

in coral; and I have myself seen a large *Coenobita*, on the island of Minnikoy, holding the empty shell of a small coco-nut over its abdomen. Again, in other parts of the world, *Gryllopagurus* lives in burrows of its own construction; *Pylocheles Agassizii* was found concealed in a cavity in a piece of sandstone, and another specimen was taken from the gastral chamber of a siliceous sponge; *Xylopagurus rectus*, like our *Pylocheles Miersi*, was discovered in a lodging in drift wood; *Ostraconotus* and *Tylaspis* are both believed to have some special protective shield, other than a shell: and *Porcellanopagurus* lives free among sea-weed.

Again, the association of our new form of Hermit-crab with a sea-anemone is nothing strange: indeed, commensalism between crustacea and sea-anemones is one of the most familiar facts of zoology, and a large number of instances of it have been described. In most cases, however, the facts seem to be that an individual of a definite species of crab and an individual of a definite species of sea-anemone have both at once taken possession of the same mollusk-shell, which they continue to inhabit for their mutual advantage,—the crab acting as locomotive to the sea-anemone, and the sea-anemone in return acting as a defence and warning-post, and possibly also as a decoy, for the benefit of the crab.

But though the mutual advantage of the association is plain enough, the absolute and essential necessity of it is not so plainly seen, and it is reasonable to imagine that when in the course of growth the Hermit-crab has to seek a new and larger shell, the partnership with the sea-anemone can be dissolved by simple withdrawal, without dangerously affecting the life of either individual—at any rate until such time as each can find a new partner of suitable size. In other words, there is no adaptation of either animal to the other, and each seems capable of existing apart from the other.

In the present case there is no shell to act as introduction to and bond between the two animals; and the sea-anemone, which is a colonial form with a spreading coenosarc, merely forms a sheet, which the crab simply tucks under its telson by one end and pulls over its back by the other end—the polyps seeming to have no power of adhesion and to depend on the crab for a fast hold.

The nearest approach to this state of affairs is found in *Parapagurus pilosimanus*, which, when full-grown, lives in a cavity hollowed out of the coenosarc of a colony of a large species of *Epizoanthus*. But in this case the individual hermit-crab and sea-anemone start their partnership with an empty mollusk-shell, which in course of time, as the occupants increase in size, becomes absorbed, so that, at last, the crab is entirely dependent on the polyp-colony for the protection of its soft abdomen.

But even here, though the association seems to have become much more intimate and permanent, there seems to be no essential adaptation of either animal to the other, nor does it appear to be beyond the bounds of possibility that each might exist—though its existence might not be so complete and secure—apart from the other.

In the case of the new form of Hermit-crab, now to be described, there is no evidence of the intervention of a shell, or other adventitious support, at any stage. Captain Anderson dredged 205 specimens, of both sexes and all ages, and in every observable instance the parent polyp of the protective colony appears to have settled on the hinder end of the abdomen of the crab and to have gradually spread by budding as the latter increased in size; so that the intimate and immediate connexion between the two animals appears to be, from the first, a necessary one.

In other words, the peculiar interest of the case is that the two animals seem to have become directly adapted to one another, and to be incapable of a separate and independent existence.

For the Hermit-crab I propose the generic name *Chlænopagurus*, from χλαῖνα a large square mantle worn over the chiton, in Homeric times, as a defence against the weather. According to Liddell and Scott the chlæna was of a purple colour, which also corresponds with the colour of the polyps that form the Hermit-crab's mantle.

For the polyps I am not at present in a position to propose a name. They belong to the family *Zoanthidæ*, but not, as far as I can make out, to any known genus. The colony consists of a copious lamellar coenosarc in which the polyps, which are small and have not very numerous tentacles, are deeply embedded: the coenosarc is perfectly soft, fleshy, and flexible, without any incrustation or deposit.

CHLÆNOPAGURUS, gen. nov.

Carapace membranous, except in the cardiac region and the region enclosed by the cervical groove, which are perfectly calcified. Rostrum prominent.

Abdomen a soft membranous obscurely-segmented bag; symmetrical in the male, although the appendages of the 3rd, 4th and 5th somites are developed on one side only; asymmetrical in the female, owing to the presence, on one side, of a large fleshy leaf-like appendage that forms a brood-pouch.

Telson and the appendages on either side of it quite symmetrical.

