

CRYPTOCHIRUS OF THE CENTRAL PACIFIC

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The genus *Cryptochirus* was established by Heller (2, p. 366)\* in 1861 to accommodate a species of small crab occupying pits in heads of living coral. As the crustacean has no means of boring into the coral skeleton it is obvious that the pit is produced by the growth of the coral about the crab, which when young settles down in a calicle, causes the death of the polyp therein, and remains more or less passive while the limy material is gradually laid down about it by the activity of the surrounding coral polyps.

As the crab grows its movements tend to form the shape of the pit and keep free an opening to the exterior through which food and water are admitted. With the growth of the coral colony the pit gradually increases in depth, and in the course of time the crab is permitted more freedom of movement. The movement, however, is chiefly a fore and aft one, the crab being capable of creeping toward the surface or backing into the bottom of the pit. Since the crab fits the tube snugly there is no possibility of a reversal of position, even if such were desirable.

Semper (4, pp. 221-224) describes the appearance of the tubular cavities, noting that the radial septa of the coral calicle are visible in the bottom of the pit, but that the side walls are coated by a calcareous deposit smoothed and polished by the action of the crab. This observer attributes the oblique course which some of the pits take to the strength of the respiratory current set up by the crab, causing the coral polyps to grow in an oblique direction.

Although the crustacean probably seldom leaves the pit, that it is capable of doing so is seen when the coral colony is subjected to high temperature, fresh water, or other abnormal conditions. In most species recorded only females occupy the deeper well-formed pits. It is probable that the female creeps out of the pit when molting occurs. Directly after this process fertilization may take place.

In all species of the genus where both sexes have been observed, the male is smaller than the female and with one exception does not occupy the pit with the female, but moves about more or less freely

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\* Numbers in parentheses refer to Literature Cited, page 18.

on the surface of the coral colony or rests in a shallow depression. The carapace of the male is more flattened than that of the female, the anterior portion is less declivitous, and the chelipeds are relatively stouter than in the female.

Certain structural features are correlated with the peculiar mode of life of this crustacean. Especially in the female is the anterior portion of the carapace bent down more or less abruptly. This declivitous region together with the first two pairs of legs serves as an operculum which closes the aperture of the pit when the crab approaches the surface. In the female the chelipeds are relatively small and form no obstruction of passage up or down the tube, and the other legs with their sharp dactyli provide levers for progressive and recessive movements. Because of their exposure the declivitous front region of the carapace and the front legs become a depository for sediment which clings to the spines and hairs of the surface. The mature female of *Cryptochirus* is characterized by a broad pouchlike abdomen which when filled with eggs is greatly inflated. A large percentage of adult females taken from coral pits are found to be ovigerous.

Although the genus has been known for more than 70 years it has generally been neglected by investigators, and few species of *Cryptochirus* have been recognized. The small size of the apertures of the pits and their superficial resemblance to the openings of worm tubes may account, in part at least, for the fact that these forms are frequently overlooked.

The type species *Cryptochirus coralliodytes* Heller was described and rather inadequately figured by its author in 1861. Its type locality is the Red Sea, but it has been reported from the Maldivic Islands, the Philippine Islands, and probably from the West Indies, Wake Island (p. 16) and Reunion. In this species the chelipeds of the female are shorter than the first walking legs, and the fourth pair of walking legs is longer than the third. The abdomen of the male is linear in outline.

In 1906 Henderson (3, pp. 211-219) described *Cryptochirus dimorphus* from the Andaman Islands. The species was found in a branched madreporite at a depth of 12 fathoms. The specific name is indicative of the marked sex dimorphism; the male is less than one-fourth the size of the female. Both sexes are reported to inhabit the same pit, the male usually clinging to the female. Structurally

the female of this species differs from that of *Cryptochirus coralliodytes* in that the chelipeds are longer and the first pair of walking legs and in the gradual diminution in the length of the legs from the chelipeds to the fourth walking legs, except that the fourth pair is about the size of the third. In the male the abdomen is triangular in form from the third to the seventh segments.

The form described by Verrill (6, p. 427) in 1908 from Bermuda under the name *Troglocarcinus corallicola* should without doubt be referred to the genus *Cryptochirus*. Verrill recognized the affinity of his new genus and species with *Cryptochirus coralliodytes*, but stated that the latter "has a differently formed carapace, smooth, convex in front, without marginal spines." I cannot reconcile Verrill's statement as quoted with the original description of *Cryptochirus coralliodytes* by Heller (2, p. 371): "Die vorderen Seitenränder sind mit 7-8 spitzen Zähnen bewaffnet, die von vorn nach hinten immer kleiner werden. Die ganze Oberfläche des Cephalothorax ist in beiden Geschlechtern mit rauhen, gleichgrossen Körnern ziemlich gleichmässig besetzt, dazwischen feinfilzig." Verrill's species inhabited semicircular or lunate pits in such corals as *Mussa*, *Maeandra*, and *Dichocoenia*. It was reported to be uncommon at Bermuda, but abundant at Dominica Island at from 3 to 5 fathoms.

In 1925 Edmondson (1, pp. 33-35) described *Cryptochirus crescentus* from Johnston Island, where it was found inhabiting crescent-shaped pits in *Pavona duerdeni* Vaughan. The distinctive features of the female of this species are the broad, depressed carapace and the stout second pair of legs with a deep concavity in the medial surface of the merus into which the cheliped fits when the crab is at rest.

During the Tanager Expedition of 1923 and the Whipporwill Expedition of 1924 opportunity was offered for collecting a large number of specimens of *Cryptochirus* from the Central Pacific area. Most of them were taken from corals at Washington, Palmyra, and Christmas islands, and a few were obtained at Johnston and Wake islands. A critical examination of this material leads me to believe that at least five species are represented, three of which, together with another form so far observed only about the Hawaiian islands, are here described as new.

I am indebted to J. E. Hoffmeister of the Smithsonian Institution for the determination of species of corals from Washington, Palmyra, and Wake islands.

**Cryptochirus rugosus**, new species (pl. 1; fig. 1).

Type, female, carapace 8 mm. long.

