CIRRIPEDIA FROM THE PACIFIC COAST OF NORTH AMERICA.

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The cirripedes have been neglected by American zoologists and, consequently, aside from a few references to littoral species in Darwin's Monograph on Cirripedia, almost nothing has been published upon the west-American forms. The littoral species, especially of *Balanidæ*, stand in need of thorough study, while only a beginning is now made in the description of the deeper-water forms, which will doubtless prove numerous.

The following report is based upon collections made by the steamer *Albatross* in Alaska and northwestern Washington in 1903 and off the coast of southern California in 1904.

It has not been thought necessary to give full references to the literature of each species. Such bibliographic matter may be found in the following works:

1851. DARWIN, CHARLES. A Monograph on the subclass Cirripedia. The Lepadidæ or pedunculated cirripedes.

1854. ———, ———. The Balanidæ or sessile cirripedes, etc.

1883. HOEK, P. P. C. Report on the Cirripedia collected by H. M. S. *Challenger* during the years 1873–76 Challenger Report, Zoology, vol. VIII.

1897. WELTNER, W. Verzeichniss der beschreibenen recenten Cirripedenarten. Archiv für Naturgeschichte, jahrg. 1897, bd. I, p. 227.

1905. GRUVEL, A. Monographie des Cirrhipèdes ou Thécostracés. Bibliography on p. 464–467.

LEPADIDÆ.

Lepas anatifera Linnæus.

Station 4391, off Santa Catalina Island, on floating wood.

Lepas pectinata Spengler.

Stations 4337 and 4351, off Point Loma Light, near San Diego, Cal., on surface. Station 4406, southeast point of Santa Catalina Island, surface, on giant kelp. Also station 4372.

Lepas fascicularis Ellis and Solander.

South point of south Coronado Island, station 4340, 46 fathoms. The *Lepas* was probably taken at the surface as the trawl came up, not at the depth given.

Scalpellum phantasma n. sp.

[Pl. VI, fig. 1.]

The capitulum is ovate, composed of 13 plates of which only a slender skeleton is calcified. There is no membranous covering or pilosity. The calcified parts are white, the chitinous interspaces creamy gray. The occludent margin is strongly and evenly arched in a single curve.

The calcified portion of the scutum consists of a band along the occludent margin, widening below, where it is biramose, and a very narrow curved band along the tergal margin of the plate, diverging V-like from the apex. The umbo is apical.

The tergum is V-shaped, consisting of a wider band along the occludent margin and a narrower, longer band near the carinal margin of the plate.

The carina is simply arched, with subapical umbo. The roof is a rather narrow gutter between two high, rounded marginal ribs. The sides are very narrow below, widening above, and spreading in a rounded lobe above the umbo.

The upper lateral plate is calcified in form of an unequally three-armed swastika, the shortest arm is directed upward, the longest obliquely downward and toward the carina, the third arm runs toward the inframedian lateral plate. The arms are slender, curved, and acute at the ends.

There is no rostrum. The rostro-lateral plate is biramose, being calcified along the occludent margin, with a slender arm ascending toward the upper lateral plate and a wider one along the basal margin.

The infralateral plate has a median umbo, a slender ascending arm, a widening descending portion, and a short arm reaching toward the carina.

The carino-lateral plate is L-shaped, with the longer branch ascending near the carina and the shorter along the basal margin. The umbo projects below the base of the carina.

The peduncle is cylindrical, protected by wide, short scales, not in the least imbricating, 9 or 10 in any of the 8 longitudinal rows.

Length of the capitulum 28 mm., breadth 15 mm., diameter 7 mm. Length of the carina 23 mm. Length of the peduncle 8. 5 mm, diameter in the middle 5.5 mm.

Type, no. 32421 U. S. National Museum, from *Albatross* station 4397, off Santa Catalina Islands, 33° 10′ 15″ N., 121° 42′ 15″ W., 2,196 fathoms, gray mud. A single specimen.

This peculiar species is perhaps the finest of the "incompletely calcified" forms. It is related by the shape of the carina to *S. gruvelianum*. Among the imperfectly calcified forms it is most related to *S. marginatum* Hoek, from north of New Guinea, but differs from that in the shape of the upper lateral plate, the regular arch of the occludent margin, and other characters. It was taken at a greater depth than other Californian cirripedes.

Scalpellum larvale, n. sp.

[Pl. VI, fig. 2–6.]

Capitulum oblong, the occludent and carinal outlines about equally convex, composed of 13 valves which are but partially calcified. Rostrum wanting. Surface not hairy. Umbo of the carina apical.

The calcified part of the scutum is shaped like an inverted letter Y, the umbo being apical, minute and acute, and extending noticeably over the tergum.

The calcified portion of the tergum is in the form of an inverted V, with the addition of a small ledge on the carinal side of the apex. The carinal limb of the V is much longer than the occludent.

The carina is much better calcified than the other plates. It is very long, extending about three-fourths the length of the tergum, simply arched, the curvature being greater above. The roof is flat, passing rectangularly into the narrow sides.