Eye-stalks stout, of good length: eyes large, reniform: ophthalmic scales acute.

Antennules of moderate length. Antennal acicle long and slender antennal flagellum long.

Mandibles with a two-jointed palp. Exopodite of first maxillæ with a small curved non-segmented flagellum. External maxillipeds of the usual pediform shape.

Chelipeds equal; massive in both sexes, but more so in the male.

Legs stout, compressed: the first two pairs are about as long as or a little longer than the chelipeds, and end in long stout dactyli: the last two pairs are reduced in length and are chelate, the chelæ of the penultimate pair being particularly perfect.

In the male the first two pairs of abdominal appendages are present and are quite symmetrical: they are uniramous appendages modified for purposes of reproduction. The appendages of the next three somites (3rd-5th) are present on one side only—right or left: they are minute, or rudimentary and, uniramous.

In the female the appendages of the first abdominal somite form a small symmetrical uniramous pair. Those of the next four somites (2nd-5th) are present on one side only—right or left: the first three of them are slender biramous appendages, of good size, for carrying the eggs, and are contained within a capacious cup-like brood-pouch formed by a membranous lobe that springs from one side of the fifth somite: the fourth of them is a tiny biramous appendage and is not enclosed in the brood-pouch.

In both sexes the appendages of the sixth somite are symmetrical biramous swimmerets, placed symmetrically on either side of the telson: their rami are slender and falciform.

The branchial formula is as follows:—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.				Pleuro- branchiæ.	Total.	
		Anterior.		Posterior.				
IX. ...	1r.	...	1	...	1	...	0	= 2+1r.
X. ...	0	...	1	...	1	...	0	= 2
XI. ...	0	...	1	...	1	...	1	= 3
XII. ...	0	...	1	...	1	...	1	= 3
XIII. ...	0	...	1	...	1	...	1	= 3
XIV. ...	0	...	0	...	0	...	0	= 0
	—		—		—		—	
	1r.		5		5		3	13+1r.

[N.B.—The rudimentary podobranch (?) of the external maxillipeds is a small lobe of the anterior arthrobranch of the same appendages.]

Each gill consists of two series of broad leaflets. The leaflets, however, are not quite simple, since each one carries, near the tip, a pair of slender filaments large enough to be seen with the naked eye.

The single species known does not inhabit a shell, but lives

under a blanket formed by the perfectly soft coenosare of a colony of Actiniarian polyps of a genus near *Zoanthus* or, more probably, *Mamilifera*.

Chlaenopagurus Andersoni, n. sp. (Plate I.)

The cervical groove is deep-cut, and the portion of the carapace that is included within it is strongly calcified. The triangular cardiac region is also fairly well calcified, especially in its anterior part. But all the rest of the carapace, except here and there along the outer edge of the cervical groove, is quite soft and membranous. The hepatic region is marked off from the branchial region by a transverse furrow, and a longitudinal furrow separates the hepatic from the pterygostomian region.

The front, which is carinated dorsally and deflexed at tip, projects well between the eye-stalks.

The eyes are large and reniform and are borne on stout stalks, which are about quarter the length of the carapace measured in the middle line.

The first two joints of the antennular peduncle are together slightly longer than the eyestalk, the first joint being flattened and somewhat dilated dorsally: the third joint and the flagellum combined are not half again as long as the first two joints.

The antennal peduncle is about the same length as that of the antennules: the acicle is about as long as the eye-stalk: the flagellum is about twice the length of the carapace.

The chelipeds are massive, quite equal, and about as long as the entire body with the abdomen in the natural position: not much more than a third of their length is formed by the arm. They are more or less covered with long, stiff, golden yellow bristles, which are specially thick-set on the under surface of the arm and the outer surface of the wrist and hand: these bristles do not hide the rather coarse squamiform tubercles from which they spring. There are some coarsish spines along the inner border of the ischium, both the lower borders of the arm, and on a good part of the outer surface of the wrist and hand.

The legs are stout and compressed, and their borders—and in the case of the last three joints of the first two pairs, a considerable part of the surface also—are more or less covered with the same stiff yellow bristles that grow on the chelipeds. The first pair of legs are of equal length with the chelipeds. The second pair are a little longer, and a third of their length is formed by the long sabre-shaped dactylus. The third pair do not reach to the far end of the carpus of the second

pair: they terminate in a very perfect chela of comparatively large size, with the dactylus anterior (or dorsal). The fourth pair reach just beyond the far end of the merus of the third pair: they end in a very much smaller and less perfect chela, with the dactylus posterior (or ventral).

