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On Another Form of Acrothoracica, newly found from Formosa

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The new acrothoracican cirriped which I am going to describe was found in the littoral near Takao on the western coast of Formosa. In the early summer of 1938, I made a trip to Formosa to collect littoral cirripeds. While examining this collection some time afterwards, I happened to find some peculiar pits formed in the basal shells of a specimen of the large-sized barnacle, *Balanus tintinnabulum tintinnabulum*. My knowledge of *Berndtia*, a curious acrothoracican dealt with in my former paper (Utinomi 1949), enabled me at once to judge these pits to be due to another acrothoracican. Thus I could secure two specimens of a new acrothoracican.

The material consists of a complete and an incomplete female. No male is found. Owing to the scantiness of the material as well as to poor preservation, I could not observe the internal structure in detail. Still there seems to be no room for doubting that this represents a new type of the Acrothoracica. *Balanodytes taiwanus*, n. g., n. sp. is the name which I propose here for this form.

Description

The preserved specimen is of a shape of an oval and considerably flattened sac, and has a large orifice on the upper rostral side. It is about 2.2 mm long and 1.2 mm wide, and has a 0.8 mm long orifice. The mantle-sac is thin, rather soft, and uniformly yellowish in the preserved state. The orifice (*or*) is nearly one-third as long as the sac, and broadly arched. In the middle of the orifice, on either side, is situated a peculiar hook-like, spiniferous projection (*pr*), about 0.22 mm long, bearing one or two sharp spur-like spines on its lower side near the extremity. The projection is sharply pointed and somewhat three-

cornered. The edges of the orifice on the rostral half from the projection, are moderately thickened, hardened, and bordered by a spiniferous ridge. The part of the ridge from the lower or rostral end of the orifice to the extremity of the hook-like projection is furnished with many chitinous, forked spines (*sp*). The inside of this ridge is

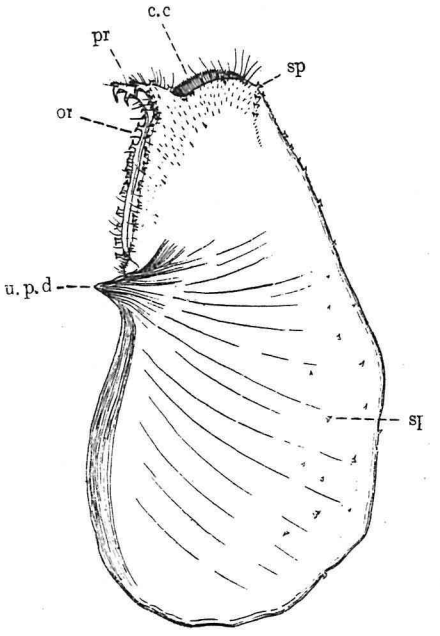

Fig. 1. *Balanodytes taiwanus*, n. g., n. sp. in lateral view. ca ×30. *sp.* spines, others given in Fig. 2.

straight and smooth, but on the carinal half upwards from the hook-like projection, it is fringed with a comb-collar (*c. c*) of flattened setae, as is the case with *Berndtia* and other acrothoracicans. At the rostral end of the orifice is situated between both sides a single rounded knob (*h*), much like that seen in *Koleolepas*, an aberrant form of pedunculate cirripeds. Such a knob is never seen in other acrothoracicans. Moreover, there is a prominent projection (*u. p. d*) pointing upwards immediately below this knob.

The lateral surface of the sac is universally smooth, except for the area around the orifice bearing numerous fine hairs, while the carinal face of the sac is sparsely studded with chitinous, simple or bifid, minute spines (*sp*), similar to those on the outer ridge of the orifice. These spines may serve for triturating the walls of the pit in which the animal is lodged, and are probably periodically renewed by moulting.