The upper lateral plate is narrow, somewhat boomerang-shaped. The rostro-lateral plate is narrow, transverse, with parallel upper and basal margins. The inframedian lateral plate is arrowhead-shaped, acute above, biramose below, small. The carino-lateral plate is calcified in form of an inverted T and is much smaller than the upper lateral plate.

The peduncle is very short, rather sparsely protected by very wide, short scales. It widens slowly from the base to the capitulum.

Length of the capitulum 13.3 mm., width 7 mm., diameter 3 mm. Length of the carina 11 mm. Length of the peduncle 5 mm., diameter in the middle 2.3 mm.

The mandibles (fig. 1, A) have 4 strong acute teeth and a lower point at the inferior angle.

The maxillæ (fig. 1, c) have a straight anterior margin with irregular strong spines.

The anterior cirri are very short, less than half as long as the second pair; the rami have 6 and 9 joints, respectively. The rest of the cirri are long, composed of long joints, which bear four pairs of spines on the anterior and three pairs of smaller ones on the posterior sides (fig. 1, B, sixth joint of the exopodite of the third cirrus), though the development of spines varies on different parts of the same cirrus.

The caudal appendage (fig. 1, D) is very small, perhaps an eighth as long as the last ramus, composed of four joints, the first one long (perhaps really composed of two joints), the last bearing a terminal tuft of long spines.

Type, no. 32417 U. S. National Museum, from *Albatross* station 4353, off Point Loma Light-House, 639 fathoms, seated on a glassy spine or spicule.

The shape of the scutal and of the inframedian plate is not like any of the known species, *S. insigne* being apparently the nearest.

A young individual in the same group, shown in the figure, is interesting as showing that the young are more normally calcified than the adult stage, the calcification after an early age proceeding only along certain lines indicating the longer axes of the valves. This young individual has a capitulum 5.7 mm. long. The valves of this specimen resemble those of *S. insigne* Hoek more than do those of the adult stage.

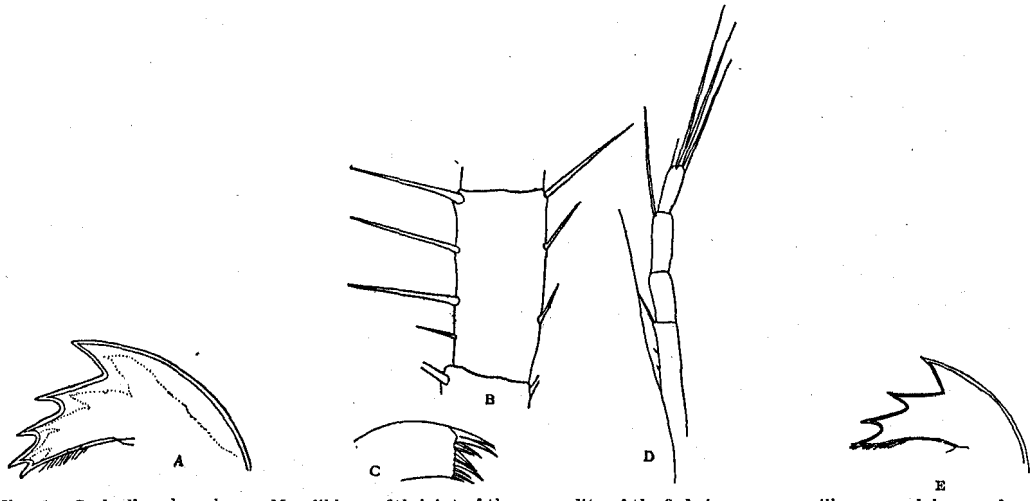


FIG. 1.—*Scalpellum larvale.* A, Mandible; B, 6th joint of the exopodite of the 3rd cirrus; C, maxilla; D, caudal appendage; E, mandible of specimen from station 4382.

A series from *Albatross* station 4382, south point of Coronado Island, in 656 fathoms (type no. 32418 U. S. National Museum), consists of smaller individuals, the largest three measuring about 10 mm. in length of capitulum. The scutal calcification is broader and less deeply bifurcate below than in the type specimen. A series from this lot showing the stages of growth is figured in plate VI (fig. 3–6), all of them being drawn to the same scale.

The anterior cirri have 6 and 10 joints. The other cirri are like those in the type of *S. larvale*. The caudal appendage has 5 joints, but otherwise is as figured for *S. larvale*. The mandibles (fig. 4, E) have three teeth and a spine at the lower end.

Several complemental males were seated in the fold of the sack just inside the occludent borders of the scuta. They are of the degenerate *Cypris*-like form, without plates. Their hosts lack penes. The species therefore belongs to Hoek's third group (Challenger Report, vol. x, Cirripedia, p. 21.)

Scalpellum californicum n. sp.

[Pl. VI, fig. 8, 13.]

The capitulum is composed of 14 normally calcified smooth valves, covered with a membrane which is shortly and delicately pilose. The occludent margin is nearly straight, the opposite margin very convex. The carina is simply arched, with convex rounded roof. The chitinous interspaces

are rather wide, and the valve margins usually not very distinct. The color is dirty gray, with most of the valves more or less purplish or livid. The scutum has subparallel occludent and lateral margins and very oblique tergal margin. The basal margin runs at a right angle from the occludent.

