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NOTES ON SOME BARNACLES FROM THE GULF OF CALIFORNIA

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THE collection of Cirripedia made by Steinbeck and Ricketts (1941) has added considerably to our knowledge of the barnacles of the Gulf of California. Although most of the barnacles in the collection were identified by Ira E. Cornwall, of the Hopkins Marine Station, Pacific Grove, Calif., nine lots of their material were examined by the author. Five species or subspecies, one new, were represented in the nine lots; these are starred in the list below. Fifteen different barnacles have been reported so far from the Gulf of California (see Pilsbry, 1907 and 1916; Steinbeck and Ricketts, 1941; and Henry, 1941):

**Balanus amphitrite inexpectatus* Pilsbry.

Balanus concavus Bronn.¹

Balanus improvisus Darwin.

Balanus tintinnabulum californicus Pilsbry.

**Balanus tintinnabulum peninsularis* Pilsbry.

**Balanus trigonus* Darwin.

Tetraclita squamosa (Bruguière).²

Tetraclita squamosa stalactifera (Lamarek).

**Tetraclita squamosa stalactifera* forma *confinis* Pilsbry.

**Chelonibia patula* (Ranzani), new subspecies described herein (p. 370).

¹ Reported by Steinbeck and Ricketts (1941). Probably should be subspecies *pacificus* Pilsbry.

² Provisionally identified as subspecies *rubescens* Darwin (Steinbeck and Ricketts, 1941).

Chelonibia testudinaria (Linnaeus).

Coronula diadema (Linnaeus).

Chthamalus anisopoma Pilsbry.

Chthamalus fissus Darwin.

Lepas anserifera Linnaeus.

Further collecting in this region will undoubtedly increase the number of known species of these crustaceans. No species of the genera *Scalpellum*, *Alepas*, or *Heteralepas*³ has been reported from the Gulf of California, and only one species of *Lepas* and one species of whale barnacles have been found. It seems possible that *Balanus tintinnabulum coccopoma* Darwin, which extends from Panama to Mazatlan, might occur in this area. Also two species, *Balanus ortcutti* and *Balanus regalis*,⁴ described by Pilsbry (1916), and each known from only one locality, on the west coast of Baja California, should be looked for in the Gulf.

Genus BALANUS Da Costa

BALANUS AMPHITRITE INEXPECTATUS Pilsbry

PLATE 31, FIGURES 15-16

Balanus amphitrite inexpectatus PILSBRY, 1916; NILSSON-CANTELL, 1933; STEINBECK and RICKETTS, 1941.

Localities: Estero de la Luna, Sonora, April 10, 1940, and Estero de Agiabampo, Sonora, April 11, 1940, on *Strombus gracilior* Sowerby.

This species was described by Pilsbry (1916) from a series of about 40 specimens growing on oystershells from the Gulf of California. Nilsson-Cantell (1933) reported *B. a. inexpectatus* from Bonaire and figured two terga to show the variation in the short, wide spur and also pointed out variations in the color of the wall. Specimens of *B. a. inexpectatus* identified by Ira E. Cornwall were collected by Steinbeck and Ricketts on the Mogote sand flats, La Paz Bay.

The specimens from Sonora are for the most part small; the largest is 13 mm. in diameter. The maximum diameter listed by Pilsbry is 15 mm. and by Nilsson-Cantell, 17 mm. They are described as "large barnacles" by Steinbeck and Ricketts. Unless eroded the parietes are dark with white lines as in the type, except in a few small specimens, which have light-colored parietes. The radii differ from Pilsbry's description. They vary in color from tan to the dull purple of the walls

³ Steinbeck and Ricketts (1941) erroneously state in their bibliography under Pilsbry (1907) that *Heteralepas quadrata* was reported from the Gulf of California by Aurlivillius. Gruvel (1905) reported *Heteralepas quadrata* (Aurlivillius) on *Lepas hillii californiensis* Gruvel from Lower California.

⁴ Von Kolosváry (1940) figures the rostrum, scutum, and tergum of a barnacle from Mollendo, Peru, which he calls *Balanus concavus regalis* Pilsbry.

and have white horizontal lines. The summits are oblique. The white alae have summits parallel to the basis. Internally the compartments are ribbed basally.