As shown in Fig. 2, the general outline of the internal structure is essentially the same as that of other acrothoracicans. The greatest peculiarity of this form is to be found in its muscular system of the mantle and body as well as in its mode of attachment. The body within the sac is comparatively long, and S-shaped in the contracted state. The upper part of the body, namely the prosoma, is widest, provided with a pair of mouth-cirri (c_1), and tapers gradually to the lower or posterior end bearing four pairs of terminal cirri (c_{2-5}). The crooked posterior portion of the body is distinctly 3-segmented, of which segments the preceding two bear no cirri. Of the terminal cirri the last 3 pairs probably belong to the three posterior thoracic segments completely fused. The thoracic cirri are, as usual, biramous and multiarticulated. The mouth-cirri are short and slender ; their anterior

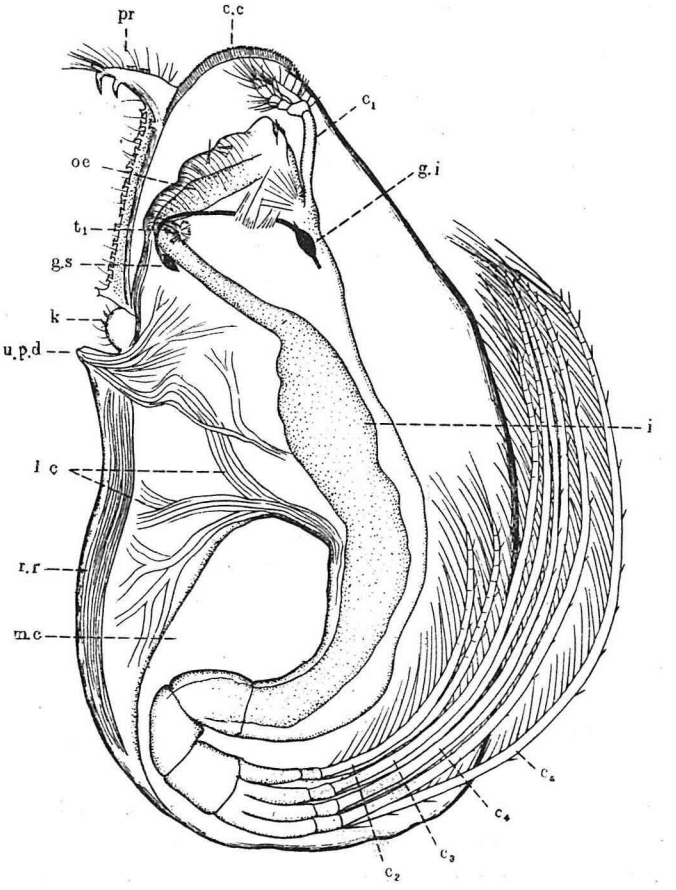

Fig. 2. Inside of the mante-sac of *Balanodytes tawanus*, n. g., n. sp., showing the general structure of the internal body, ca. ×50. c_1 mouth-cirri, c_{2-5} terminal cirri, *c. c.* comb-collar, *g. i* infra-oesophageal ganglion, *g. s* supra-oesophageal ganglion, *i* intestine, *k* orificial knob, *l. c* longissimus corporis, *m. c* mantle-cavity, *oe* oesophagus, *pr* hook-like projection, *r. r* retractor pallii rostralis, t_1 bodily transverse muscle I, *u. p. d* attachment-process.

ramus is 4-segmented, while the posterior ramus is apparently unsegmented. The terminal cirri are almost alike and indistinctly segmented except the terminal portion. The caudal appendage is entirely lacking.

The nervous system could be partially traced. The cerebral or supra-oesophageal (*g. s*) and infra-oesophageal ganglia (*g. i*) are situated at the usual positions. The terminal ganglion, if it occurs, is to be found on the ventral side of the posterior thoracic segment where the body is abruptly bent, but I was unable to confirm its presence. The alimentary canal consists of a narrow oesophagus (*oe*) bent rectangularly at the position of the bodily transverse muscle (t_1) and a broadly expanded intestine of considerable length; no accessory organs could be traced. The ovaries are contained within the thickened wall of the mantle, where this is connected with the body.

