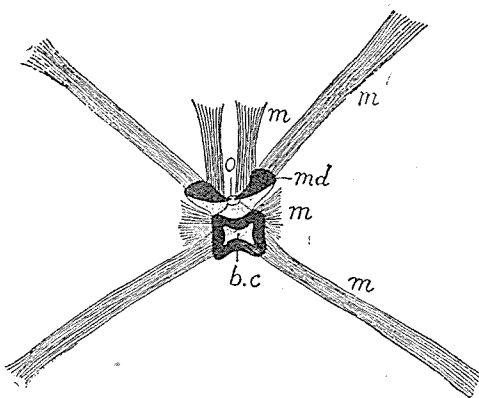


Fig. 1. Front view of parts around oral aperture.  $\times 150$ .

b.c. buccal cavity,  
 m. muscles,  
 md. mandible,  
 o. oral aperture.

from the oral aperture and form together an acute piercing apparatus. The mandible is provided with two pairs of muscles, one directed anteriorly and the other antero-laterally.

The buccal cavity leads into a short oesophagus (Fig. 4, *oe*) directed inwards, which in turn opens into a spacious sac which I shall call the alimentary sac (Figs. 3, 4, *a.s.*). This represents probably both the stomach and the intestine. It occupies by far the greater part of the body cavity, extending from the anterior end of the first segment to the posterior end of the seventh segment where it terminates blindly. The wall of the alimentary sac is made up of tall cylindrical cells showing nuclei in the basal parts. The cavity of the alimentary sac, as well as that of the oesophagus, is filled with particles of blackish colour which seem to be the coagulated blood of the host, intermixed with muscular and connective fibres of the fish. Minute granules of the same colour may be met with in the cells lining the sac and oesophagus.

Next to the alimentary system, the ovary is the most conspicuous organ the animal is provided with (Figs. 2, 3, 5, *ov*). It is a tubule of a dendritic shape, extending throughout the subdermal connective tissue from the first to the seventh segment, showing everywhere profuse branchings and anastomoses and giving rise to a fine network covering the alimentary sac. In sections one can observe that the branches of the ovarian tubule is lined with a thin membrane of connective tissue and has its internal cavity almost filled with eggs in various stages of development.

The oviduct (Figs. 2, 3, *ovd*) takes its rise in the sixth segment from a branch of the ovarian tubule and runs straight backwards along each lateral side of the body and opens to the outside near the anterior margin of the seventh segment. Behind this opening it continues its way round the posterior blind end of the alimentary sac and unites with the corresponding part of the oviduct of the opposite side at the posterior end of the same segment. The oviduct is a thin tube having nearly the same calibre throughout. In the anterior part the wall of the oviduct is fairly high and shows foldings, and the internal lumen

is relatively narrow. In the posterior part, on the contrary, the wall is low and even, and the lumen is comparatively wide.

In the second segment, in the lateral part and close to the anterior margin, occurs on each side a tissue which is most probably the testis (Figs. 2, 5, *te*). This forms a short blind tube a little wider than the ovarian tubule with its cavity filled with sexual cells of the same small size, presumably spermatocytes or spermatids. But I could find no mature spermatozoa. The lumen of the tube is directly continuous with that of the neighbouring branch of the ovarian tubule, so that eggs and sperm-cells may be found together in one and the same part of the tubule.

Between the ovarian network and the alimentary sac are found several muscular bundles (Fig. 3, *m*) which consist of fibres oblique or parallel to the longitudinal axis of the body.

### Nauplius-larva.

In the fluid that fills the space between the body and the enveloping membrane float numberless minute eggs of the parasite. The eggs are spheroidal in shape, about 0,12 mm. in diameter, and contain an embryos at various stages of development, of which the most advanced one is the nauplius-stage. One can also find free nauplious larvae among the eggs.

The nauplius (Text-figure 2) is oval in shape, with a rounded posterior end where a pair of caudal setae are attached. Of the three pairs of appendages, the antennules are uniramous and composed of three segments. Both the antennae and the mandibles, on the other hand, are biramous; the protopodite is two-segmented; the exopodite consists of a basal and four short terminal segments, while the en-

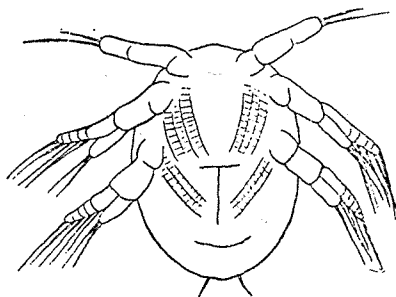


Fig. 2.  
Nauplius-larva.  
× 200

dopodite is not divided into segments.