The pit below the adductor ridge of the scutum varies in depth. In one scutum the adductor and articular ridges are confluent (pl. 31, fig. 15). The valve is not roughened.

The spur of the tergum varies both in width and in length. The tergum shows patches of purple both externally and internally. The articular ridge is very prominent and reflexed.

Pilsbry did not describe the mouth parts and cirri of the specimens from the Gulf of California, but Nilsson-Cantell has figured the internal parts of the specimens from Bonaire. The mouth parts and cirri of the specimens from Sonora differ somewhat from the description of Nilsson-Cantell.

The labrum has two teeth on one side of the notch and three on the other. The lower pair of spines of the maxilla are larger and longer than the other spines and are set on a slight prominence. The fourth and fifth teeth of the mandible are very short and blunt. There are spines between the first and second teeth.

The posterior ramus of cirrus i is two-thirds the length of the anterior and has 9 segments. The anterior ramus has 18 segments. Both rami are protuberant. The rami of cirrus ii have 11 and 10 segments, strongly protuberant; the anterior ramus is one segment longer than the posterior. The lower segments of cirrus iii have spinules on the distal sutures and teeth on the anterior borders of the segments. The anterior ramus is 3 segments longer than the posterior. Median segments of cirrus vi have 6 pairs of spines and a few fine spinules on the distal borders. The segments of the posterior cirri are very elongate. The penis is very long, at least twice the length of cirrus vi and has a fine dorsal point.

BALANUS TRIGONUS Darwin

Localities: Estero de Agiabampo, Sonora. April 11, 1940, on *Calinectes bellicosus* Stimpson; Concepción Bay, Baja California, on *Navicula pacifica* Sowerby.

Genus TETRACLITA Schumacher

TETRACLITA SQUAMOSA STALACTIFERA forma CONFINIS Pilsbry

Locality: San Francisquito Bay. March 31, 1940, on *Acmaea daliana* Pilsbry, with *Chthamalus anisopoma* Pilsbry.

Genus CHELONIBIA Leach

CHELONIBIA PATULA DENTATA, new subspecies

Plate 31, Figures 4-13

Holotype.—U.S.N.M. No. 79409, from Estero de Agiabampo, Sonora, Mexico, April 11, 1940, on *Callinectes bellicosus* Stimpson.

Description.—Largest diameter, 18 mm.; height, 7 mm. Steeply conical. Orifice polygonal, large, varying from 63 to 77 percent of the greatest diameter of the shell. Surface white, smooth.

Radii rather wide, smooth and glossy, very little sunken below the parietes. Summits may be slightly oblique or very oblique, minutely jagged. Edge of outer lamina and recipient furrow minutely but distinctly toothed. Outer lamina of some compartments with one to three oblique ridges and pits, so that the lines of suture become toothed.

Alae: Summits oblique, edges minutely jagged.

Compartments: The rostrum is the highest compartment and at the base is about twice the diameter of the carina. The sutures on the internal surface of the rostrum are usually indistinct. The lateral compartment is slightly wider than the carinolateral. The compartments may be irregular in shape, especially if the barnacle is situated on the claws of a crab.

Sheath: Part formed by radii and alae horizontally grooved; part extending to base as pillars vertically ribbed with base denticulate; intermediate part smooth.

Inner lamina not well differentiated from sheath.

