

Notes on Two Interesting Pedunculate Cirripeds,  
*Malacolepas conchicola* n. gen. et sp. and  
*Koleolepas avis* (HIRO), with Remarks on  
their Systematic Positions

By

Fujio HIRO

(Zoological Institute, Kyoto Imperial University)

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With Plates VIII-IX and 4 Text-figures

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In the present paper I propose to describe two interesting pedunculate cirripeds, *Malacolepas conchicola* n. gen. et sp. and *Koleolepas avis* (HIRO, 1931), and to discuss their systematic positions. These two cirripeds, both degenerated in external and internal structures, are found commensal with molluscs. Their adaptation to this peculiar mode of life is shown by the peculiar extension of the attachment-area of the peduncle, though in different manner in the two forms. As to the systematic positions of these cirripeds, the first-mentioned species is so peculiar in various respects that it should be ranked in a new genus, while the other form is a second species of the interesting genus *Koleolepas*.

Before going into descriptions, I desire to acknowledge the kindness of Mr. N. YOSU of the Misaki Marine Biological Laboratory in sending me the specimens of *Koleolepas avis* and the specimens of *Malacolepas conchicola* attached to *Venerupis mitis*. The latter specimen was collected by Mr. Y. ŌSIMA and to him also I wish to express my thanks.

Genus *Malacolepas* HIRO, n. gen.

*Generic Diagnosis*—Nude pedunculate cirriped, with integument of capitulum very thin, transparent, and devoid of internal muscular layers. Capitulum like that of *Alepas*, with a large orifice, without

any trace of valve. Peduncle shorter than capitulum, with the basal end usually much extended. Labrum without teeth. Mandible with 6 or 7 teeth. Maxilla I with an indistinct notch. Maxilla II quadrangular, with a continuous series of bristles along the whole edge. Each segment of cirri armed with five pairs of long ventral spines. Caudal and filamentary appendages absent. Attached to the inside of the shell of the living lamellibranch.

Genotype: *Malacolepas conchicola* n. gen. et sp.

**Malacolepas conchicola** n. gen. et sp.

(Pl. VIII, Figs. 1—3, Text-fig. 1—3.)

*The Material*—In the summer of 1930, while studying cirripeds at the Seto Marine Biological Laboratory, I found a large specimen of a living lamellibranch *Cucullaea labiata* (SOLANDER), taken in a dredge from a depth of about 60 metres off Tanabe, which harbored a cluster of peculiar pedunculate cirripeds inside the valve beneath the mantle (Pl. VIII, fig. 1.). It consisted of five animals each with the basal end extended strikingly and covered wholly by a calcareous tube not unlike that of a Serpulid worm. At first sight this cirriped seemed to be akin to *Heteralepas* or *Alepas*. However, a more minute examination revealed certain considerable differences in the internal structure.

More recently, I had an opportunity to examine eight specimens of a cirriped, which were collected by Mr. Y. ŌSIMA from the littoral zone near the Misaki Marine Biological Laboratory and sent me by Mr. N. YOSU for identification. They were attached to the inner surface of shells of *Venerupis mitis* DESHAYES (Pl. VIII, fig. 2). On examining these specimens, I found that they were identical with the specimens attached to *Cucullaea labiata* from Seto, though their attachment-process of the peduncle shows a somewhat different feature from that of the latter.

*Description*—The *capitulum* (Fig. 1, c) bears a resemblance to that of *Alepas pacifica* PILSBRY, 1907, being broad, somewhat compressed, and having a thin and transparent membrane, and no trace of valve at all. The occludent margin is sinuous and slightly produced along the orifice which occupies half of its margin; the carinal margin is strongly arched. The apex of the capitulum adjoining the orifice, as seen from the side, is slightly produced. The width of the capitulum is somewhat smaller than two-thirds of the length.

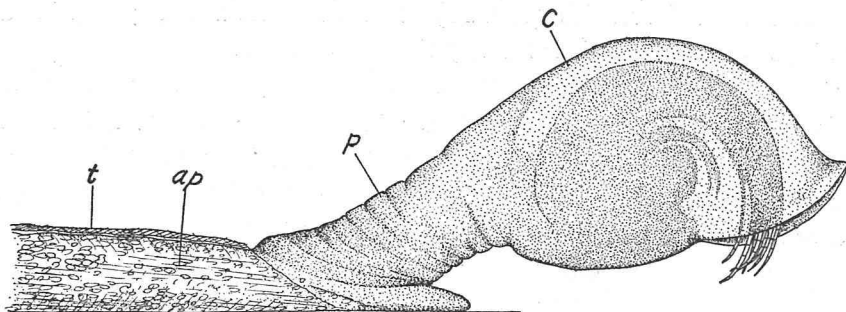


Fig. 1. *Malacolepas conchicola* n. gen. et sp. Holotype,  $\times 8$

The *peduncle* (Fig. 1, *p*) is a little shorter than half of the capitulum; it is rather thick and cylindrical, and tapers slightly toward the base. It is furnished with circular and longitudinal muscular layers. As mentioned above, the basal attachment-process (Fig. 1, *ap*) shows a feature characteristic of this form. It is a hollow structure and enclosed in a calcareous tube (Fig. 1, *t*), in the specimens attached to *Cucullaea labiata*. It is demarcated from the peduncle by a constriction which is distinct in the specimens attached to *Venerupis mitis*.