### Systematical Position.

Regarding the systematic position of *Sarcotaces*, as already mentioned, there have been brought out two opinions one held by Olsson to assign the genus to the Copepoda, and the other suggested by Hjort to refer it to the Cirripedia. Neither of these authors, however, has given the grounds on which his views rest, except that Hjort mentions that the absence of the antero-lateral horns in the nauplius of *Sarcotaces* does not necessarily tell against its affinity to the Cirripedia, inasmuch as there are many forms in this group that are devoid of the horns in question in the larval stage, e. g. *Laura*, *Sylon*.

Now my observations given above seem to show definitely that *Sarcotaces* belongs to the Copepoda and not to the Cirripedia. First, the oviducts open in the first abdominal segment. This is a feature characteristic of the group Copepoda. In the majority of the forms of the Cirripedia the oviducts open in the first thoracic segment. Second, the nauplius-larva has neither the antero-lateral nor the anal spine, and this is again a feature found in the copepod nauplius. The antero-lateral spines are absent rather rarely in the cirriped nauplius and the same seems to be true of the anal spine. The larva of *Laura* has no antero-lateral spines but is provided with the anal spine.<sup>1)</sup> In view of such features in both the adult and the larva of *Sarcotaces*, it seems indisputable that the animal should be ranked among the Copepoda and not among the Cirripedia. Probably it should represent a distinct family in the former group.

As mentioned above, there are two species of *Sarcotaces* thus far known:

1. *S. verrucosus* Olsson,  
length 15 mm. with rudiments of extremities, host *Acanthuri*  
*sp.*, locality West Indies;

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1) De Lacaze—Duthieis 1882, *M.m. Acad. Sci., Paris*, 42, Pl. 8.

2. *S. arcticus* Collett,

length 45 mm., without rudiments of extremities, host *Molva abyssorum*, locality Norway.

The present examples seem to approach the former species both in the presence of the rudiments of extremities and in the size of the body. But they do not conform with Olsson's statement that his species is furnished with a "corolla of setae" at the postero-lateral corner of the mouth. Beside, the host is different and the locality is very far from that of *S. verrucosus*. It seems therefore best to refer the specimens to a distinct and new species of that genus to which I propose to give the name of *Sarcotaces pacificus*.

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**EXPLANATIONS OF PLATE XVII.**

## ABBREVIATIONS.

as.....	alimentary sac,	o .....	oral aperture,
b.c .....	buccal cavity,	o. ovd .....	opening of oviduct,
m.....	muscle,	ov.....	ovary,
md .....	mandible,	ovd .....	oviduct,
m xp.....	maxilliped,	p .....	papillae,
m. x.....	maxilla,	te .....	testis.
oe.....	oesophagus,		

- Fig. 1. *Antennarius* sp., with bumps (×) containing *Sarcotaces*, and a bump (✱) cut open whence a parasite was taken out, ×  $\frac{2}{3}$ .
- Fig. 2. *Sarcotaces pacificus* n, sp., somewhat diagrammatic, × 9.
- Fig. 3. Cross-section in sixth segment; ventral side is below in the figure, × 50.
- Fig. 4. Horizontal section of buccal and oesophageal tube, × 230.
- Fig. 5. Testis and ovary) × 230.
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Fig. 1.

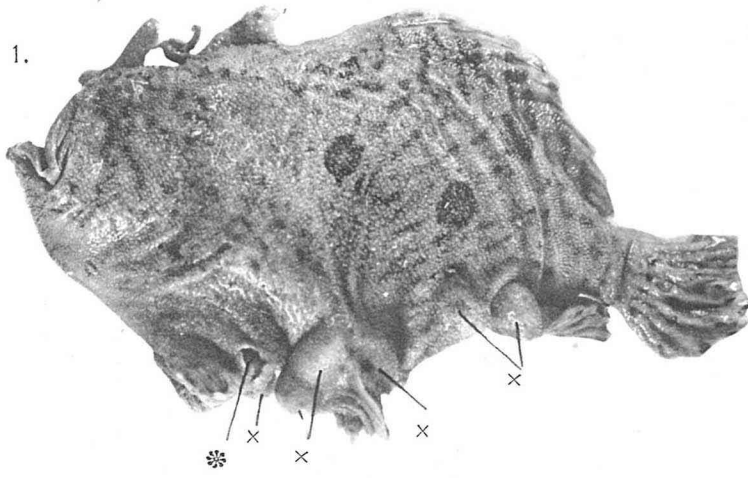


Fig. 3.

