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A new species of *Balanus* (Crustacea: Cirripedia) from Singapore

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INTRODUCTION

During a study of the ecology of the genus *Balanus* da Costa in Singapore waters, a hitherto undescribed species of the genus was found inhabiting large sponges of the species *Suberites inconstans* (Dendy). The specimens belong to the subgenus *Membranobalanus* Darwin.

DESCRIPTION

***Balanus* (*Membranobalanus*) *basicupula* sp. nov.**

Figures 1 & 2.

Holotype.—Specimen BM. 1965.7.13.1, Labrador Coast, Singapore, 10.8.1960, collected by A. Suhaimi, deposited in the British Museum (Natural History), London.

Paratypes.—Other specimens of the same series and with the same data, deposited in the British Museum (Natural History), BM. 1965.7.13.2; the National Museum, Singapore, NMS. 1304; and the Department of Zoology, University of Singapore.

Other Material.—Numerous specimens from low water spring tide level at Tanjong Gul on the West coast of Singapore, and Pulau Hantu, south of Singapore.

Diagnosis.—A small barnacle belonging to the sub-genus *Membranobalanus*, distinguished by its flexible, membranous shell and large cup-shaped ventral portion.

Size.—Adult specimens examined averaged 1 cm. along the opercular-basal axis and 0.6 cm. in rostro-carinal diameter.

Shape.—The species is elongated along the opercular-basal axis, and laterally somewhat depressed. The basal region is prominently cup-shaped and extends for about twice the height of the shell beyond the basal margin. It is supported by a downward extension of the rostral compartment. Above the basal margin, the shell is conical with a large, entire orifice.

Shell.—The shell is thin, smooth and membranous and there is little internal deposition of calcareous material. The parietes are not porose. The rostral compartment extends far beyond the basal margin of the other compartments. This basal extension tapers downwards, terminating in a point.

Opercular valves.—These are relatively thick and well calcified and possess distinct growth ridges. They are not well sculptured internally. They are attached to the shell very close to the basal margin and are relatively large in comparison with the compartments.

Scutum (fig. 1*b*).—There is no adductor ridge. The articular ridge is moderately developed and has an angular margin and oblique lower edge. The pit for the depressor muscle can be clearly distinguished.

Tergum (fig. 1*c*).—This is usually beaked. The carinal margin is slightly convex and rounded, whilst the scutal margin is concave. The spur is extremely short and it is situated close to the basi-scutal angle. The lower edge of the spur is rounded. The articular ridge is moderately developed.

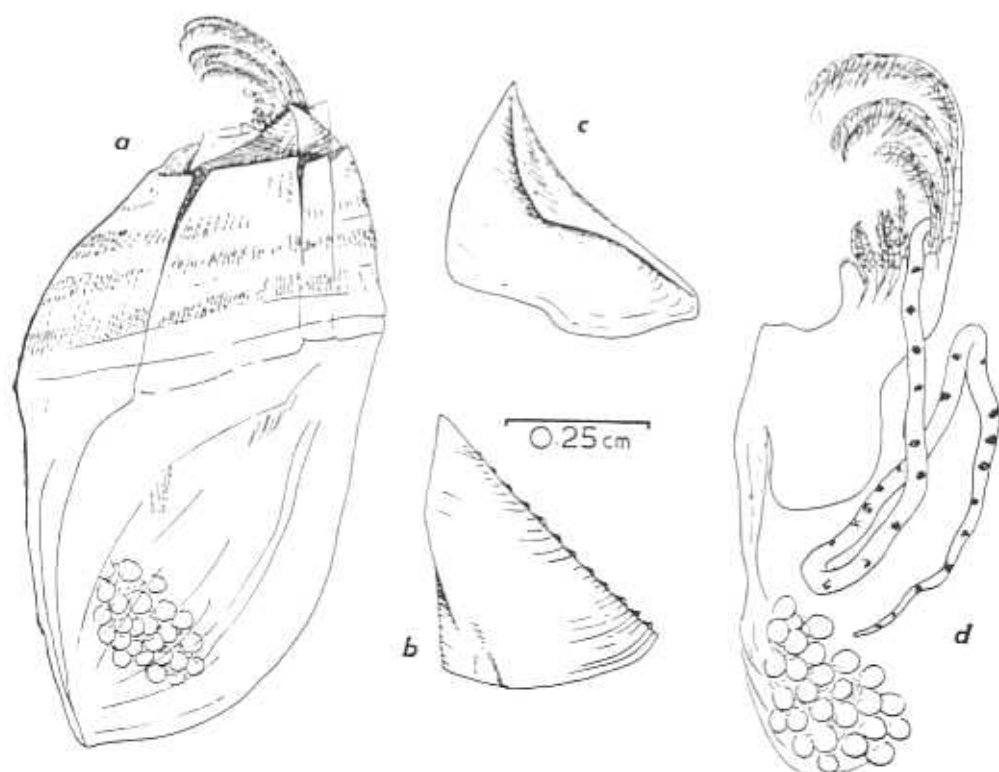


Figure 1. *Balanus* (*Membranobalanus*) *basicupula* sp. nov.; a whole specimen, b scutum (exterior view), c tergum (interior view), d dissected specimen to show the elongated penis.

Mouthparts.—The Labrum (fig. 2*a*) is sub-rhombiform rather than triangular and has rounded lateral edges. The labral notch is not deep. It has a wide entrance on each side of which there are three teeth. The Palpi (fig. 2*b*) are boat shaped with the superior margin somewhat hollowed out. The Mandible (fig. 2*c*) has three large, prominent teeth, placed far apart, and three rudimentary teeth placed close together near to the inferior angle. The last of these rudimentary teeth is pointed, so that the inferior angle appears to be bifurcated. There is a further rudimentary tooth between the second and third prominent teeth. The 1st Maxilla (fig. 2*d*) has a straight free border. No small notch can be seen under the upper pair of spines.