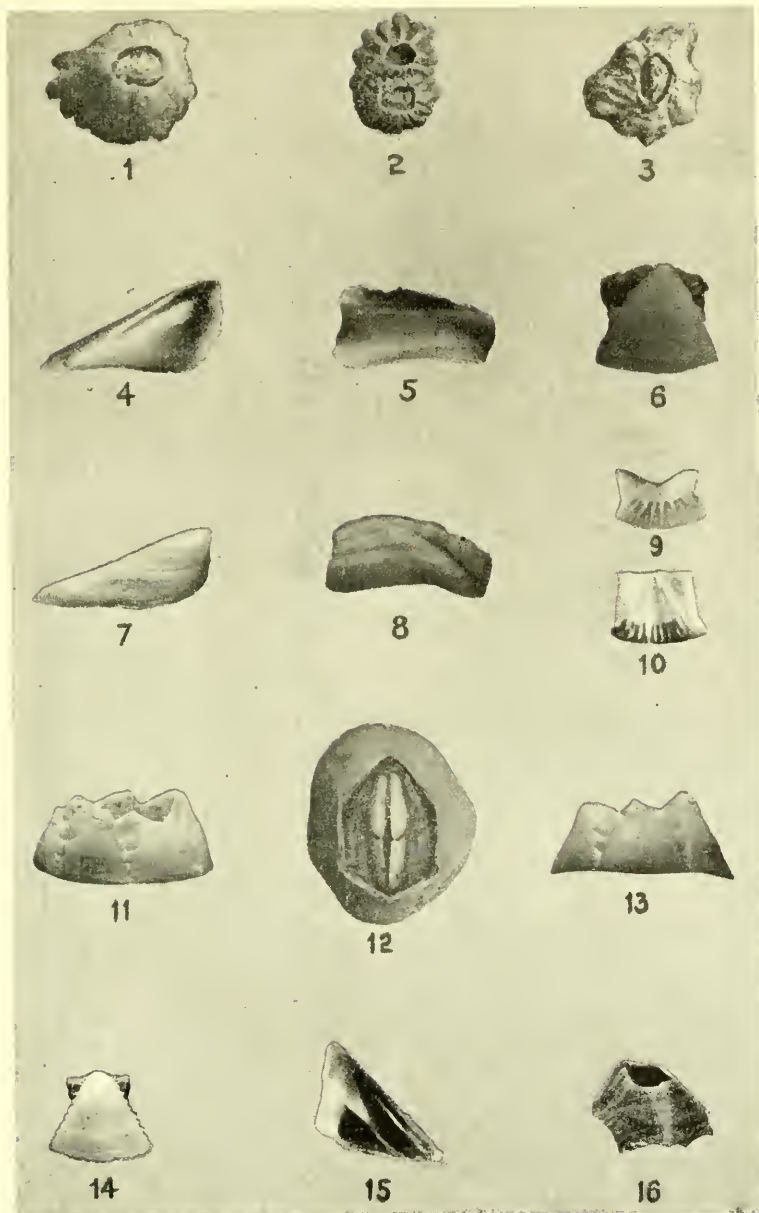
Vertical plates or septa: Alternate plates do not reach inner lamina; basal edges finely denticulate.

Interspaces between vertical plates filled up at extreme top of compartments; tubular for about two-thirds the height of compartments, as alternate vertical plates reach the inner lamina; exposed at base of compartment.

Opercular valves much smaller than the orifice, the opercular membrane attached rather high in the orifice.

Scutum: Occludent margin only slightly inflected except near basal margin; narrow but deep channel runs close to and parallel with margin from apex to base; not sinuous. Pit for adductor muscle deep. Articular ridge small but prominent, supporting a yellowish, horny membrane, which is attached to the inner part of the tergum. Basal ledge on exterior margin, narrows toward rostral end of scutum.

Tergum: Scutal margin wider than carinal edge, curved. Articular furrow wide and deep, receiving horny crest from scutum. Articular ridge represented by slightly raised edge of furrow.



- 1-3. *Chthamalus anisopoma* Pilsbry: 1, From San Francisquito Bay on *Acmaea dalliana* Pilsbry ($\times 3.5$); 2, Port San Carlos on *Tegula rugosa* Adams ($\times 2$); 3, Gabriel Bay on *Ostrea mexicana* Sowerby ($\times 3.5$).
- 4-13. *Cheloniobia patula dentata*, new subspecies: 4, 5, Internal view of scutum and tergum ($\times 7$); 6, carina showing teeth ($\times 3$); 7, 8, external view of scutum and tergum ($\times 7$); 9, base of lateral compartment ($\times 2$); 10, internal view of rostrum ($\times 2$); 11, type specimen from the side ($\times 1.5$); 12, apical view ($\times 1.5$); 13, carinal view of type specimen ($\times 1.5$).
14. *Cheloniobia testudinaria* (Linnaeus) from La Paz (from collection of M. C. Z.): Carina showing teeth ($\times 1$).
- 15, 16. *Balanus amphitrite inexpectatus* Pilsbry from Estero de la Luna: 15, Scutum ($\times 6$); 16, lateral view ($\times 1.5$). (Photographs by Don Anderson.)

Longitudinal furrow narrow but distinct. Basal ledge narrower than in scutum; widest toward scutal margin. Labrum short, blunt teeth on each side of notch. The margin is hairy.