Carapace of type specimen (pl. 1, *B, D*; fig. 1, *a, b*) convex in both directions, anterior one-third bent down; front border concave with a small median tooth, on either side of which is a blunt lobe. Antero-lateral angle of carapace rounded with a deep ocular notch (crevice for eye-stalk) bounded below by a blunt process. Antero-lateral border of carapace armed with a row of sharp teeth of about equal size. Antero-medial area of carapace depressed with shallow, pointed furrows extending backward on either side. Upper surface of carapace rough, covered with strong tubercles, spiniform on the anterior half, becoming smaller and blunter posteriorly. Circular gastric area elevated, covered with tubercles. Postero-lateral of gastric elevation, on either side, is a small elevated lobe (epigastric) covered with 10-12 tubercles. A crescent-shaped depression with concavity directed posteriorly separates gastric and cardiac areas. Long hairs, thicker on the anterior declivitous portion, are interspersed between the tubercles of the carapace. Side walls of carapace granular.

Upper surface of basal segment of antennule concave, armed with three sharp teeth, the middle one the longest; ventral border toothed. (See fig. 1, *c*.) Ischium of outer maxilliped (fig. 1, *d*) granular, its median border straight; distal extremity of lateral border of merus rounded; margins of maxilliped heavily fringed with long hairs.

Chelipeds of type specimen (fig. 1, *e*) equal, slender; fingers slightly shorter than palm, the upper proximal border of which bears a few tubercles; carpus longer than palm, dorsal border armed with spiniform tubercles; merus quadrangular in lateral view, toothed along upper border. Upper margin of cheliped fringed with long hairs. First walking legs (fig. 1, *f*) longer and stouter than chelipeds; dactylus, propodus, and carpus subequal in length; carpus and propodus bearing sharp spinules along upper borders; merus broad and stout, a row of spines on upper and lower borders. Long hairs fringe upper and lower margins of merus and dorsal borders of carpus and propodus.

Second and third walking legs (fig. 1, *g*) subequal, shorter than the first, dorsal borders of propodus, carpus, and merus bearing tubercles, some of which are spiniform. Fourth walking leg (fig. 1, *h*) longer than second or third, segments smooth, scantily fringed with long hairs.

Male of species (pl. 1, *E, F*) with carapace more depressed and smoother than that of female; length of carapace of largest individual observed, 5 mm. Chelipeds larger and stouter than in female. Abdomen linear in outline.

Type locality, Washington Island, Bernice P. Bishop Museum, number 3668.

This species of *Cryptochirus* represents one of the largest and by far the roughest, as to surface of carapace, I have observed. Mature females are readily distinguished from other forms by the circular gastric elevation and the two epigastric areas marked off by deep furrows. The straight median border of the ischium of the outer maxilliped is also a distinctive characteristic.

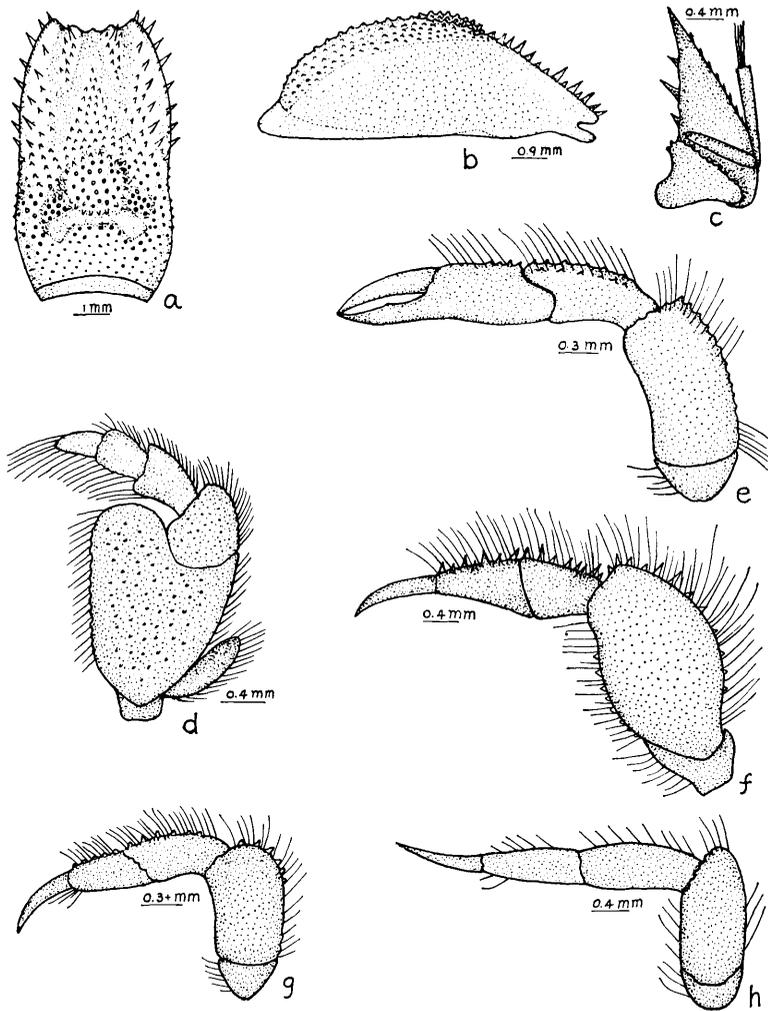


FIGURE 1.—*Cryptochirus rugosus*, new species (female): *a*, dorsal surface of carapace; *b*, lateral surface of carapace; *c*, medial surface of left antennule; *d*, outer maxilliped, left side; *e*, left cheliped; *f*, first walking leg, left side; *g*, second walking leg, left side; *h*, fourth walking leg, left side.

Females inhabit tubular pits in *Favia speciosa* (Dana) (pl. 1, A, C). The deepest pit observed was 72 mm. in depth. This remarkable depth of the tube is due to the rapid growth of the coral and its continued growth after the maturity of the crab has been reached. Males were found exposed on the surface of the coral and capable of moving about freely.

**Cryptochirus pacificus**, new species (pl. 2; fig. 2).

Type, female, carapace 8 mm. long.

Carapace (fig. 2, a, b) with posterior two-thirds flattened, anterior deflexed region with a V-shaped depression on either side of the median line; front margin with a small median tooth, on either side of which is a low rounded lobe. Antero-lateral extremity of carapace bluntly rounded; orbital depression deep, bounded below by a toothlike process. Antero-lateral border of carapace armed with a row of sharp teeth of uniform size; upper surface covered with tubercles which are large and spiniform anteriorly, becoming small and blunt posteriorly. A crescent-shaped depression with concavity directed posteriorly separates gastric and cardiac areas. Side walls of carapace granular. Long hairs are interspersed among the tubercles of the surface, the coating being denser on the anterior declivitous region.