The mouth-parts are very prominent and show a closer resemblance to those of the genus *Octolasmis* than of any other genus, although there are some striking differences as mentioned below.

The *labrum* (Fig. 2 A) is bullate, and its upper end is almost straight in the lateral view, while in the apical view it is not pointed and slightly concave in the middle; this feature is akin to that of *Octolasmis*; the free margin, however, has no trace of teeth, though it is provided with minute hairs.

The *palpus* (Fig. 2 A) is conical and bears bristles along the inner (or anterior) edge; thus it belongs to NILSSON-CANTELL'S type VI of the palpus ('Cirripeden-Studien', 1921, p. 135.).

The *mandible* (Fig. 2 B) is furnished with six or seven teeth, of which the lower ones may have a few additional teeth. The lower angle is pointed and 2- to 4-dentated. The upper and lower edges are planted with hairs, as in *Octolasmis*.

The *first maxilla* (Fig. 2 C, D, E) is characteristic in shape although with individual variations. The frontal edge is notched indistinctly and provided with strong spines which are somewhat obscurely divided into three groups; the spines in the upper group are 3 to 5 in number, of which the uppermost one is always the thickest.

The *second maxilla* (Fig. 2 F) is of the Octolasmid type with a continuous series of bristles along the whole edge.

The *cirri* are rather short and not strongly curved; the protopodite is fairly long except in the first cirrus; in the second cirrus it is about half, and in the sixth cirrus about one-third, as long as their corresponding rami. The first cirrus is swollen and situated rather close to the second cirrus; it is very short as compared with the posterior five

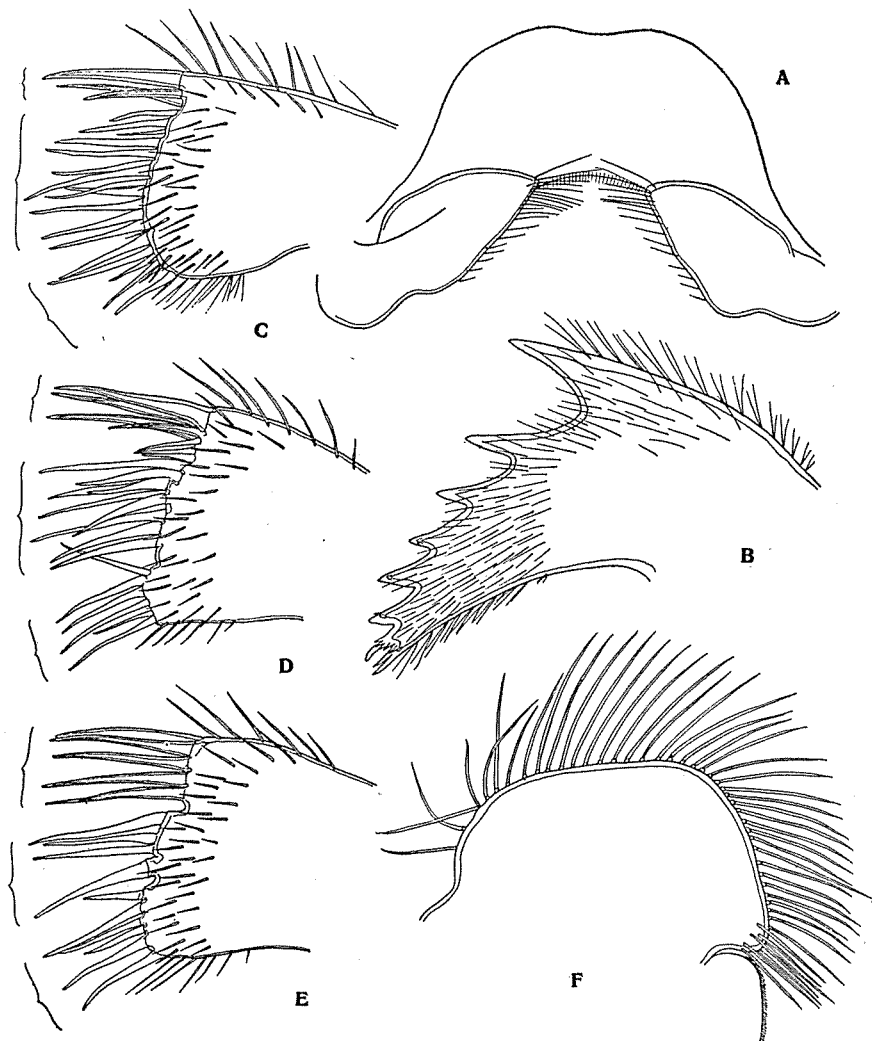


Fig. 2. *Malacolepas conchicola* n. gen. et sp.  
A, Labrum and palpi. B, Mandible. C,D,E, Maxilla I. F, Maxilla II.