Palpi meet over labrum.

Mandible: Five teeth; fifth tooth united with inferior angle. Upper and lower margins hairy.

Maxilla: Margin straight with seven pairs of spines below the upper pair. Cluster of small spines on inferior angle.

Cirri. All the cirri have pectinated spines. The spines of the first two cirri are more coarsely pectinated than those of the posterior cirri. Cirrus i, subequal rami of 9 and 8 segments. Cirrus ii, subequal rami of 14 and 13 segments; both rami slightly protuberant. Cirrus iii, slenderer and longer than cirrus ii but much shorter than cirrus iv; rami have 21 and 20 segments; fine spines on distal sutures. Cirrus iv and v long and slender; spination like that of cirrus vi. Cirrus vi, median segments with two pairs of long spines and clumps of short spines at the base of each pair. There are multifid spinules on the distal sutures; the spines at the posterior-distal angle are two-thirds the length of the segment. Both rami have 38 segments; all the segments except those at the tip are twice as wide as long.

Penis nearly as long as cirrus vi; dorsal point lacking.

Remarks.—*Chelonibia patula dentata*, in addition to the presence of teeth on the lines of suture between some of the compartments, shows several minor differences from typical *C. patula* (Ranzani). The inner lamina is not so distinct from the sheath, the sutures on the interior of the rostrum are usually not very clear, and the inside of the radii are transversely grooved.

All except the small specimens show teeth on the outer lamina of at least the carina (pl. 31, figs. 11, 12, and 13). In the type specimen there are three teeth on each side of the carina and two teeth on the left carinolateral and left lateral but no teeth on the right or on the rostrum. The teeth differ from those of *C. testudinaria* (fig. 14) by being coarser and fewer in number (fig. 6), and they are oblique instead of parallel to the basis as in that species.

Chelonibia patula (Ranzani) has never been reported from the west coast of North America, although it is nearly a cosmopolitan species in tropical and subtropical waters. It has been recorded from the Hawaiian Islands by Gruvel, according to Pilsbry (1916). Seven specimens of typical *C. patula* from *Portunus sanguinolentus* from Honolulu from the collection of the Department of Zoology, University of Washington, have been examined and agree with Darwin's description of this species.

Chelonibia patula is the least modified species of this genus. The development of the teeth in one to three compartments in *C. patula*

dentata connects this subspecies with *C. testudinaria*, although in other respects the structure of the compartments has not changed. Whether typical *C. patula* occurs on the west coast of North America or whether this species is represented by subspecies *dentata* is an interesting question, which cannot be answered until extensive collecting has been done in this region.

Genus **CHTHAMALUS** Ranzani

CHTHAMALUS ANISOPOMA Pilsbry

PLATE 31, FIGURES 1-3

Chthamalus anisopoma PILSBURY, 1916; STEINBECK and RICKETTS, 1941.

Localities: Cape San Lucas, March 1940, on *Aemaea atrata* Carpenter; Gabriel Bay, Espiritu Santo Island, April 12, 1940, on *Ostrea mexicana* Sowerby; San Francisquito Bay, March 31, 1940, on *Aemaea dalliana* Pilsbry, with *Tetraclita squamosa stalactifera* f. *confinis* Pilsbry; Port San Carlos, Sonora, April 4, 1940, on *Tegula rugosa* Adams.

Specimens of *C. anisopoma* from the above localities vary somewhat from those described by Pilsbry and from the general description given by Steinbeck and Ricketts. The parietes may be white or buff, smooth (pl. 31, fig. 1), ribbed at base or strongly ribbed (fig. 2) as in the type form. The specimens vary in shape from conic to cylindrico-conic or they may be extremely flattened (fig. 3). The largest specimen is 7 mm. in diameter and 3.5 mm. in height.

Young barnacles have smooth parietes, which are usually dark gray. In a specimen 1.5 mm. in diameter the orifice is closed by both pairs of valves, and the right and left scuta and right and left terga are similar in shape and size. They resemble the left valves of the adult. Therefore this species is probably more closely related to *C. panamensis* than to *C. fissus*. When the barnacle reaches the diameter of 3 mm. the valves show the disparity in size and shape between the right and left valves typical of the adult.

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