Basal segment of antennule (fig. 2, c) armed above with three sharp spines, the middle one being the smallest; convex lower border toothed. Outer maxilliped (fig. 2, d) with elongate-oval ischium having strongly convex median border; outer distal extremity of merus bluntly rounded; margins of segments fringed with long hairs.

Chelipeds of type specimen (fig. 2, e) equal, slender; palm longer than fingers, with a few blunt teeth on dorso-proximal border; carpus as long as palm, distal half of upper border bearing a row of blunt teeth; merus slightly longer than carpus, smooth except for a few blunt teeth on lower margin. Long hairs fringe upper and lower margins of merus and upper borders of carpus and palm.

First walking leg (fig. 2, f) longer and stouter than cheliped; propodus and carpus subequal, upper and lateral surfaces bearing sharp spines; merus stout, as long as carpus and propodus combined, upper and lower margins and lateral surface near distal extremity toothed. Long hairs fringe both borders of merus and upper borders of carpus and propodus. Second walking legs (fig. 2, g) shorter than the first, armed in a similar manner except there are fewer spines on the ventral border of merus; merus short and stout. Fourth walking leg (fig. 2, h) as long as second, slender and unarmed, but scantily fringed with hairs.

Male of species (pl. 2, E, F; fig. 2, i, j) with carapace 5 mm. long, more depressed than that of female. Cheliped (fig. 2, i) stouter and longer than that of female, a few sharp teeth borne on the upper borders of merus, carpus, and manus. Upper border of merus and upper and part of outer surfaces of carpus and manus clothed with hairs. Abdomen (fig. 2, j) linear in outline.

Females of this species bear some resemblance to those of *Cryptochirus rugosus* (p. 6), but differ from them in the smoother carapace and in the armature of the appendages. The strong convexity of the median border of the ischium of the outer maxilliped also is a distinctive feature.

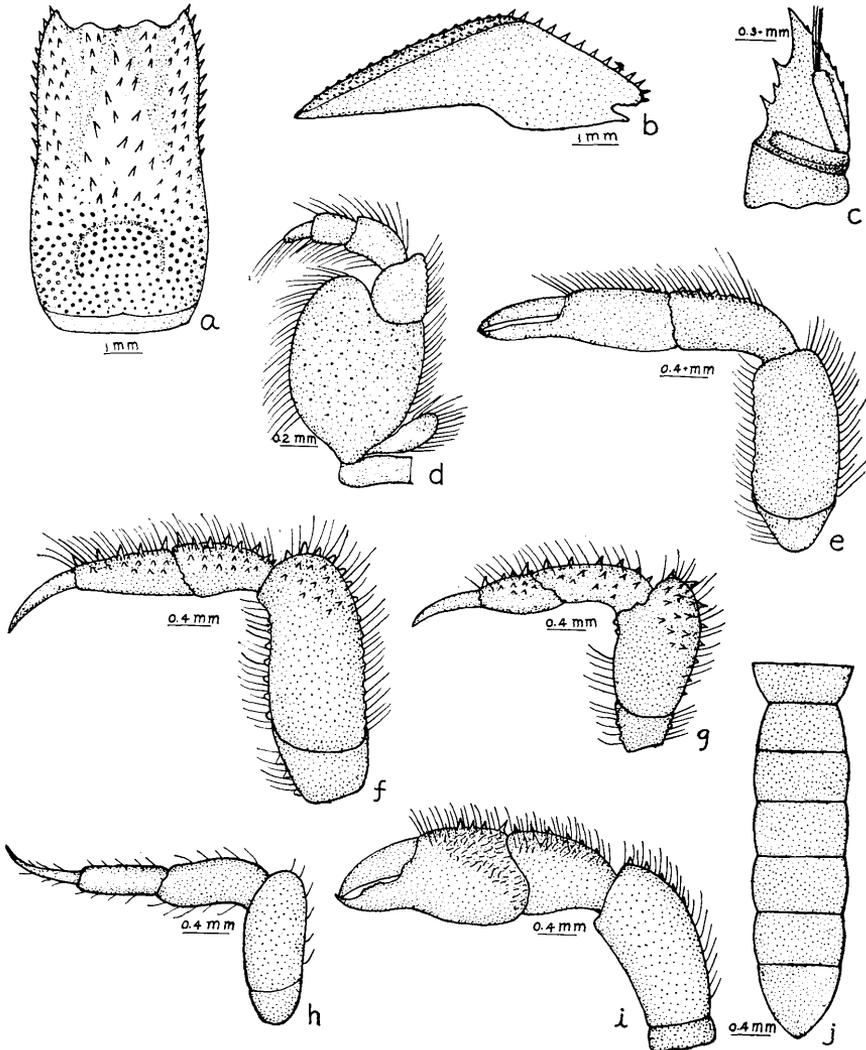


FIGURE 2.—*Cryptochirus pacificus*, new species, a-h, female; i, j, male: a, dorsal surface of carapace; b, lateral surface of carapace; c, medial surface of left antennule; d, outer maxilliped, left side; e, left cheliped; f, first walking leg, left side; g, second walking leg, left side; h, fourth walking leg, left side; i, left cheliped; j, abdomen.

The type specimen (Bernice P. Bishop Museum, number 3669) and female cotypes were taken from a massive coral, *Favia* species (?) (pl. 2, A, C) at Palmyra Island in shallow water. The species was also collected at Washington Island in large blocks of *Macandra lamellina* Ehrenberg (pl. 2, D). One pit observed had a depth of 32 mm. Males of the species are to be found on the surface of coral heads in the vicinity of the pits occupied by the females.

### **Cryptochirus pyriformis**, new species (pl. 3, A-D; fig. 3).

Type, female, carapace 4 mm. long.

Carapace (fig. 3, a, b) widest in the middle, posterior two-thirds slightly convex in both directions, anterior deflexed area flattened; front margin with a broad median concavity bordered on each side by a rounded lobe. Antero-lateral angle of carapace sharp; orbital fissure broad, bordered below by a sharp tooth. Antero-lateral border of carapace armed by a row of small teeth. Upper surface of carapace uniformly covered with tubercles which are spiniform on the anterior half, but small and granule-like posteriorly. A shallow crescent-shaped groove with concavity directed posteriorly separates gastric and cardiac areas. Side walls of carapace finely granular.