pairs: the posterior ramus is slightly longer than the anterior ramus and slightly longer than the protopodite. In the posterior five cirri which have equal or subequal rami, each segment is armed with five pairs of long spines and sometimes with a pair of short spines along the ventral margin, and the distal angle of each is provided with a pair of long and short spines (Fig. 3 B). The numbers of segments in the rami are as follows:

	I	II	III	IV	V	VI
Holotype, from Seto.	8 9	13 13	14 15	15 15	14 14	15 15
Paratype, " Misaki. No. 1.	9 9	14 15	15 16	15 15	15 15	16 13
" " " No. 3.	6 8	13 13	12 12	12 12	12 12	12 12

The *filamentary* and *caudal appendages* are degenerated.

The *penis* (Fig. 3 A) is small, delicately annulated, and slightly longer than one-third of the sixth cirrus.

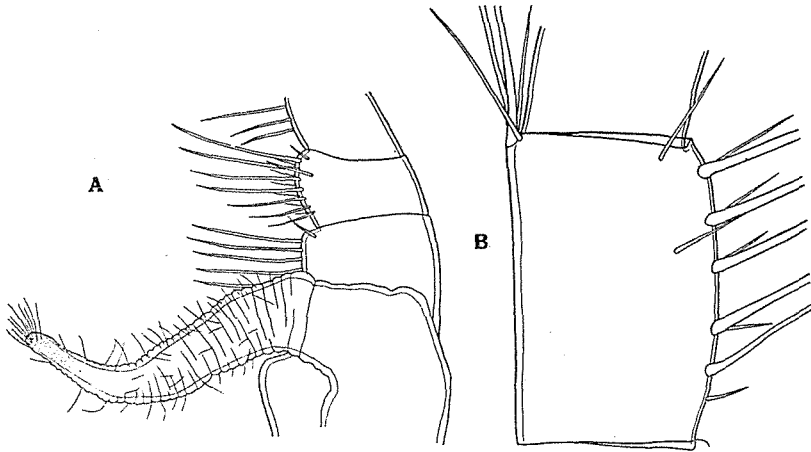


Fig. 3. *Malacolepas conchicola* n. gen. et sp.

A, Penis and protopodite of cirrus VI. B, Intermediate segment of cirrus VI.

Numerous small eggs are found in the mantle cavity; they are elongate-oval in form and contain larvae mostly in the first nauplius stage.

*Measurements* (in mm.)—

	Capitulum		Peduncle	
	Length	Breadth	Length	Breadth
Holotype, from Seto.	5.5	3.0	2.8	1.4
Paratype, " Misaki. No. 1.	4.6	3.0	1.3	2.3
" " " No. 2.	4.0	3.0	1.7	1.6
" " " No. 3.	3.7	2.4	1.6	1.8
" " " No. 4.	3.0	1.1	1.3	1.6

*Remarks on the formation of the calcareous tube*—As mentioned above, it is a peculiar feature of this cirriped that the extended portion of the base of the peduncle, which is attached to the inner surface of the shell, is covered with calcareous matter. In the specimens attached to *Cucullaea labiata* (SOLANDER), this portion forms a complete blind tube, and the tubes of the adjacent individuals overlie one another, with the smaller one borne on the larger (Pl. VIII, fig. 1). The tube is 6.8–24.6 mm. in length and 1.5–3.5 mm. in diameter. Besides the tubes, two individuals in the collection have a common cup around the basal parts of their peduncles (Pl. VIII, fig. 3). This cup measures 5.1 mm. in diameter and 4 mm. in length and is formed by several layers of dirty-white chitinous laminae, while its basal part is calcified, though not so strongly as the above-mentioned tube. This cup resembles in shape more or less the basal cup which is formed around the burrowing *Lithotrya*, but it shows a great difference both in structure and in formation from the cup of *Lithotrya*. In the case of *Lithotrya*, it is obvious that the cup belongs to *Lithotrya* and is formed by the matter secreted from the cement gland in the peduncle, although our knowledge of its use for the cirriped is meagre as yet.

At first it seemed somewhat difficult to decide whether the calcareous tube of the present material belongs to the cirriped or to the host. However, histological study showed clearly that it had no connection with *Malacolepas* at all. The soft part which is enclosed in the calcareous tube, is hollow and involved by a spongy tissue beneath a very thin membrane, though a few muscle-fibres are found at its distal end. The membrane of this part is directly continuous with the integument of the peduncle proper.