The tergum is very long and narrow, its occludent and carinal margins slightly convex, the lower margin sinuous.

The carina is simply arched with apical umbo and convex roof. The upper half of the valve has the roof defined by small lateral ridges, but these become weaker and finally obsolete below, where the valve is wider and the convex roof passes into the sides without distinct boundary. The sides are narrow throughout and excavated in a shallow furrow along the lateral ridges. The carina extends upward to the middle of the carinal margin of the tergum.

The upper lateral plate is trapezoidal, the carinal, tergal, and scutal margins slightly convex, the basal margin straight and abutting on the inframedian lateral plate only. The angles are somewhat rounded off, and the umbo is at the tergo-scutal angle.

The rostrum is small, subtriangular, with apical umbo. The rostro-lateral plate is small and wedge-shaped, being narrower in front.

The inframedian lateral plate is well developed, nearly square, as wide as high, its forward (or ventral) margin convex, and bounded more by the scutum than by the rostro-lateral plate. The other margins are straight. The umbo is central.

The carino-lateral plate is small, irregularly reniform or lunate with blunt ends, with concave carinal margin and convex latero-basal margin. The umbones scarcely project at the base of the carina.

The peduncle is long, approaching the capitulum in length, its lower half cylindric, upper half gradually widening to the width of the base of the capitulum. It is very closely and regularly clothed with rather small lozenge-shaped scales, of which there are 20 or more in a longitudinal row.

Length of capitulum 15 mm., width 7 mm., diameter 4 mm. Length of carina 11 mm. Length of peduncle 11.5 mm., diameter in the middle 3 mm.

The rami of the first pair of cirri are very short, with globose segments, 11 and 12 in number. The other cirri are long, composed of long segments, which bear from 5 on the second cirri to 6 pairs of spines on the fifth and sixth cirri.

Albatross stations 4558, 4555, 4551, 4452, 4535, 4439, off Point Pinos Light-House in 40 to 86 fathoms, on mud and rock bottom; the types, no. 32411 U. S. National Museum, from station 4558. Topotypes no. 32412. Seated on annelid tubes, etc. Apparently abundant in the region of Monterey Bay.

S. californicum is an abundant form in comparatively shallow water. It is related to *S. grœnlandicum* and *S. angustum*, of the extreme northern Atlantic, but in these the general shape of the capitulum differs, and most of the plates show more or less diversity. The rostro-lateral plate is much higher in both of the Atlantic forms.

Most of the specimens are smaller than the type, the capitulum 10 to 12 mm. long, with the peduncle less closely scaly. The livid or dried-blood color of the valves or parts of them is variable, some individuals being white. The peduncle varies a great deal in length. It is sometimes only half the length of the capitulum, and yet not more closely scaly than in other individuals with long peduncles.

The figures are from washed specimens with the enveloping membrane partly removed in order to show the valves clearly. Their outlines are much less distinct in uncleaned individuals.

Scalpellum californicum osseum n. subsp.

[Pl. VI, fig. 7.]

Similar in general characters to *S. californicum*, but the valves are more completely calcified, white, with distinct outlines and clear-cut angles, though covered with a thin, transparent, densely pilose membrane. Upper lateral plate distinctly pentagonal, the scutal and tergal margins longest. Tergum shorter and wider than in *californicum*. Peduncle long, very sparsely scaly, the scales white; pilose. Length of capitulum, 6.5 mm.

Type, no. 32413 U. S. National Museum, from *Albatross* station 4454, off Point Pinos Light-House, 71 fathoms. Taken also at station 4478, Santa Cruz Light-House, 30 fathoms.

The large number of individuals of *S. californicum*, at all stages of growth, which I have examined show that the above-described form is not a young stage of that species, although it is similar in the number and proportions of the valves.

Scalpellum proximum, n. sp.

[Pl. VI, fig. 9–11.]

Capitulum ovate, compressed, composed of 13 well-calcified valves. There is a well-marked band of integument between the carina and the other valves. It is covered with a thin membrane which is rather closely, shortly pilose. The plates have a sculpture of wide-spaced low ridges parallel to growth lines. The occludent margin forms an even curve nearly as arcuate as the carina.

The scutum is irregularly quadrangular, with convex occludent margin, slightly recurved and very acute umbo, which projects slightly over the tergum; basal margin convex, upper margin concave, and lateral margin sigmoid. The upper latero-tergal angle projects in a point between the apex of the upper latus and the tergum.

The tergum is triangular with recurved apex; occludent margin convex, basal margin straight and oblique, the carinal margin undulating. The carina is very long, regularly arched, with slightly convex, nearly flat roof, bounded by low, rounded lateral ribs. The sides are narrow below, widening above, and at an angle greater than 90° with the roof. It extends upward fully three-fourths the length of the tergum, nearly to its apex.

The upper lateral plate is irregularly pentagonal, the tergal and scutal margins longest, concave, the apex obtuse, being a little built out on the tergal side of the umbo, which is subterminal. The carinal margin is quite short; the basal, which abuts against the inframedian latus, still shorter. There is no rostrum.