Basal segment of antennule (fig. 3, c) stout; upper border armed with a row of five teeth; convex lower border toothed, three or four teeth at the distal extremity stout and sharp.

Outer maxilliped (fig. 3, d) with median margin of ischium rounded; segments distal to ischium short and stout; lateral border of merus rounded; long hairs fringe the margins of the segments.

Chelipeds of type specimen (fig. 3, e) equal, short and stout; fingers as long as palm, which is about one-half the length of carpus; upper borders of palm and carpus bear a few blunt teeth; merus slightly longer than high, surface and margins unarmed; upper and lower borders of merus and upper borders of carpus and manus fringed with hairs.

First walking leg (fig. 3, f) longer than cheliped, the propodus and carpus subequal in length; merus compressed, its height three-fifths that of its length; dorsal and broadly rounded anterior border of merus and upper borders of carpus and propodus bearing sharp spines. Long hairs fringe dorsal and ventral margins of merus and dorsal borders of carpus and propodus. Second walking leg (fig. 3, h) shorter than first; height of merus two-thirds that of its length; blunt teeth and long hairs are borne on the dorsal borders of propodus, carpus, and merus; ventral border of merus fringed with hairs. Fourth walking leg (fig. 3, g) shorter than second; dactylus, propodus, and carpus long and slender; height of merus one-half that of its length; blunt teeth borne on the upper borders of propodus and carpus; hairs fringe upper margins of propodus, carpus, and merus.

Male species with cheliped (fig. 3, i) stouter than that of female; palm as deep as long and subequal in length with that of carpus; height of merus one-half of its length; cheliped smooth, but surface well covered with hairs.

Mature ovigerous females of this species may be recognized by the short, broadly inflated abdomen, which conforms to the shape of the cavity in which

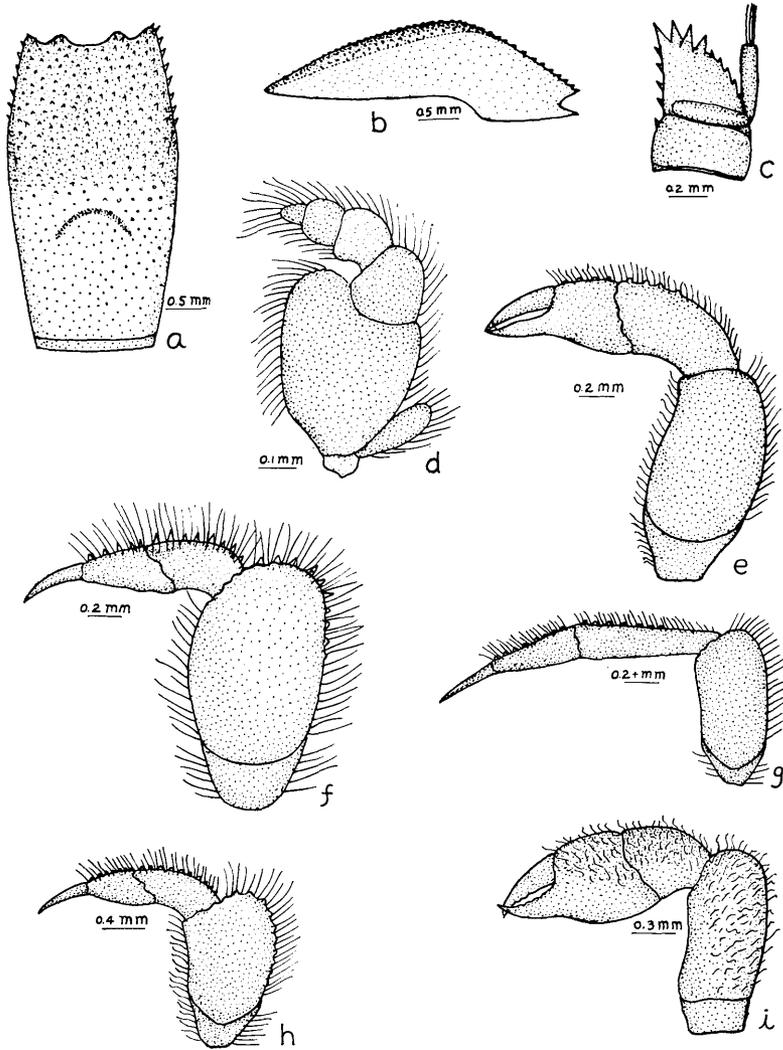


FIGURE 3.—*Cryptochirus pyriformis*, new species, a-h, female, i, male: a, dorsal surface of carapace; b, lateral surface of carapace; c, medial surface of antennule; d, outer maxilliped, left side; e, left cheliped; f, first walking leg, left side; h, second walking leg, left side; g, fourth walking leg, left side; i, left cheliped.

the animal is concealed. The chelipeds are relatively stouter than in *Cryptochirus rugosus* (p. 6) or *Cryptochirus pacificus* (p. 8) and the height of the merus compared with its length is greater than in those species. The blunt teeth borne on the fourth walking legs also separate this species from others observed.

Type locality, Washington Island, Bernice P. Bishop Museum, number 3670.

Females commonly inhabit shallow pits, about 8 mm. deep, in the coral, *Favites abdita* (Ellis and Solander) (pl. 3, *A, B*) and have been observed in *Orbicella curta* Dana and *Hydonophora* species. The cavity increases in diameter below the narrow aperture and this shape probably prevents the ovigerous female from leaving her place of concealment. Males are much smaller than females and do not occupy pits, but move about freely on the surface of the coral heads.

**Cryptochirus minutus**, new species (pl. 3, *E, F*; fig. 4).

Type, female, carapace 3 mm. long.

Carapace (fig. 4, *a, b*) quadrangular when viewed from above; posterior three-fourths flat, short anterior region bent abruptly downward; serrated front margin with a broad median concavity bordered on either side by an acute process which extends beyond the sharp antero-lateral angle of the carapace. Ocular depression broad and deep, bordered below by a sharp, toothlike process.