The abdomen is a perfectly soft membranous bag, of which the segmentation is quite recognizably, but far from conspicuously, defined. In the male it is symmetrical, though the minute or rudimentary appendages, that are present on one side (right or left) of the 3rd 4th and 5th segments, are represented on the other side only by small tufts of small bristles. In the female its symmetry is lost by the presence, on one side or other, of a large membranous leaf-like lobe that forms a capacious cup-like brood-pouch.

The first two pairs of abdominal appendages of the male end in convoluted plates, the second pair working in the grooves formed by the first pair.

The telson is quite symmetrical, and lies in the middle line, tucked up against the ventral surface of the abdomen. On either side of it are the quite symmetrical swimmerets of the sixth pair: the basipodite of these has a spine at its posterior angle: both the exopodite and endopodite are narrow slender and falciform, with the anterior edge serrated and the tip spiniform: the exopodite is many times larger than the endopodite.

The animal does not inhabit a shell, but is protected by the soft fleshy coenosarc of a colony of Actinarian polyps. This forms a sort of sheet or blanket, one end of which is tucked round the telson of the crab and is firmly held by the hook-like swimmerets of the 6th abdominal somite and by the folded-in telson, while the corners of the other end are firmly grasped by the chelæ of the penultimate thoracic appendages in such a way that the sheet can be drawn right over the back of the crab as far as the eyes.

The colour of the crab is red: the coenosarc of the polyp-colony is bluish, the polyps themselves are dark purple.

A large male, lying in the natural position with the telson bent under, measures, from the tip of the rostrum, 63 millim.; and the chelipeds of the same individual, measured along their convex curve, are 68 millim. in length.

An egg-laden female measured in the same way, is 37 millim. long and has chelipeds 35 millim. long.

205 specimens, representing both sexes in all stages, were dredged by the Investigator off Cape Comorin, in 102 fathoms.

I have much pleasure in dedicating this species to Captain A. R. S.

Anderson, I. M. S., who was Surgeon-Naturalist on the "Investigator" from 1893 to 1899, and who discovered the species and first noticed the peculiar nature of its protective covering.

It will be figured in full detail in the *Illustrations of the Zoology of the Investigator*.

§ 2. On a new species of Crab of the genus *Domecia* of the sub-family Eriphiinæ, of the family Xanthidæ.

So far as I know, the genus *Domecia* has hitherto been represented in collections by a single species, *D. hispida* Eydoux and Souleyet, which was first discovered off the Sandwich Islands and has since been found to have a very remarkable distribution in shallow water, having been taken on the reefs of the Gulf of Mexico and Caribbean Sea, in the Andaman Sea, and in several parts of the tropical Indo-Pacific, from Java and the Liu Kiu Islands on the west to Tahiti on the east.

In my *Materials for a Carcinological Fauna of India*, pt. 3, p. 465 (Journ. As. Soc. Bengal, Vol. LXVIII. pt. 2, 1898, p. 230) four specimens of *Domecia hispida* are recorded from the Andaman Islands (Little Andaman and the Coco islets), and I have now to record the recent capture, again by the "Investigator," of three more very fine specimens from the same locality, as well as of an entirely new species of the same genus.

This new species differs from its sole congener *D. hispida* in the following characters:—

- (1) the carapace, chelipeds, and legs are much less hairy and spiny:
- (2) the orbital margin is smooth or only finely and obscurely crenulate:
- (3) the exposed surface of the curious merus of the external maxillipeds is perfectly smooth:
- (4) the coloration is different:
- (5) the size is considerably less.

Domecia glabra, n. sp.

Carapace about three-quarters as long as broad, contracted posteriorly, flat, with no trace of regions and with only four distinct spines on its surface,—namely two, one behind the other, on either branchial region, near the antero-lateral border. [There is also a row of tiny spinules, visible only with a strong lens, immediately behind the frontal margin]. The surface of the carapace is free from hairs.

Frontal margin sinuous, denticulate and spinate: orbital margin smooth, or finely and faintly puckered: antero-lateral borders armed with four spines (including the outer orbital angle) of which the last but one has a tiny secondary spinule at its base. Two spines, side by side, at the inner suborbital angle.