The rostral lateral plate is small, quadrangular, nearly as high as wide, with the umbo at the upper angle of its occludent margin. The inframedian lateral plate is narrow, hourglass-shaped, with the umbo at the lower fifth, where the plate is narrowest. Below this is a small triangle and above is a larger one, the upper margin abutting in part on the upper lateral plate, in part on the scutum, with an angle at the suture between these plates. The carinal lateral plate is quadrangular, very much higher than wide, the umbo slightly recurved and projecting below the carina. Its carinal margin is longer than the upper lateral plate, about parallel with its lateral margin; basal margin horizontal, upper margin very oblique.

The peduncle is hardly half as long as the capitulum, covered with wide short scales, of which there are about 9 in any longitudinal row, and about 8 rows.

Length of capitulum 15 mm., breadth 8 mm., diameter 3.4 mm. Length of carina, 13 mm. Length of peduncle 6.5 mm., diameter 3 mm.

Type, no. 32422 U. S. National Museum, from station 4387, 32° 29′ 30″ N., 118° 05′ 00″ W., vicinity of San Diego, Cal., 1,000 fathoms, on an annelid tube.

Somewhat related to *S. gruvelianum*, but quite distinct by the long carina with less strong ribs at its angles, the different shape of the scutum, and of all the lower whorl of plates. It stands very near *S. novæzelandiæ* Hoek, which has a capitulum of the same general shape, the valves similarly separated by narrow chitinous interspaces. In *S. proximum* the occludent margin is more convex; the roof of the carina is apparently greater in width below; the upper lateral plate is obtuse at the apex, not acute as in Hoek's species; the inframedian lateral plate differs in shape; and finally the portions of the carinal lateral projecting below the carina are shorter. *S. flavum* Hoek is also very closely related, but differs by the shape of the inframedian and carinal lateral plates.

S. proximum belongs to a very widely distributed type of the genus, ranging probably through all seas. Gruvel has identified *S. novæzelandiæ* from the north Atlantic, taken by the *Travailleur* in 2,400 to 2,500 meters; and it may eventually be found expedient to subordinate a number of the allied forms to *novæzelandiæ* as subspecies.

Scalpellum gruvelianum, n. sp.

[Pl. VII, fig. 1–3.]

Capitulum compressed, composed of 13 well-calcified valves, covered with a thin membrane which is sparsely hirsute, especially on and near the carina. The plates have no sculpture other than low, wide-spaced growth wrinkles.

Scutum quadrangular, with convex occludent margin, concave tergal, straight lateral and basal margins; the umbo is noticeably recurved and projects slightly over the tergum.

Tergum triangular, the occludent margin convex, apex recurved, scutal margin straight, carinal margin straight, except near the apex, where it is concave. The carina is evenly arched with apical umbo, the roof flat, bounded by a strong rounded ridge along each side; the sides at a little more than 90 degrees with the roof, widest above. It extends beyond the middle of the tergum. The upper lateral plate is quadrangular, the sides straight, scutal margin much the longest, fully twice as long as the carinal margin; umbo apical.

There is no rostrum. The rostral lateral plate is quadrangular, a little narrower in front, being thus somewhat wedge-shaped. It is much shorter than wide. At the occludent margin the umbones are contiguous and project a little. The inframedian lateral plate is very small and narrow, wedge-shaped, with apical umbo. The carinal lateral plate is very irregular in shape, much higher than wide, the umbones projecting and recurved beyond the base of the carina. The carinal margin is equal in length to the scutal margin of the upper lateral plate.

The peduncle is about half as long as the capitulum, pretty closely covered with wide, short scales, and sparsely hairy.

Length of capitulum 17 mm., breadth 9 mm., diameter 3 mm. Length of carina 13 mm. Length of peduncle 9 mm., diameter 3 mm.

Type, no. 32414 U. S. National Museum, from station 4418, Southwest Rock, Santa Barbara Island, 238 fathoms, on an annelid tube, gray sand bottom. The half dozen specimens of the type lot show no mentionable variation. Only two reached the dimensions given above, the others being two-thirds to three-fourths that size.

Scalpellum tritonis Hoek and *S. luteum* Gruvel, both Atlantic species, rather closely resemble this form in lateral aspect. *S. tritonis* has a flat-roofed carina. In *S. luteum* the carina is bicostate, but the inframedian lateral plate is wider at the base, triangular, the shape of the carinal lateral plates below the carina is different, etc. It is from near the Azores, and seems, in the ensemble of its characters, to be more nearly related to *S. gruvelianum* than any other species now known. *S. planum* Hoek has a carina with similar raised angles, but the other plates differ widely. By the keys of Hoek and Gruvel, *S. gruvelianum* comes out to *S. planum*, but a place can easily be made for it by attention to the shape of scutum and the lateral plates.

This species is respectfully dedicated to M. A. Gruvel, author of various valuable works on cirripedes, including a useful monograph.

Scalpellum gruvelianum secundum, n. subsp.

[Pl. VII, fig. 4.]