Antero-lateral border of carapace armed with 6 short teeth; declivitous area granular and bearing numerous sharp spines; two broad oval depressions mark this region, which is densely coated with hairs. Posterior, flattened area of carapace covered with granules and small tubercles, some of which are spiniform; side walls of carapace finely granular.

Basal segment of antennule (fig. 4, *c*) armed above by a few strong teeth and below by smaller ones. Ischium of outer maxilliped (fig. 4, *d*) almost as broad as long, surface smooth; lateral border of merus serrated, its distal extremity acute.

Cheliped of type specimen (fig. 4, *e*) equal, stout; dactylus as long as upper border of manus, which is equal to the greatest depth of hand; carpus as long as palm and shorter than merus. Upper borders of manus, carpus, and of merus, in part, bearing strong spines and densely coated with hairs.

First walking leg (fig. 4, *f*) equal in length to cheliped; propodus and carpus subequal, their combined length equal to that of merus; strong spines and a thick coating of hairs borne on upper borders of merus, carpus, and propodus. Second walking leg (fig. 4, *g*) shorter than first; carpus longer than propodus and subequal in length with merus. Short blunt teeth and serrations arm the upper borders of merus, carpus, and propodus. Fourth walking leg (fig. 4, *h*) slender, unarmed, as long as cheliped.

Chelipeds of male (fig. 4, *i*) shorter and stouter than those of female; palm inflated, as deep as long; dorsal borders of manus, carpus, and merus bearing

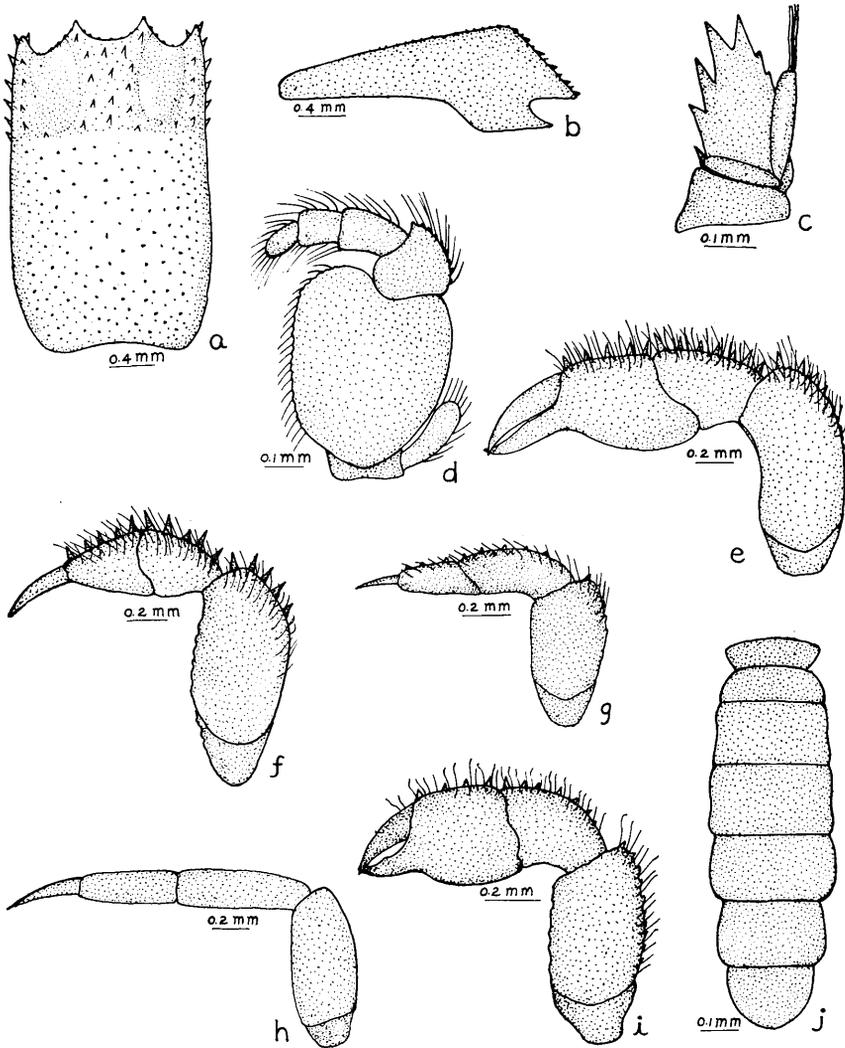


FIGURE 4.—*Cryptochirus minutus*, new species, a-h, female; i, j, male: a, dorsal surface of carapace; b, lateral surface of carapace; c, medial surface of left antennule; d, outer maxilliped, left side; e, left cheliped; f, first walking leg, left side; g, second walking leg, left side; h, fourth walking leg, left side; i, left cheliped; j, abdomen.

teeth and a fringe of hairs. Abdomen of male (fig. 4, *j*) linear in outline with sinuose borders; fifth segment broadest, sixth and seventh successively narrower.

Zoea of species (fig. 6, *a, c*) with carapace armed with frontal, dorsal, and lateral spines, the dorsal being long; telson of abdomen narrow, elongated, posterior margin with a long stout spine at each lateral border and six median spinelets; a slender spinelet is borne at the lateral base of each strong spine.

This species is one of the smaller representatives of the genus and may be distinguished by the short declivitous region of the carapace marked by two broad oval depressions, and a serrated front margin. The stout chelipeds and strong teeth of the basal segment of the antennule also are features by which the species may be recognized.

Type locality, Waikiki Reef, Oahu, Bernice P. Bishop Museum, number 3671.

Females of the species inhabit pits in *Cyphastrea ocellina* and *Lcptastraea purpurca*, being more abundant in the former than in the latter coral. Especially is *Cyphastrea ocellina* heavily infested by this crab on Waikiki Reef and in Hanauma Bay, Oahu. It is less plentiful in the same species of coral on the shoal reefs of Kaneohe Bay, Oahu.

Some of the pits concealing females reach a depth of 12 mm. and many are curved or angular in their course. Males, which are about 1.5 mm. long, do not inhabit pits with females, but are found on the surface of the coral in shallow depressions or in a calicle in which the coral polyp has been destroyed.

### **Cryptochirus coralliodytes** Heller (?) (pl. 4, *A, B*; fig. 5).

*Cryptochirus coralliodytes* Heller, Sitz. Ber. Akad. Wissen. Wien. vol. 43 (1), pp. 370, 371, pl. 4, figs. 33-39, 1861; Edmondson, Bernice P. Bishop Museum, Bull. 27, p. 32, pl. 1, 1925.