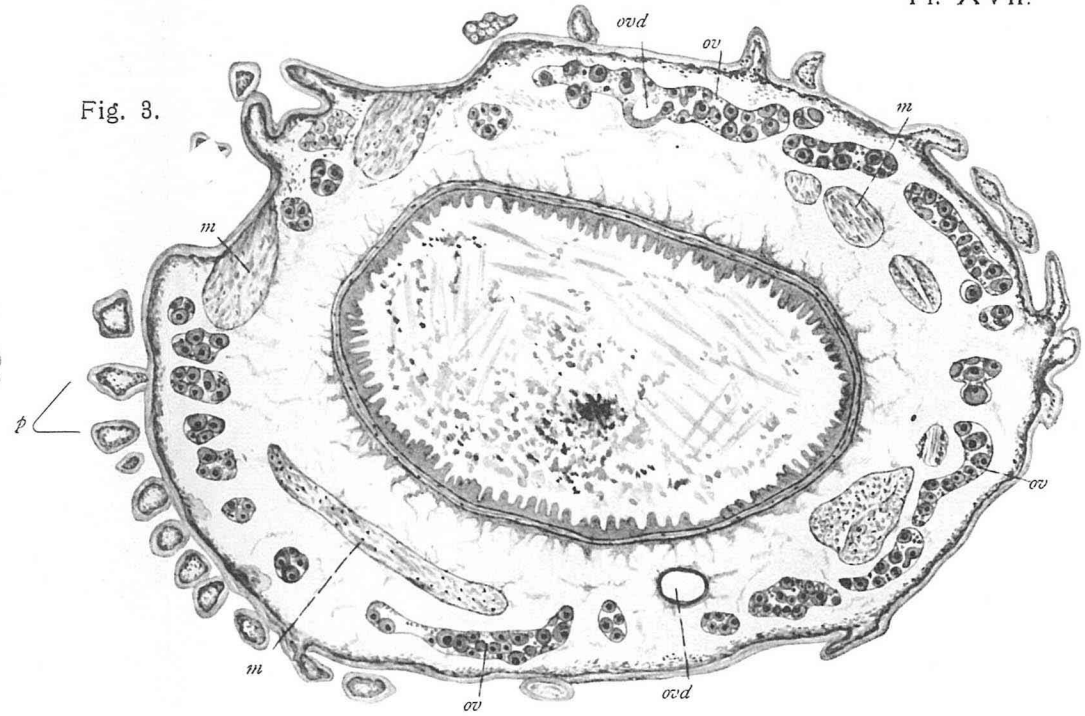


Fig. 2.

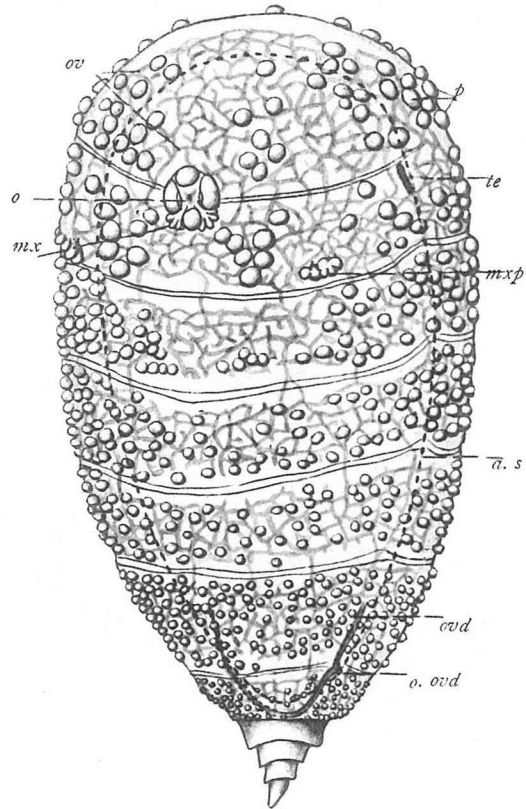


Fig. 4.

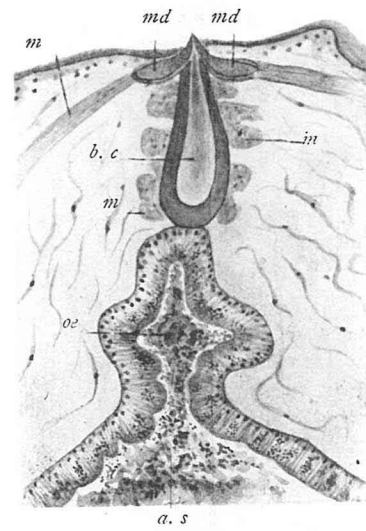


Fig. 5.