As to the production of the calcareous matter from the host mollusc, this case reminds one very much of the formation of pearls in some lamellibranches. Apparently the peculiar mode of life of the cirriped induces the secretion and deposition of the calcareous substance of the host. With the accumulation of the substance, the peduncle of the cirriped grows gradually longer to give the cirriped more room and facility to get food. In other words, the part which is enclosed in the tube, was a part of the peduncle originally but has degenerated with the development of the animal. The fact that the specimens attached to *Cucullaea labiata* all face toward the inhalent siphon of the host, forcibly suggests the above interpretation. Obviously, the distal end of the attachment-process coincides with the point where the larva

first attached itself. It is probable that the basal cup mentioned already is an initial stage of the formation of the tube.

In the specimens attached to *Venerupis mitis*, however, the attachment-process of the base is extended flatly and never forms a tubular feature. In this case, the process undoubtedly consists of matter secreted from the cement gland of the cirriped.

Whether this species is found always attached to the inner surface of the lamellibranch, or whether the association is only by chance, I am unable to say at present. At any rate, the relation of *Malacolepas* to the shell seems very intimate in the specimens examined.

#### Genus *Koleolepas* (STEBBING, 1900)

This genus was established by STEBBING for the reception of a single species, *Koleolepas willeyi*, of which WILLEY had found a single specimen from a Turbo-shell taken in a fish-basket at Sandal Bay, Lifu, Loyalty Islands. This genus as well as the species has since been treated rather enigmatically by some systematists in respect to its systematic position, because no further specimen has been found by later investigators, and also because its structure shows a peculiar feature, so that it has been felt rather difficult to tell the relationship of the genus to other genera. In my previous paper I described some specimens of an allied form under the name of *Heteralepas* (*Heteralepas*) *avis* with some doubt as to its systematic position. Since then I have found some characters in the same species which have led me to the view that it is to be included in *Koleolepas*. I give the diagnosis of the genus, which is a renovation of STEBBING'S original diagnosis to some extent.

*Generic Diagnosis*—Capitulum with reduced scutum or none, and with a crest-like dorsal border. Orifice with lip-like valve on each lateral side, and with a projecting bulb at the base. Peduncle long and forming an adhesive disc at the base. Labrum with elongate teeth. Palpus broad, triangular. Mandible with three peculiar dentated teeth and a pectinated lower angle. Maxilla I broad, with a short notch. Maxilla II a simple lobe. Cirri with rami, slightly shorter than the protopodite; those of the second to sixth armed with strong claw-like spines at the distal angle of dorsal side in upper segments. Filamentary and caudal appendages present. Attached to gastropod shells inhabited by hermit crabs.

*Genotype*: *Koleolepas willeyi* STEBBING, 1900.

**Koleolepas avis** (HIRO, 1931)

*The Material*—This cirriped has a habit not less peculiar than that of *Malacolepas conchicola*, as already described. As regards the genotype of this genus, *Koleolepas willeyi*, STEBBING cited WILLEY'S note as follows: "Sheathed and crested Cirripede living in a Turbo shell in which was a Pagurid and on surface of which were many Actinians (seven large ones). There is a hole in the shell exposing the end of the abdomen of the Pagurid, and inside this hole was the cirripede, attached, as shown above, to inside of shell". This habit closely resembles that of *Koleolepas willeyi*, though there is some difference. The present species *Koleolepas avis* was found attached to the outside of a shell of *Fusinus*<sup>1</sup> *nodoso-plicatus* DUNKER which was inhabited by a giant hermit crab, *Pagurus arrosor* (HERBST), and carried a giant sea-anemone, *Adamsia rondletii* (DELLECHIAGE) on the outer surface. It is represented by three specimens of which two are large and one is small. The material was obtained at a depth of about 20 metres off Misaki, Sagami Bay.

*Description*—The *capitulum* is somewhat oval and moderately compressed; its width is about four-fifths of the length. The *scutum* is of a crescent shape and orange in colour, it is situated just below the orifice oblique to the occludent margin, and well-developed on only one side of the capitulum (in two specimens on the left side and in one on the right). The crest-like dorsal border, which is peculiar to this genus, extends from the apical fissure of the orifice over two-thirds of the carinal margin of the capitulum, and is raised about 1 mm. from the capitulum proper in the holotype. The orifice is relatively small, and the triangular lip-like valves are protruded from its lateral sides, giving the cirriped a bird-bill-shape. Below the basal fissure of the orifice a 'projecting bulb' is situated, as in *Koleolepas willeyi*. As STEBBING has pointed out, this bulb reminds us of the corresponding part of *Alcippe*<sup>2</sup> *lampas*, where there is one on each side of the base of the orifice. The integument is light yellow, tinged slightly with brownish colour in the specimen in alcohol, and apparently without any pattern such as that shown in WILLEY'S sketch of a living *Koleolepas willeyi* in the living state.

The *peduncle* is very long, about three times as long as the capitulum and tinged a light yellowish hue. The longitudinal and circular

1. The name of *Dolium* which was mentioned in my previous paper (1931) is a mistake for *Fusinus*.

2. *Alcippe* HANCOCK, 1849 (= *Trypetesa* NORMAN, 1903 = *Alcippoides* STRAND, 1926).



muscular layers are strongly developed. The large part of the peduncle is covered with a sheath which is the continuation of the adherent disc.