Carapace (fig. 5, *a, b*) subquadrangular in dorsal view, 5 mm. long, widest posterior to the middle, convex in both directions; front margin with a median rounded lobe, the shallow depression on each side bordered by a blunt process which is not so extended as the antero-lateral angle of the carapace. Orbital notch shallow, followed by a shallow groove in the side wall of the carapace and bounded below by a sharp tooth.

Anterior deflexed area of carapace narrowly depressed on each side of the mid line; antero-lateral border armed with a row of teeth gradually decreasing in size from the front backward; spiniform tubercles interspersed with long hairs cover the anterior half of carapace; posterior half covered with blunt tubercles and granules. A shallow crescent-shaped groove separates gastric and cardiac areas.

Dorsal border of basal segment of antennule (fig. 5, *c*) with a row of teeth, the stronger ones at the distal extremity; lower border serrate.

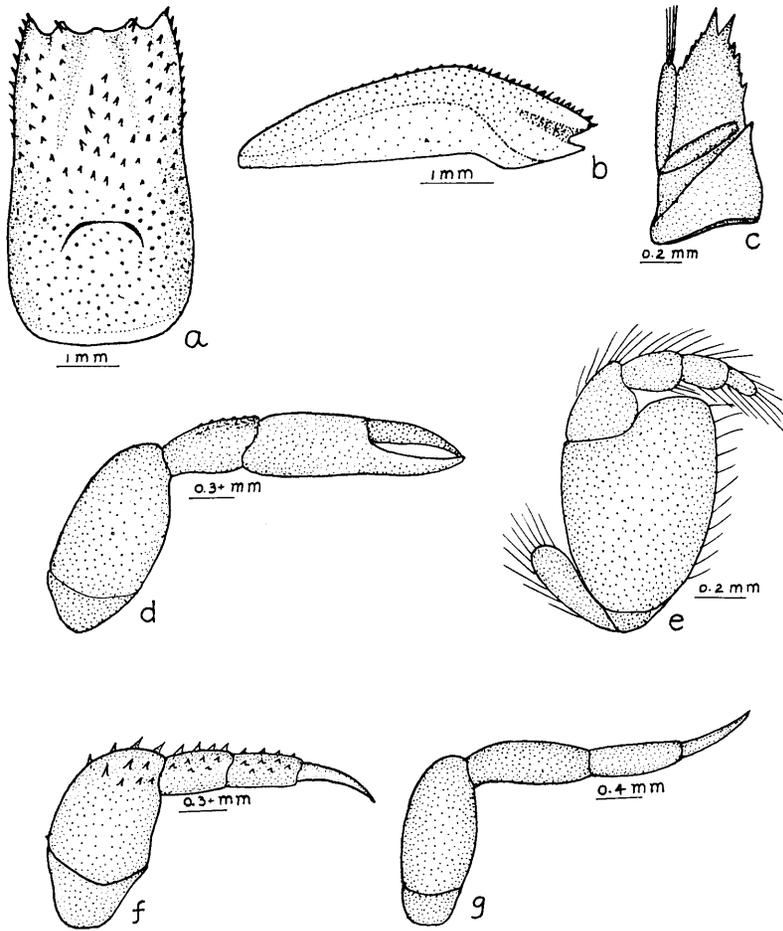


FIGURE 5.—*Cryptochirus coralliodytes* Heller (?), female, from Wake Island: *a*, dorsal surface of carapace; *b*, lateral surface of carapace; *c*, medial surface of right antennule; *d*, right cheliped; *e*, outer maxilliped, right side; *f*, second walking leg, right side; *g*, fourth walking leg, right side.

Chelipeds of female (fig. 5, *d*) equal, slender, dactylus as long as upper border of manus; palm and fingers unarmed; carpus smooth except for some blunt tubercles on dorsal border; merus smooth, its length less than twice its depth.

Ischium of outer maxilliped (fig. 5, *e*), longer than broad, inner margin smooth and rounded; merus smooth, its latero-distal border rounded, but not projected. (In the type specimen this border is projected and pointed.) Second walking leg (fig. 5, *f*) shorter than cheliped; merus short and deep; propodus, carpus and merus, in part, armed with sharp spines. Fourth walking leg (fig. 5, *g*) longer than cheliped, its surface smooth. Abdomen of female long and narrow, greatly extended beyond the carapace.

A specimen collected at Wake Island by the Tanager Expedition is reported by Edmondson (1, p. 32) to conform closely with Heller's description of *Cryptochirus corallodytes*. Although it is still tentatively considered a representative of Heller's species, further study of this specimen has revealed some apparent differences, the certainty of which may be determined only by a comparison with type material. The specimen occupied a pit in a colony of *Favia pallida* (Dana). (See pl. 4, *A*.)

***Cryptochirus crescentus*** Edmondson (pl. 4, *C, D*).

*Cryptochirus crescentus* Edmondson, B. P. Bishop Mus., Bull. 27, pp. 33-35, pl. 1, fig. 6, 1925.

In addition to the type locality, Johnston Island, the distribution of this species is now known to include Christmas Island (North Pacific Ocean), where it was found by the Whipporwill Expedition to be abundant, occupying crescent-shaped pits in *Pavona duerdeni*. Indications of its presence in the Hawaiian islands are seen in unoccupied crescent-shaped pits in bleached specimens of *Pavona duerdeni* from Pukoo, Molokai, now in Bernice P. Bishop Museum. Samples of this coral collected at Waikiki and Hanauma Bay, Oahu, are not infested by the crab. It is quite likely, however, that the crustacean may be found throughout the distributional area of *Pavona duerdeni*. Careful examination of other species of *Pavona* also might reveal its presence.

There has been some discussion relative to the affinity of species of *Cryptochirus* and another coral-infesting crab, *Hapalocarcinus marsupialis* Stimpson (5, pp. 412-413), which inhabits galls on many species of corals, of which *Pocillopora cespitosa* is the prevailing one in Hawaii.