Similar to *S. gruvelianum* in general characters, but the carina extends somewhat higher on the tergum, the sutures are wider, the plates being more separated by chitinous interspaces, and the infralateral plate differs in shape, being somewhat wider above than below, with subcentral umbo, the lower half of the plate being raised in a short thick ridge. Length of capitulum 9 mm., of peduncle 4 mm.

Type, no. 32415 U. S. National Museum, from *Albatross* station 4429, Gull Inlet, south coast of Santa Cruz Island, in 506 fathoms, gray mud.

Represented by a single specimen, which while obviously related to *S. gruvelianum*, yet presents a number of differences which seem to indicate another variety or species. The apices of the terga seem to have been broken or worn off.

Scalpellum perlongum, n. sp.

[Pl. VI, fig. 12.]

The long and narrow capitulum is composed of 13 white valves, is nearly nude and nowhere hairy. There is no rostrum; the umbo of the carina is apical; the valves are wholly calcified, and marked with growth lines.

The scutum is quadrangular, convex, with the occludent margin convex above, straight below. The umbo slightly overlaps the tergum, tergal margin oblique, basal margin slightly convex. The lower anterior part of the valve is sculptured with weak radial striæ.

The tergum is longer than the scutum, triangular, the occludent margin convex, basal margin straight, carinal margin sinuous.

The carina is very long, extending to the upper third of the tergum, and is arcuate, much more strongly so above than below. The roof is slightly convex, nearly flat, the sides meeting it at right angles, but without ribs at the angles. The sides are widest near the apex.

The upper lateral plate is quadrangular, the scutal margin longest and concave, the tergal, carinal, and basal margins shorter, subequal, nearly straight. The lower anterior angle is cut off, abutting against the inframedian lateral plate. The rostro-lateral is squarish, as high as wide, the upper and side margins subequal, the basal margin decidedly shorter. The umbo is at the upper occludent angle.

The inframedian lateral plate is very long and narrow, somewhat wineglass-shaped, being narrowest below the middle, widening slowly above and rapidly at the base. The umbo is at the narrow part.

The carino-lateral plate is very long—fully twice as long as wide. The lateral and carinal margins are subparallel, the upper margin very oblique and near the base curving out below the carina, beyond which the umbones bluntly project.

The peduncle is short and slender, rather sparsely protected by large scales, of which there are about six in any longitudinal row.

Length of capitulum 8.8 mm., breadth 3.3 mm., diameter 1.2 mm. Length of carina 6.6 mm. Length of peduncle 2 mm.

Type, no. 32420, U. S. National Museum, from *Albatross* station 4353, off Point Loma Light-House, vicinity of San Diego, in 639 fathoms, on a glassy spine or spicule; gray mud bottom.

Chiefly notable for the long plates of the basal whorl and the elongation of the whole capitulum. It is very closely related to *S. flavum* Hoek, from the South Atlantic, lat. 46° 46′ S., lon. 45° 31′ E., in 1,375 fathoms, but differs by the quadrate rather than triangular rostro-lateral plate, its basal margin being much longer than in *S. flavum*, by the narrower sides of the carina, and the narrower carino-lateral plate. Three specimens were on the same glassy spicule which bore the types of *S. larvale*.

BALANIDÆ.

Balanus concavus Bronn.

Balanus concavus Darwin, Balanidæ, p. 235. G. C. Martin, Maryland Geological Survey, Miocene, p. 94, plates 33, 34, 1904.

Stations 4303 and 4304, Point Loma Light-House, vicinity of San Diego, in 21 to 25 fathoms; 4420, East Point San Nicolas Island, 33 fathoms; 4492, Santa Cruz Light-House, 26 fathoms.

The specimens belong to the small, conic, pink-striped form already known from Panama. This race is very unlike the large form of the Virginia and Maryland Miocene and the more rugged, irregular specimens of the Caloosahatchee Pliocene, but Darwin considers that such varying races are all referable to *B. concavus*.

Balanus aquila, n. sp.

[Pl. VIII, fig. 5–8; pl. X, fig. 2; pl. XI, fig. 2.]

A large species related to *B. psittacus* (Molina). Basis, parietes, and radii permeated by pores, but they are minute and inconspicuous except in the parietes.

The wall is conical with small orifice, roughened by irregular rude ridges on the parietes, whitish where not covered with a bright yellow cuticle, which remains chiefly near the base. It is thick, strong, and dense, porous only in the outer layer. The radii are rather narrow, the alæ concealed. The sheath is long, sculptured with minute thread-like transverse raised lines. Below it the interior is white with some yellow stains, and closely, irregularly striated. The white basis is level, thin, and solid except for a very few pores which in some places penetrate its lower or attached portion. The sutures are inconspicuous and smooth within, but the separated plates show transversely striate edges.

The scuta (pl. VIII, fig. 7, 8) are dull yellow inside, whitish beneath, a brownish-yellow cuticle externally. The plate is curved inward on both tergal and occludent borders, but more so on the former. The basal margin arches upward and is quite arcuate, bringing the baso-tergal angle above the middle of the valve's length. The surface is sculptured with close, fine, deeply cut longitudinal grooves, decussated by shallower, wider transverse or concentric furrows, cutting the striæ into beads or granules. Inside, the scutum has a sharp, raised and reflexed articular ridge, and a deep, narrow articular furrow. There is a strong adductor ridge, not confluent with the articular ridge. Inside the

beveled margin of the lower half of the occludent border there is an inflected sharp ridge. Toward the basal margin the inner surface is longitudinally grooved.