The *adherent disc* is oval in shape. The upper surface is attached to the basal disc of *Adamsia*, while the under surface adheres to the shell of *Fusinus*; the two surfaces are similar in appearance, though the under surface is more or less roughened. The integument consists of a rather hard, chitinous membrane, slightly wrinkled in the part near the capitulum. The disc is tinged a light greyish colour. The longitudinal muscle-fibres of the peduncle extend in a fan-like manner to the disc. This fact shows that the disc is a modified part of the base of the peduncle. But it cannot be regarded as homologous with the disc of Acrothoracican *Alcippe lampas* which is, according to GENTHE (1905), an evagination of the carinal portion of the mantle. In one small specimen the peduncle is long but has not yet formed a disc.

The mouth-parts resemble those of *Koleolepas willeyi* and are of a very peculiar shape, bearing no resemblance to those of any other genus of Cirripedia.

The *labrum* is not strongly bullate and has a comb-like series of teeth along the strongly concave free margin.

The *palpus* is triangular and bears bristles along the inner (or

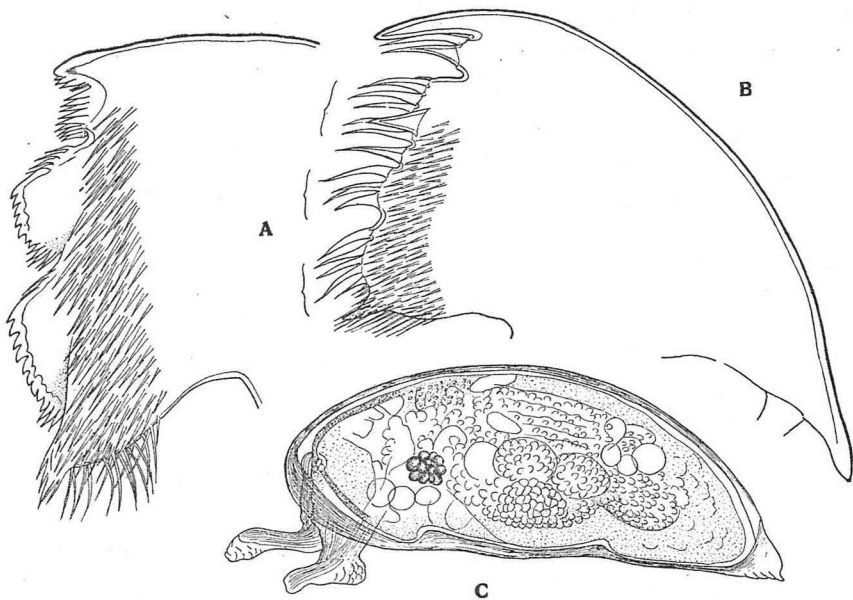


Fig. 4. *Koleolepas avis* (HIRO, 1931).

A, Mandible, viewed from inside. B, Maxilla I, viewed from inside.  
C, Pupal-stage larva.

anterior) edge as well as the extremity, which is somewhat rounded.

The *mandible* (Fig. 4 A) is the most peculiar of the mouth-parts. The frontal edge is broad and provided with four processes of which the uppermost tooth is acute and shorter than the lower teeth. The interval between the first and second teeth is armed with a row of rather long denticles (about 8 or 9 in number). The second and third teeth are similar in shape; their broadly truncated edges are jagged and bear about 12 denticles. The lower angle is strongly pointed and dented.

The *first maxilla* (Fig. 4 B) has a broad frontal edge, of which the upper part above a small notch bears one stout and two acute spines, while the lower part, which occupies three-fourths of the frontal edge, is provided with acute spines arranged in three groups slightly separated. The lower angle is pointed and surrounded by bristles. The upper edge of the blade as well as that of the mandible bears no bristle.

The *second maxilla* resembles that of *Alcippe lampas*; it is a simple lobe and furnished with rather short bristles at its rounded end.

In *Koleolepas willeyi*, according to STEBBING, the first cirrus is longer than the other five cirri, but in this species it is shorter; it is situated at some distance from the second cirrus. The protopodite of the first cirrus is relatively thin and a little longer than the rami. A *filamentary appendage* which resembles that of *Heteralepas* is present on the posterior side of the proximal segment of the first cirrus. The remaining five cirri are curled, relatively short, and all similar in appearance; in each pair, the rami are subequal in length, but the anterior ramus is a little wider than the posterior; the protopodite is much swollen and slightly longer than the rami.

The arrangement of the spines on the posterior five cirri is characteristic:— on the ventral margin the protopodite and the lower half of the rami are planted with spines very sparsely, each segment having a few spines, or none at all. On the dorsal margin, on the other hand, the distal angle of each segment of the upper half of rami bears 1—6 claw-like spines arranged in a ring together with the ventral spines; these spines are stronger in the anterior ramus than in the posterior. The numbers of segments in the rami are as follows:

	I	II	III	IV	V	VI
Holotype.	5 7	9 8	9 8	9 8	8 8	8 8
<i>K. willeyi</i> . (after STEBBING)	5 6	7 8	— —	— —	— —	7 8

The *caudal appendage* is short, unarticulate and with a few hairs on its summit.