Of the species of *Cryptochirus* observed I have had opportunity of studying the larvae of but one, *Cryptochirus minutus* (p. 14). On comparing the zoea of this species with that of *Hapalocarcinus marsupialis* (fig. 6, *b, d*) the close resemblance is obvious. The similarity is seen to exist in the spinous processes of the carapace and also in the abdomen of the two species. Chief differences seem to be in the lateral processes of the fifth segments of the abdomen, and

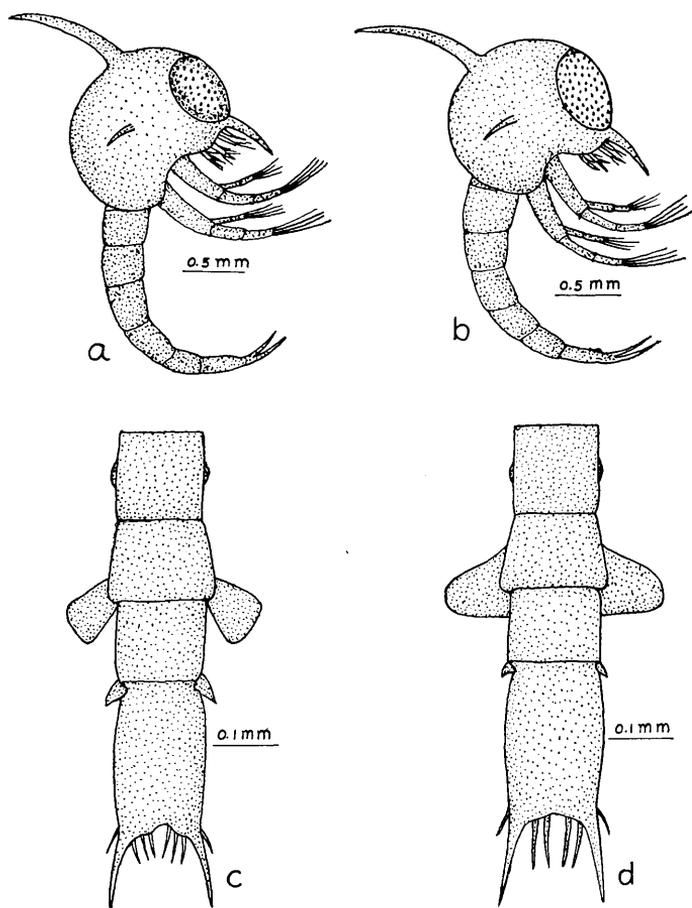


FIGURE 6.—Zoea of *Cryptochirus minutus* (a) and of *Hapalocarcinus marsupialis* (b); last four segments of abdomen of zoea of *Cryptochirus minutus* (c) and of *Hapalocarcinus marsupialis* (d).

in the spinules of the posterior margin of the telson, which in *Hapalocarcinus marsupialis* are longer but fewer than in *Cryptochirus minutus*.

Most authorities have based their belief in the close relationship of the two genera of coral-infesting crustaceans, *Hapalocarcinus* and *Cryptochirus*, on the structural resemblance of the adults. The larval resemblance is now seen to support this belief.

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## PLATE LEGENDS

PLATE 1. *CRYPTOCHIRUS RUGOSUS*, NEW SPECIES.

*A.* Surface of coral, *Favia* species (?) from Washington Island, showing aperture of pit inhabited by female crab. *B.* Dorsal surface of female,  $\times 5.5$ . *C.* Section of coral, *Favia* species (?) showing outline of pit 60 mm. deep. *D.* Dorsal surface of female,  $\times 6$ . *E, F.* Dorsal and ventral surface, respectively, of male,  $\times 6$ .

PLATE 2. *CRYPTOCHIRUS PACIFICUS*, NEW SPECIES.

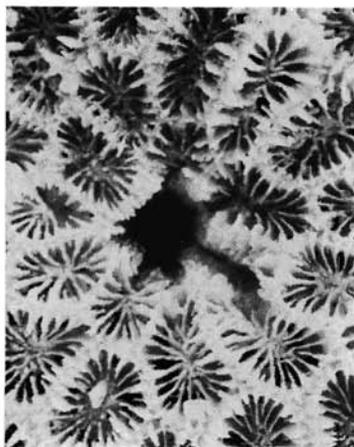
*A.* Surface of coral, *Favia* species (?) from Palmyra Island, showing aperture of pit inhabited by female crab. *B.* Dorsal surface of female  $\times 5$ . *C.* Section of coral, *Favia* species (?) showing outline of pit. *D.* Surface of coral, *Macandra* species from Washington Island, showing aperture of pit inhabited by female crab. *E, F.* Dorsal and ventral surfaces, respectively, of male,  $\times 8$ .

PLATE 3. *CRYPTOCHIRUS PYRIFORMIS* AND *CRYPTOCHIRUS MINUTUS*, NEW SPECIES.

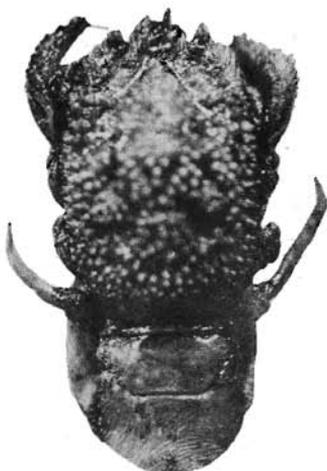
*A.* Surface of coral, *Favites abdita* from Washington Island, showing aperture of pit inhabited by *Cryptochirus pyriformis*. *B.* Section of *Favites abdita* showing outline of pit 8 mm. deep inhabited by *Cryptochirus pyriformis*. *C, D.* Dorsal and ventral surfaces, respectively, of female *Cryptochirus pyriformis*,  $\times 7$ . *E.* Surface of coral, *Cyphastrea ocellina* from Oahu, showing female *Cryptochirus minutus* in aperture of pit. *F.* Dorsal surface of female *Cryptochirus minutus*,  $\times 10$ .

PLATE 4. *CRYPTOCHIRUS CORALLIODYTES* HELLER (?) AND *CRYPTOCHIRUS CRESCENTUS* EDMONDSON.