The tergum (pl. VIII, fig. 5, 6) has a long purple beak, one-fourth the length of the whole plate. The outer surface is worn above, but the lower part is cancellated like the scutum. The longitudinal sulcus is closed by infolding of its sides. The spur is long, rounded at the end, and situated at less than its own width from the scutal margin. On both sides the basal margins slope steeply to the spur. The interior is yellow, with a long purple spot in the middle. Articular ridge short, suberect and thin. A low, flat, gently arcuate rib runs from the spur to the apical beak, in which a fine cavity penetrates from the apex of the purple spot. The depressor crests are few and not very strong.

Basal length of the walls 70 mm., height 75 mm. Length of the scutum 31 mm., breadth 13.5 mm. Length of tergum with spur 32 mm., breadth 12 mm.

The mandible (fig. 2, B, left side) has four small teeth, the last adjacent to several low obtuse denticles at the lower end. The end of the maxilla is sigmoid, the upper half excavated, the lower convex. It is armed with numerous stout and slender spines (fig. 2, C, right side). The first pair of cirri has wide rami like moth antennæ, the posterior one three-fourths as long as the anterior, with greatly protruding segments, about 22 in number. The segments of the anterior ramus are less protruding

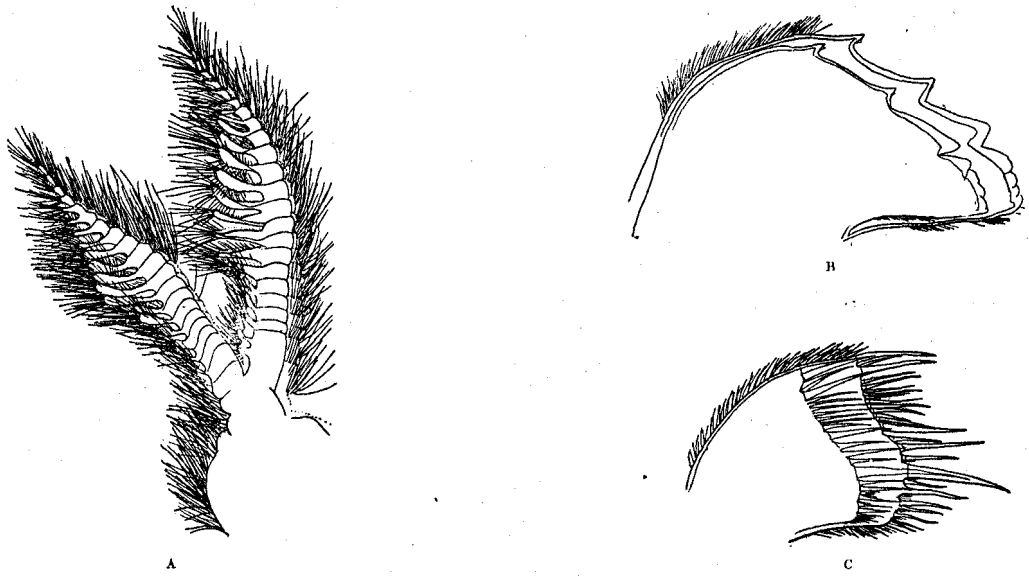


FIG. 2.—*Balanus aquila*. A, Second cirrus; B, mandible; C, maxill..

and about 30 in number. The second cirri (fig. 2, A) have subequal branches, and the protrusion of the segments reaches its maximum. The third cirri are longer, with much less protruding segments. The other cirri are much more slender, longer, with about 5 pairs of long spines on each joint.

Type, no. 32403, U. S. National Museum, from *Albatross* station 4496, off Santa Cruz Light-House, 10 fathoms, fine gray sand and rock bottom.

The dense structure of the walls of this species would almost entitle it to a place in Darwin's section C of the genus *Balanus;* but it is clearly related to *B. psittacus* of the Chilean coast by the structure of the opercular plates and the cirri. It differs from *B. psittacus* in the following respects:

The sculpture of the opercular plates is unlike, the longitudinal grooves being far deeper, and the transverse ridges closer. The occludent margin of the scutum is bent inward, as well as the tergal margin. The adductor ridge in the scutum stands free from the articular ridge throughout, whereas in *B. psittacus* the confluence of the two ridges forms a deep vaulted cavity above the depressor muscle impression. The terga are much alike, but in *B. aquila* there is no ridge along the carinal side of the purple streak, such as occurs in *B. psittacus*, and externally the longitudinal sculpture is coarser and the transverse much closer. There are numerous other differences in the walls, etc., but those given above are amply sufficient for the discrimination of the species.

Balanus, sp. undet.