The muscular system, when compared with that of *Berndtia*, is much different, and seems to closely resemble that of *Kochlorine*, briefly described by Noll (1875). Of all the peculiarities, as far as could be detected, the presence of a pair of unusually powerful longitudinal muscles (*r. r*), running downwards from the projection just below the orificial knob, is the most remarkable. This muscle seems to correspond with that running downwards from the hanging process ('unpaarer Fortsatz mit den Haken') below the orifice in *Kochlorine*. In this form, however, the projection is merely a process for attachment, and this muscle apparently acts to support or uplift the whole mantle-sac in each perforating movement, and it also gives support for attachment to the longitudinal and transverse muscles of the mantle. Therefore, this longitudinal muscle, to be named the retractor pallii rostralis, differs from the retractor orificii of *Berndtia* both morphologically and functionally.

The mantle is provided with longitudinal and transverse muscles; of the latter muscles, some lying upwards arise from the attachment-process. The longitudinal muscles run outside of the transverse muscles in the rostral half of the mantle, while in the carinal half they lie inside the latter. All these longitudinal muscles are attached to the retractor rostralis on both sides, and run obliquely towards the orifice, but without attaining the edge of the latter. A short lateral bar is present inside of the mantle a little below the orifice.

Most of the main muscles of the body (*l. c*) arise from the attachment-process, but some originate from the thickened wall of the mantle below the attachment-process. These muscles are probably homologous with the retractor corporis found in ordinary cirripeds. Besides, there

is on each side a group of short muscles converging towards the attachment-process which run towards the head portion. These muscles seem to correspond with the retractor I of the body as named by Genthe (1905) for *Trypetesa lampas*.

Remarks

As stated above, the muscular system of the body in this acrothoracican resembles closely that of *Trypetesa*, while that of the mantle is more closely allied to that of *Kochlorine*, especially in the occurrence of the powerful rostral retractor muscle running downwards from the attachment-process. The retractor orificii found in *Berndtia*, *Lithoglyptes* and *Cryptophialus* is entirely lacking in this form, as well as in *Kochlorine*. This may be due to the short distance between the orifice and the attachment-process, and also to the underdevelopment of the attachment-area. Thus, the group Acrothoracica is divisible into two groups in reference to its muscular system.

It is evident that the present form is most closely allied to *Kochlorine* which was originally described by Noll (1875) from specimens living in *Haliotis*-shells from Cadiz, Atlantic coast of Spain as *K. hamata*, and afterwards (1883) recorded by him from the same shells from the Cape of Good Hope, S. Africa as *K. bihamata*. According to Noll (1875), *Kochlorine* is lodged freely within the hole bored into the shell by hanging with a hook-like spine on the upper projection below the orifice to the upper edge of the hole, thus without any ordinary attachment-disc being developed. In this form, however, the corresponding projection bears no hanging hook, and it directly adheres to the wall of the hole bored into the barnacle-shell. No special attachment-disc such as seen in *Berndtia* and other acrothoracicans is formed. Further, *Kochlorine* differs distinctly from the present form in the shape of the paired projections on the edges of the orifice, and in possessing three pairs of terminal cirri and a pair of short caudal appendages.

These characteristic features seem to be sufficient to make this acrothoracican the type of a new genus. Certainly it has several features resembling those in *Kochlorine*, yet it differs from the latter in possessing some clear distinctive peculiarities. Thus, it may be well to institute a new family, Balanodytidae, for the present from and *Kochloline*, instead of the Kochlorinidae given by GRUVEL (1905) and BERNDT (1907) based on the old system of taxonomy. Its diagnosis follows :—

Balanodytidae :— Orifice broadly arched, with a spiniferous pro-

jection on each side of its upper edge. Attachment-area weakly-developed or absent. Fibrous lateral bar present inside of mantle. Cirri indistinctly segmented. Retractor orificii absent, but retractor pallii rostralis present. Dioecious.

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