External maxillipeds shaped like those of *D. hispida*, the merus being a very short broad joint, but having a perfectly smooth surface. Anterior edge of buccal cavern smooth.

Chelipeds, in the female, equal, hardly longer than the carapace: a spine at the far end of the inner (anterior) border of the arm, and some spinules at the far end of the outer (posterior) surface: upper surface of wrist, hand, and base of dactylus spiny.

Legs stout, not much shorter than the chelipeds: the anterior (dorsal) border of their merus, carpus, and propodite, and the posterior border of their dactylus, finely serrated: there are a few fine stiff hairs between the serrations.

Colours, orange or yellow; most of the spines of the carapace, but not of the appendages, are black.

A single egg-laden female from the Andamans, 16 fathoms: its carapace is only 4 millim. long.

The species has been figured for a future issue of the *Illustrations of the Zoology of the Investigator*.

§ 3. On a new species of *Latreillia* and on *Latreillopsis bispinosa*.

A new species of *Latreillia* was dredged in the Gulf of Martaban, in 53 and 67 fathoms. Its nearest relative is the Atlantic and Mediterranean *L. elegans*, which it resembles in form and colouration but from which it differs in the structure of the last pair of legs. These have a long propodite plumed exactly like the vane of a feather, and a very short dactylus. The species, which has been named *L. pennifera*, will be described in the forthcoming fifth part of my *Materials for a Carcinological Fauna of India*, and will be figured in a future issue of the *Illustrations of the Zoology of the Investigator*.

Latreillopsis bispinosa, described and figured by Dr. Henderson in the Report on the "Challenger" Anomura, has hitherto been known by a single imperfect female specimen, which was dredged off Zebu in the Philippine Islands.

Dr. Anderson has lately sent 3 specimens, namely, an adult male and female and a young male, which were dredged off the east coast of the Andamans at a depth of 53 fathoms (not the Gulf of Martaban, 53

fathoms' station). The male differs from the female in the form of the chelipeds, which in the male have a club-shaped palm. The branchial formula is exactly the same as that of *Latreillia pennifera*: there are 8 branchiæ on either side, namely 3 pleurobranchiæ (somites xi. xii. and xiii.), 2 pairs of arthrobranchiæ (appendages ix. and x.), and a small podobranchia on the second maxillipeds.

Natural History Notes from the Royal Indian Marine Survey Ship
'Investigator,' Commander T. H. Heming, R. N., commanding.—
Series III. No. 3. On some Notable New and Rare Species of
Crustacea. By A. ALCOCK, M.B., C.M.Z.S., Superintendent of the
Indian Museum.

(Plate I.)

[Received July 28th ; Read August 2nd, 1899.]

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- § 2. On a new species of Crab of the genus *Domecia*.
- § 3. On a new species of *Latreillia*, and on the occurrence of *Latreillopsis* in the Andaman Sea.

Among the collections recently sent to the Indian Museum by Captain A. R. Anderson, I. M. S., lately Surgeon-Naturalist to the Marine Survey, are a large number of specimens of a new form of Hermit-crab, a single specimen of a new species of the curious little Coral-crab *Domecia*, a new species of *Latreillia*, and specimens of *Latreillopsis bispinosa*.