Two very large barnacles were taken at *Albatross* station 4209, Admiralty Inlet near Port Townsend, Wash., on rocky, coarse sand and shell bottom in 25 fathoms. I have been unable to identify them with any described form, but since they are much worn externally and riddled by boring sponges, study of them is deferred until better preserved material comes to hand. The cup is remarkable for the deeply concave pocket-like base and the smooth interior walls of the parietes.

Balanus glandula Darwin.

Balanus glandula Darwin, Mônog. Balanidæ, p. 265.

Quarantine station, Port Townsend, Wash., on *Purpura crispata*. *Albatross* station 4219, Admiralty Inlet in the same vicinity in about 16 fathoms, on broken gastropod shells. Other Alaskan localities are Sitka and Unalaska, collector Dr. Benjamin Sharp, in collections of Academy of Natural Sciences of Philadelphia. Specimens were also taken at Nanaimo Bay, on shore, by Prof. H. Heath. This is a common Alaskan barnacle.

Balanus sp.

Albatross station 4457, off Point Pinos Light-House, 46 fathoms, on a gorgonian. Immature.

Balanus sp.

Albatross station 4561, Santa Cruz Light-House, 15 fathoms. Immature specimens on waterlogged twigs, caught in the tangles.

Balanus flos, n. sp.

[Pl. IX, fig. 1–7.]

A species of Darwin's section C, somewhat related to *B. spongicola* Brown. Base and parietes porous, radii solid.

The wall is high, steep, and tubular, with somewhat square base and aperture, pink outside and within. The parietes usually have a few rather strong ribs, but may be nearly smooth. The radii are smooth, with strongly serrate edges, and slope very steeply from the apices. The alæ are smooth, very narrow, with smooth edges. The apices of the plates project as strong teeth around the aperture and are more or less recurved, giving it a corolla-like appearance, the aperture being nearly as large as the base. The inner submargins of the alæ are sculptured with slender thread-like transverse raised lines especially developed in the carina and carino-lateral plates. Below the sheath the inner surfaces of the parietes are white and are longitudinally grooved, as usual. The base is rather thin, but porous. The opercular plates are white.

The scutum (pl. IX, fig. 3, 6, 7) is triangular, with strongly recurved apex and low sculpture of flattened, unequal wrinkles parallel to the basal margin. There are no noticeable radial lines, though an extremely indistinct and fine striation is discernible under a strong lens. Internally (fig. 6) there is a small, low articular ridge and a small adductor ridge occupying the median third of the valve's length and not confluent with the articular ridge. The muscles are inserted so superficially as to leave no pits, the inner faces of the valves being remarkably flat. The narrow occludent margin is marked with very oblique sulci.

The tergum (pl. IX, fig. 4, 5) is not beaked apically. Very faint longitudinal striæ may be traced along the carinal margin, but elsewhere the plate is sculptured with low, wide-spaced growth marks. There is no furrow running to the spur, but the growth-lines are deeply sinuated where it should be. The spur is short and rather wide. Inside there is a strong, elevated, and acute articular ridge, no noticeable articular furrow, and the ridge running to the spur is very low. Crests for the attachment of depressor muscles are very small. The scutal margin of the tergum is evenly concave.

Length of the wall at base 12 mm., breadth 11.5 mm., height 16 mm. Length of the aperture from apex of the carina to apex of the rostrum, 10 mm.

Length of the wall at base 11.5 mm., breadth 12 mm., height 12 mm.; length of the aperture 8.5 mm.

The mandibles (fig. 3, D) have three rather small but strong teeth and a bluntly irregular denticulate lower projection. The maxillæ (fig. 3, C) have two strong spines above, the margin excavated below them, then becoming convex, the lower angle being broadly rounded. The edge bears about 8 spines, the lower ones stronger, and there is a tuft of fine bristles below the lower extremity.

The first pair of cirri (fig. 3, A) have very unequal rami, the longer or anterior branch of about 23 normal segments, and about twice the length of the shorter ramus, which is composed of 11 segments, all of them strongly protuberant on the forward side. The second pair of cirri has rami of 13 and 12 joints, respectively, also strongly protuberant on both branches. The third cirri have longer and more slender rami of 16 and 15 joints, which protrude moderately in front. The anterior ramus is the longer. The fourth, fifth, and sixth pairs of cirri are much more slender, long, and curled, the rami subequal. There are about 36 joints in the branches of the sixth pair (fig. 3, B). The penis (fig. 3, B) is rather short for a *Balanus*, closely annulated.