The number of spines between the upper and lower pairs of larger spines varies between four and five. The 2nd Maxilla (fig. 2e) is club-shaped and covered with hairs. A group of numerous hairs extends from part of the outer border over to the whole of the inner border. These hairs are directed inwards and downwards.

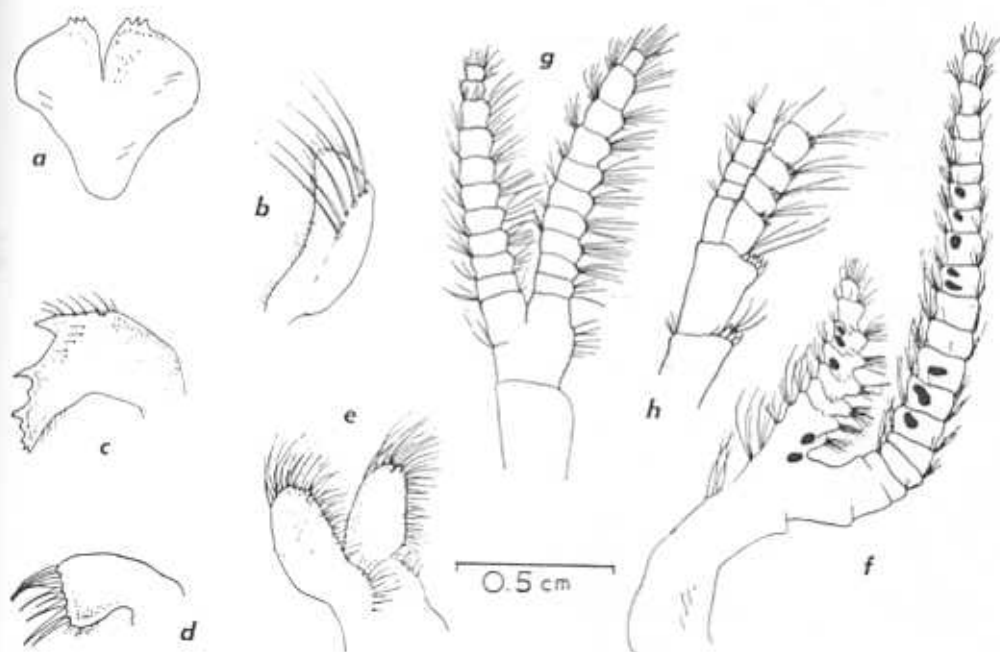


Figure 2. *Balanus (Membranobalanus) basicupula* sp. nov., mouth parts and cirri of thoracic appendages; a labrum, b palpi, c mandible, d first maxilla, e a pair of second maxilla, f first cirri, g third cirri, h part of fourth cirri showing comb-like spines.

Thoracic appendages.—In this section the number of segments given refers to fully adult individuals. In certain instances juveniles may have a smaller number of segments.

The first cirri have two very unequal rami of 8 and 19 segments. The segments of the shorter ramus are protuberant on the anterior face. There are tufts of hairs on the distal edges of these protuberances. The second cirri have equal or sub-equal rami with either 10 segments in each ramus or 8 in the shorter and 10 in the longer. The segments are rounded and covered with hairs. The 3rd cirri resemble the second pair but have longer rami each containing 13 segments. The fourth cirri (fig. 2f) are about twice as long as the third pair and have sub-equal rami. The shorter ramus has 25 segments, whilst the longer has 30 segments. The shorter ramus, which is the endopodite, bears a prominent comb-like row of spines at the anterior distal border of each segment. The segments of the exopodite lack these spines. The fifth and sixth cirri resemble the fourth but are longer and with more numerous segments and do not possess spines of any kind on either ramus.

Male genitalia (fig. 1d).—The penis is probosciform and extremely long, being about three times the length of the last pair of cirri. It is folded three times beneath the body. There are no spines on the dorsal basal region and the distal portion is not covered with hairs or bristles.

Affinities.—This species falls into the subgenus *Membranobalanus* Darwin, since it possesses the following characters:—(1) the base is membranous and cup-shaped; (2) the rostral compartment extends beyond the basal margin; (3) the parietes are not porose; (4) the radii are poorly developed; (5) the adductor ridge of the scutum is scarcely developed; and (6) the spur of the tergum is short.

The sub-genus contains the following previously described species:—*declivis* Darwin, 1854, West Indies, Bermuda, and Black Sea; *orcutti* Pilsbry, 1907, California, South Africa; *longirostrum* Hock, 1913, Malay Archipelago; and *cuneiformis* Hiro, 1936, Malayan waters.

B. (M.) basicupula differs from all the known species of this sub-genus by the fact that the shell is membranous and flexible, and by the very markedly cup-shaped basal region. The radii and alæ are poorly developed and their sutural edges are not well defined.

It resembles *B. (M.) longirostrum* in the shape of the labrum; but that species has only two teeth on each side of the labral notch. It is further distinguished from *B. (M.) longirostrum* in lacking the small spines on the dorsal basal portion of the penis, and in having no hair covering to the distal portion of the penis.

It differs from *B. (M.) declivis* inter alia in the rounded, non truncate, lower edge of the spur.

B. (M.) cuneiformis is inadequately described but certainly differs from the present species in the non-membranous shell and the less markedly cup-shaped basal region. These features, combined with geographical distribution are also sufficient to distinguish *B. (M.) orcutti*.

Other features.—*B. (M.) basicupula* is yellowish-white in life. The basal portion is translucent. It lives almost completely embedded in the outer tissues of the sponge, *Suberites inconstans*. Numerous individuals are to be found in each sponge head.

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