The *penis* is a little shorter than the sixth cirrus, and bears no distinct annulation.

In a small specimen a pupal-stage larva was found attached below the orifice. Its internal structure has degenerated (Fig. 4 c).

*Measurements* (in mm.)—

	Capitulum		Peduncle		Basal disc	
	Length	Breadth	Length	Breadth	Length	Breadth
Holotype, from Misaki.	7.0	5.5	20.0	3.0	24.0	14.0
Paratype, " " No. 1.	10.0	6.5	21.0	4.5	26.0	17.0
" " " No. 2.	3.5	2.5	11.5	1.5	—	—

Remarks on the systematic positions of  
*Koleolepas* and *Malacolepas*

As was mentioned above, *Koleolepas* and *Malacolepas* are both degenerate forms, so that it is rather difficult to determine their systematic positions. As regards the phylogeny of the pedunculate cirripeds in general, opinions are diversified, but there seems to be a consensus of opinion among many authors, that the recent cirripeds have been derived from an ancestral form with a large number of plates. Of the pedunculate cirripeds, the Lepadidae (s. str.) which have naked peduncles, are considered to have been derived from the Scalpellid group by the loss of the lower lateral valves of the capitulum and the scales of the peduncle, through *Oxynaspis* which is regarded as the more ancient form of the Lepadidae (s. str.). A point that is probably in favour of this opinion, is that among the recent forms, parasitism or commensalism tends to bring about degeneration of valves both in size and in number.

The analogy in external appearance found among various forms which have resulted from the degeneration or elimination of some or other valves, leads to confusion in retracing the evolutionary courses of those forms. ANNANDALE (1909, p. 62.) says: "It is the fact of convergence that makes it so difficult to subdivide the group, for it is often impossible to say whether a similarity in any one organ or structure is due to direct phylogenetic relationship or to parallel evolution, while the value that is to be given to each character is a matter that calls for the nicest discrimination—which, indeed, must always remain largely

a matter of opinion". Each systematist holds therefore a different opinion as regards the phylogenetic relationship of the degenerate forms. For instance, GRUVEL (1905), ANNANDALE (1909) and KRÜGER (1911) recognize a single group, Anaspidae or Alepadinae, as including the following genera: *Alepas*, *Chaetolepas* (= *Ibla*, after BROCH, 1922), *Microlepas*, *Anclasma* and (?) *Koleolepas*, which have only the feature of degeneracy in common. BROCH (1922) also is rather against the view that the Lepadidae (s. str.) should be split up into small groups. But it seems to me advisable to subdivide the family, to consider the phylogenetic relationship of the different forms included in it. It is also necessary to take into account the various adaptive changes of structures, as structural differences may be produced by differences in the mode of life among the same group.

Let us consider, for instance, the position of the umbones of the valves, to which special importance is attached by most palaeontologists in the discussion of the phylogeny of the Cirripedia. They hold that from the ancient form, in which the umbones of the valves are apical, arose the recent forms of the Lepadidae (s. str.), in which the position of the umbo is variable in different valves and also in different species. No doubt the difference in the position of the umbo is correlated with the direction of the growth of the valve. In this connection it is very interesting to observe that in the recent forms of *Oxyiaspis*, which is regarded as the ancestral form of the Lepadidae (s. str.), the shape and size of the scutum is variable, as is also the position of the umbones of the scutum and carina to some extent, in different species, although it is always subcentral. Obviously, this *Oxyiaspis*, or its allied form, has given rise on the one hand to the recent *Pocillasma* and *Lepas* which have the valves wholly calcified and the umbones of the scutum and carina basal in position, and on the other hand to such forms as *Conchoderma* and *Alepas*, in which the valves are decalcified and degenerate, but the umbo of the scutum remains subcentral. It is noteworthy in this case that *Pocillasma* and *Lepas* have no doubt arisen independently, since, although externally they are similar to each other, internally *Lepas* is decidedly more related to *Conchoderma* and *Alepas* than to *Pocillasma*. Moreover, it seems clear that *Heteralepas* has a closer relationship to *Conchoderma* than to any other genus in the features of the valves. It is beyond doubt that the crescentic scutum of *Koleolepas* has been derived from the elongate-triangular scutum, such as is seen in the genus *Heteralepas*. In these two genera, as

well as in *Alepas*, the scutum alone, of all the valves, persists after the decalcification.