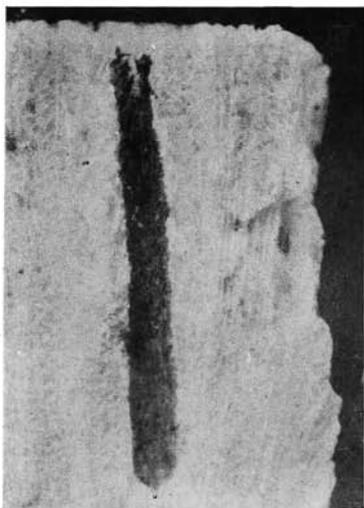
*A.* Surface of coral from Wake Island showing aperture of pit inhabited by *Cryptochirus coralliodytes* (?). *B.* Dorsal surface of *Cryptochirus coralliodytes* (?) from Wake Island. *C.* Pit in coral, *Pavona duerdeni* from Christmas Island, North Pacific Ocean, inhabited by *Cryptochirus crescentus*. *D.* Dorsal surface of *Cryptochirus crescentus* from Christmas Island,  $\times 12$ .



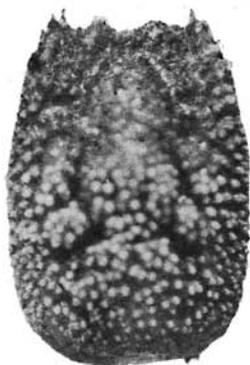
A



B



C



D

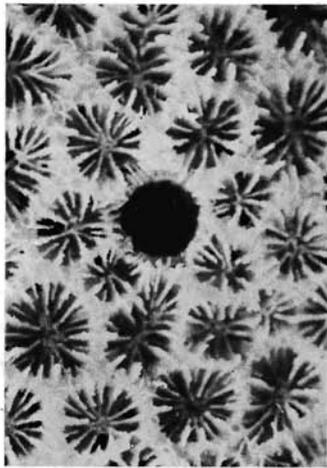


E



F

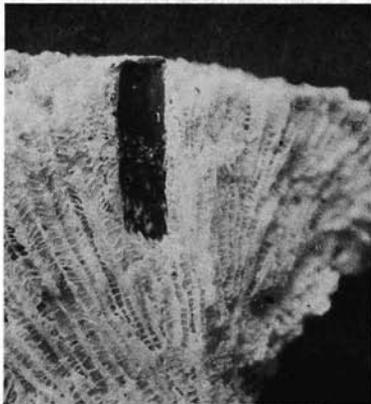
PLATE 1.—CRYPTOCHIRUS RUGOSUS, NEW SPECIES.



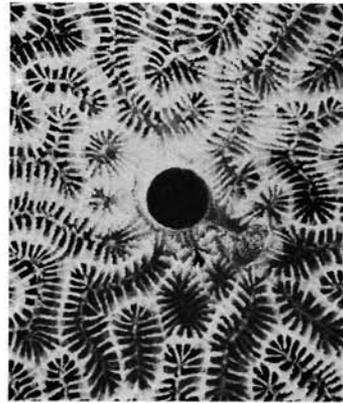
A



B



C



D

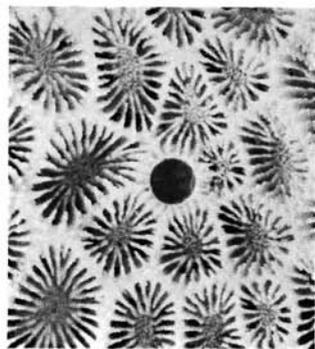


E

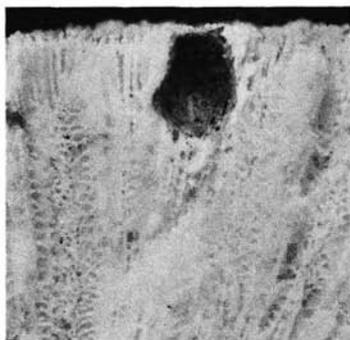


F

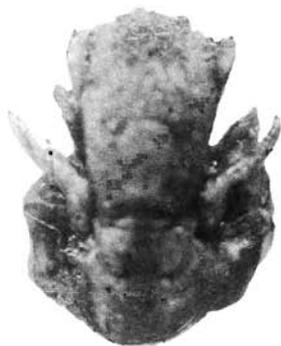
PLATE 2.—*CRYPTOCHIRUS PACIFICUS*, NEW SPECIES.



A



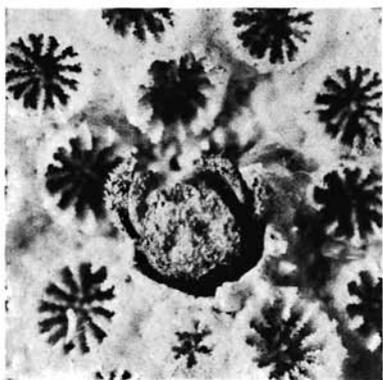
B



C



D

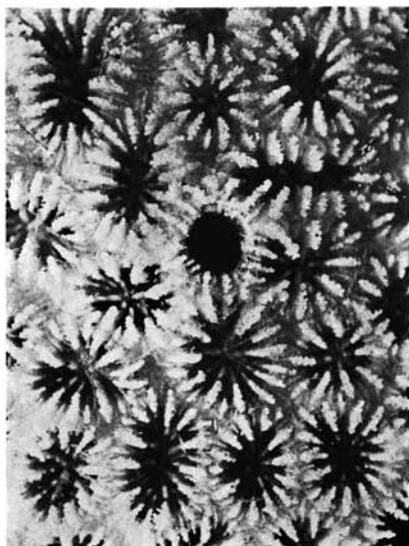


E



F

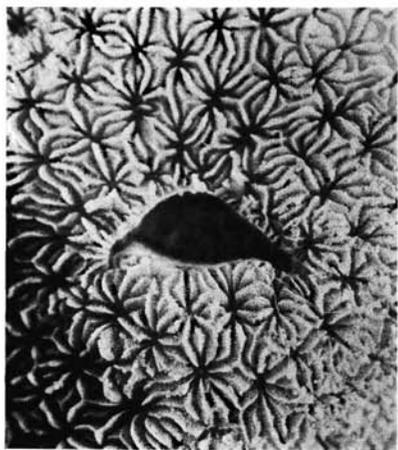
PLATE 3.—CRYPTOCHIRUS PYRIFORMIS AND CRYPTOCHIRUS MINUTUS,  
NEW SPECIES.



A



B



C



D

PLATE 4.—CRYPTOCHIRUS CORALLIODYTES HELLER (?) AND  
CRYPTOCHIRUS CRESCENTUS EDMONDSON.