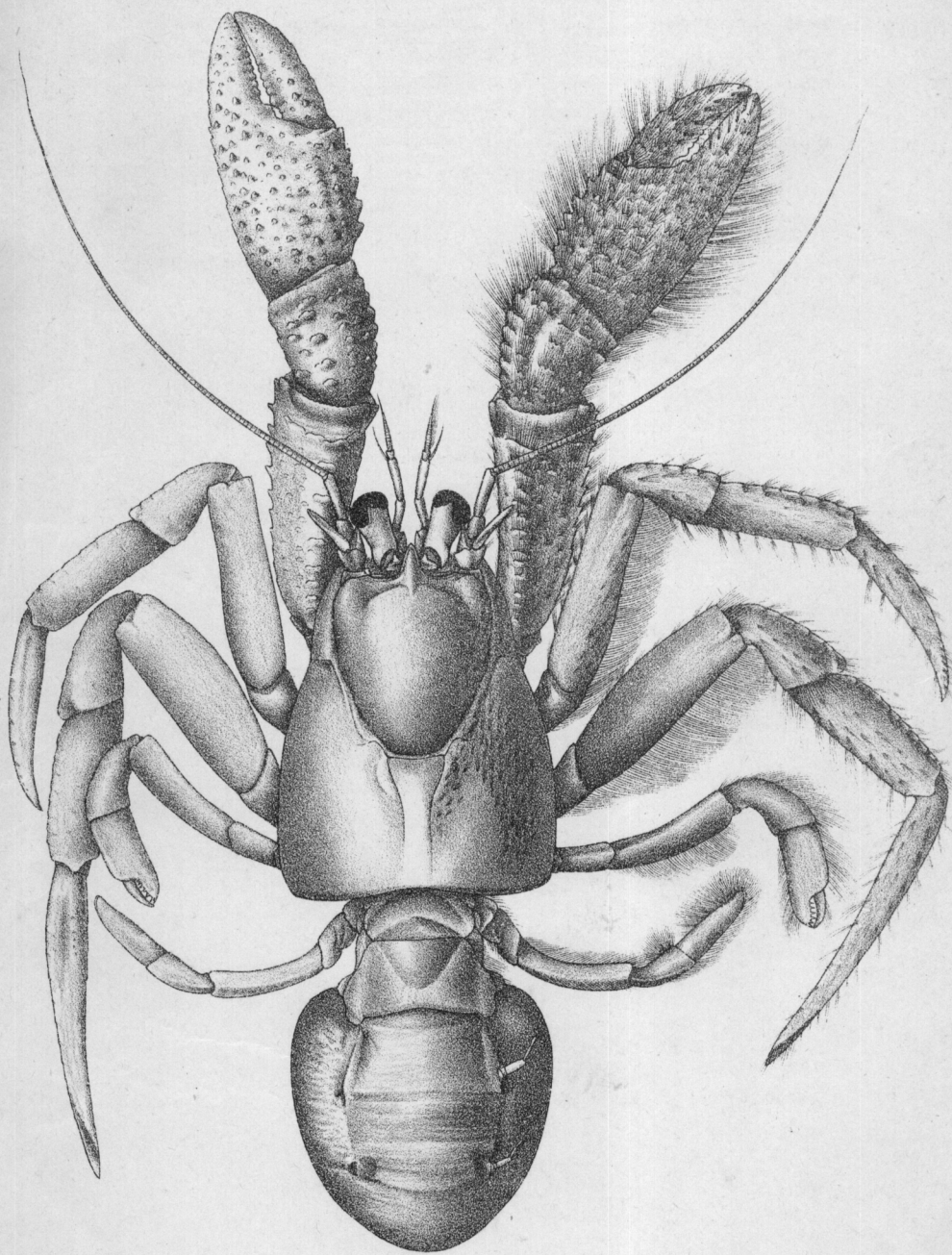
§ 1. On a new Hermit-crab exhibiting adaptive commensalism with a Sea-anemone.

The Hermit-crab is noteworthy (1) in having for its refuge, not the usual mollusk-shell, but a sheet or blanket formed by the coenosarc of a colony of Sea-anemones, (2) in being—as far as the male is concerned—symmetrical, and (3) in having the appendages of the 3rd-5th somites of the male and of the 2nd-5th segments of the female present on the right or left side indifferently.

Symmetry in Hermit-crabs is, of course, nothing new: *Pomatocheles* is perfectly symmetrical, as also are *Chiroplatæa* and *Pylocheles* (if these two genera are really distinct from *Pomatocheles*): also symmetrical are *Glaucothoe*, *Mixtopagurus*, *Xylopagurus*, the male of *Gryllopagurus*, some species of *Cancellus*, and lastly, though in a different way, *Ostraconotus*, *Tylaspis*, and *Porcellanopagurus*.

[In our new form the male is symmetrical somewhat in the same way as in the three genera last named; that is to say, the abdomen is a soft bag without any lateral twist.]

Nor is there anything unusual in the fact that the protective covering of the abdomen is not a mollusk shell; for in these seas alone there are several well-known instances of Hermit-crabs making use of other convenient receptacles. For instance, *Pylocheles Miersi* is found impacted in hollow twigs of sunken drift wood; *Troglopagurus*, according to Messrs. Thurston and Henderson, lives in small cavities



S.C. Mondul, del. et. lith.

CHLAENOPAGURUS ANDERSONI ♂. × 1½.