Of the internal parts, the mouth-parts are of great importance for the phylogenetic study of the cirripeds, for they represent 'very conservative formations of the body' as NILSSON-CANTELL pointed out. In *Kolcolepas*, however, they present an especially difficult case, because they show great peculiarity. Besides the labrum and the palpus which are quite unique, the mandible has a peculiar pectinated frontal edge—a condition which has probably been derived from a mandible such as that of *Heteralepas* and *Paralepas*. In the first maxilla, the frontal edge is provided with spines divisible obscurely into four groups—this feature rather recalls that of the Lepadidae (s. lato), in which, however, the spines are arranged in four or five distinct steps. The second maxilla has a shape nearest to that of *Alcippe lampas*, the Acrothoracic cirriped. Thus on the basis of the mouth-parts, *Kolcolepas* may be said to be more closely related to the forms included in the Heteralepadidae and Lepadidae (s. lato) than to any other.

The cirri and their appendages also give some obvious evidence for the relationship mentioned above. The filamentary and caudal appendages are clearly recognizable. The arrangement of spines on the cirri shows peculiarity in a quite different manner from that of *Microlepas*, the degenerate form.

In the original description of *Kolcolepas*, STEBBING suggested that this genus stands between the Thoracic and the Acrothoracic group, and this opinion is shared by GRUVEL (1905). According to STEBBING, "The typical species (i. e. *K. willeyi*) was found in symbiosis with a Pagurid, and the fact that the mollusc-shell inhabited by the two in common had in some way been broken into or out of in the immediate neighbourhood of the cirriped's position may imply that this genus belongs to the boring groups". In the three specimens examined here, however, I could find no trace of boring; it is very doubtful if this animal has any boring power, for the so-called disc of *Kolcolepas* and that of the Acrothoracic group present entirely different aspects. It is clear that the cirripeds, especially the nude pedunculate forms, with a symbiotic or parasitic mode of life, may show more or less similar adaptive features, depending on the similarity of the environment.

*Kolcolepas* has not been found since its discovery in 1900, and naturally its systematic position has been thought dubious (Cf. ANNANDALE, 1909, p. 64; KRÜGER, 1911, p. 44; NILSSON-CANTELL, 1921, p. 158; BROCH, 1922, p. 226; BROCH, 1927, p. 548.). In its general

appearance *Koleolepas* seems to be related to the Heteralepadidae on the one hand and to certain forms of the Lepadidae (s. lato) to some extent on the other. Nevertheless, it can hardly be included in these families, because it has some distinctive characteristics which are rather important, so that it fully deserves a distinct new family for which I would suggest the name of *Koleolepadidae*, if the Heteralepadidae are to be recognized as a distinct family. But, it seems to me more advisable to include the Heteralepadinae and the Koleolepadinae, together with the Lepadinae (*Lepas*, *Conchoderma* and *Alepas*), in the family Lepadidae. Anyhow, it is obvious that the above-mentioned forms are widely separated from the Poecilasmatidae.

Next, as regards the new genus, *Malacolepas*, it is easier to determine its systematic position than in the case of *Koleolepas*. Obviously it is a reduced form of the *Pocillasma-Octolasmis* group, for it retains the internal structures of the *Pocillasma-Octolasmis* type, in spite of the fact that it shows very peculiar adaptive changes externally due to its peculiar habitat. The internal structures show a close resemblance to those of the Octolasmid group, in that the first cirrus is not apart from the posterior pairs, and in the arrangement of spines on the cirri, and also in the mouth-parts except maxilla I. The absence of the caudal appendage as well as that of the teeth of labrum, may be considered to be due to degeneration. The number of teeth on the mandible is greater than in the *Pocillasma-Octolasmis* group or in *Alepas*, but it is more closely related to the former than the latter in its general appearance. Maxilla I differs, however, very much from that of the *Pocillasma-Octolasmis* group. All these facts seem to show that *Malacolepas* is a derivative of some *Octolasmis*-like form.

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## Explanation of Plates

### Plate VIII

Fig. 1. *Malacolepas conchicola* n. gen. et sp. Specimens from Seto, attached to the inner surface of a shell of *Cucullaea labiata* (SOLANDER).  $\times 2$ .

Fig. 2. *Malacolepas conchicola* n. gen. et sp. Specimens from Misaki, attached to the inner surface of shells of *Venerupis mitis* DESHAYES.  $\times 2\frac{1}{2}$ .

Fig. 3. A portion of Fig. 1, showing two animals with a common cup around the basal parts of their peduncles.  $\times 5$ .

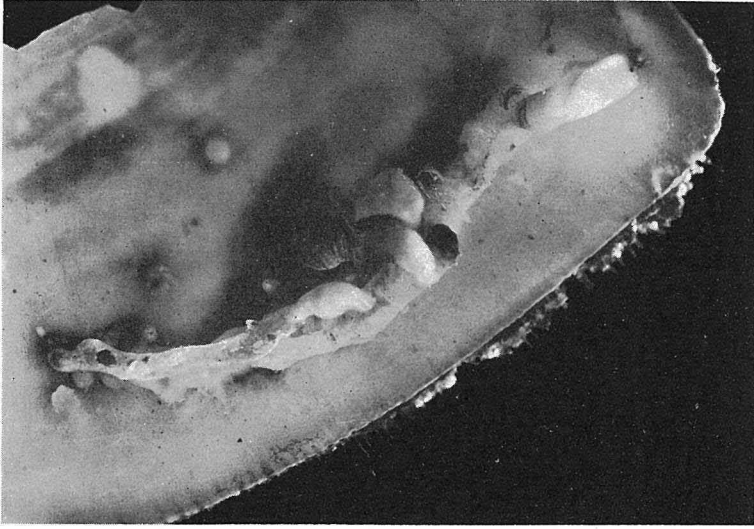
### Plate IX

Fig. 4. *Koleolepas avis* (HIRO, 1931), showing only its capitulum (*c*) between a giant sea-anemone *Adamsia rondeletii* CHARGREN and a spindle-shell *Fusinus nodoso-plicatus* DUNKER, inhabited by *Pagurus arrosor* (HERBST).  $\times 1$ .

Fig. 5. *Koleolepas avis* (HIRO, 1931). A specimen from Misaki, viewed from the upper surface of the disc.  $\times 1\frac{1}{5}$ .

Fig. 6. *Koleolepas avis* (HIRO, 1931). Another specimen with the disc from Misaki.  $\times 2$ .

1



2



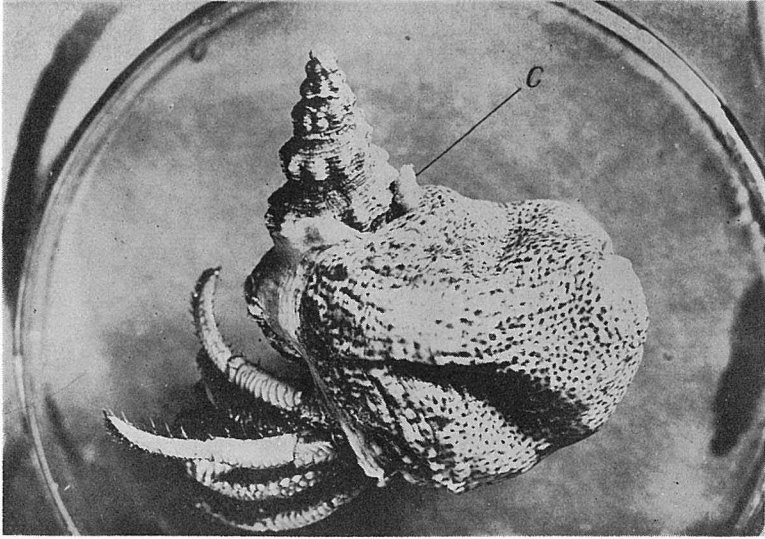
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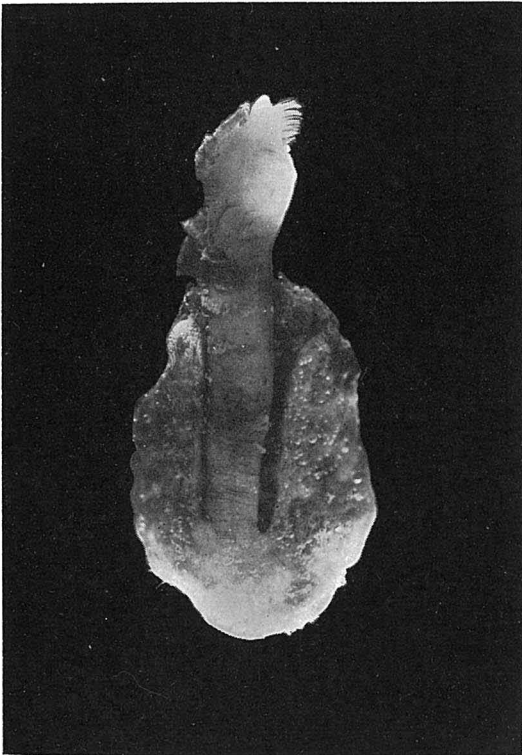
F. HIRO.



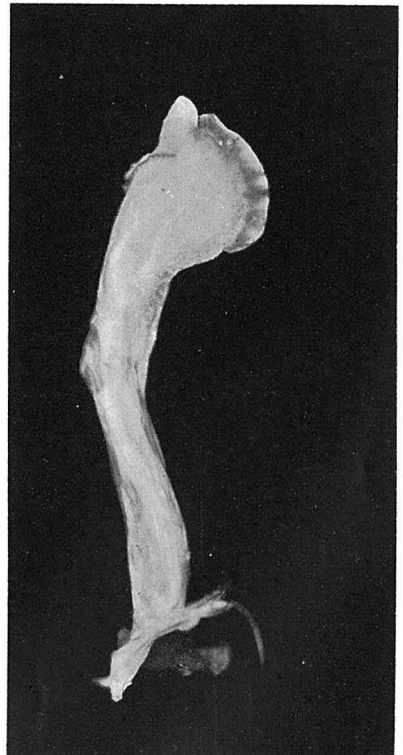
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5



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F. HIRO,