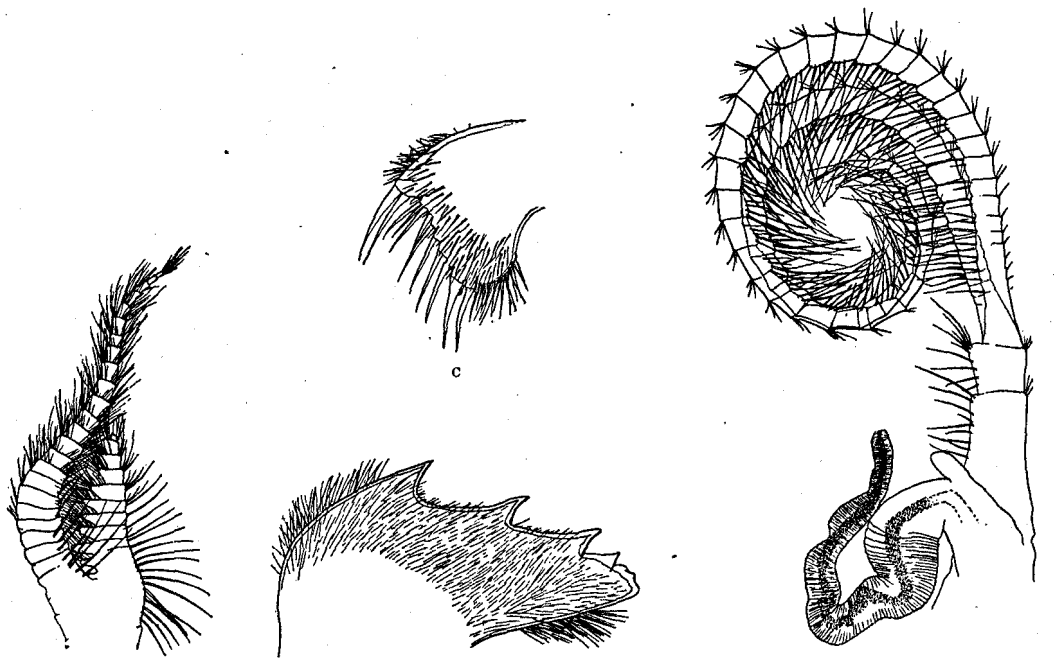


FIG. 3.—*Balanus flos*. A, First cirrus; B, sixth cirrus and penis; C, maxilla; D, mandible.

Type no. 32405, U. S. National Museum, from *Albatross* station 4558, Point Pinos Light-House, 40 fathoms, region of Monterey Bay, on polyzoan colonies. Cotype, no. 32406 U. S. National Museum, from same station. A specimen on a broad seaweed from station 4420, off east point of San Nicolas Island in 338 fathoms, fine gray sand.

This flower-like barnacle superficially resembles *B. amaryllis* Darwin and *B. corolliformis* Hoek, but differs from both in important characters, more especially in the features of the base, which place it in a different section. There seems to be no very closely allied species among those referred to Darwin's section C, except *Balanus spongicola* Brown, of the Atlantic, which differs by the longitudinal sculpture of the scutum, a feature upon which Darwin lays especial stress, and by various other differences in the shape of the scutum and tergum. The mouth parts and cirri would seem to be much as in *B. spongicola*, judging from Darwin's description. *Balanus pœcilus* Darwin differs from *B. flos* by its coloration, the shapes of the opercular valves, and by various features of the cirri.

The diverging apices of the terga are a prominent feature of *B. flos* at all stages of growth. The specimen from station 4420 is very pale pink, almost white, externally.

Balanus evermanni, n. sp.

[Pl. VII, fig. 7–14; pl. VIII, fig. 1–4; pl. X, fig. 1; pl. XI, fig. 1.]

The outer wall is cup shaped, wider above than at the base; the length generally much exceeding the diameter. The compartment plates are not permeated by pores, and the sutures are not calcified or firmly cemented. The heavy calcareous base is likewise imperforate, and the suture where it joins the plates is but very weakly cemented. Surface dull, white, often showing remnants of a thin yellow cuticle. The orifice is very large, not contracted, and squarish or ovate, being narrower and more strongly angular at the carina. All the plates project strongly upward, making the borders of the orifice serrate. The parietes of the two carino-lateral plates are very narrow; those of the other plates are moderately wide; all are weakly sculptured with more or less obliquely transverse wrinkles or ripples, narrow but widely spaced. The radii have finer growth ripples nearly parallel to the tube, and are lanceolate, tapering very slowly upward. The wings or alæ are very wide, with an external upper striated triangle,

FIG. 4.—*Balanus evermanni*. A, Maxilla; B, second cirrus; C, mandible.

elsewhere smooth. Internally the plates are closely but not strongly striated near the base. The sutures are smooth and even.

The opercular valves are white under a thin yellow cuticle. The scuta (pl. VIII, fig. 3, 4) have the occludent and tergal margins straight, crenulated at the edge. The adductor muscle impression is shallow and ill-defined, the lateral depressor muscle impression is deep. The adductor ridge is a low, rounded and wide callous rib. The articular ridge is short and not very prominent. The exterior is deeply and subregularly marked with oblique riblets in the direction of growth lines.

The terga are sculptured externally like the scuta, except that the riblets are narrower and more crowded. The longitudinal furrow is open. The apex is not beaked. Scutal margin straight; carinal margin slightly convex. The spur is rather long and narrow. Internally the articular ridge is rather low, blunt, but strong. There are four or five short and delicate ridges at the carino-basal angle. The spur is connected with the articular ridge by a strong, rounded and straight rib (pl. VIII, fig. 1, 2).

Scutum, length 41 mm., greatest breadth 18.7 mm. Tergum, length 33 mm., breadth 13 mm. From a specimen in which the longest valve of the cup is 88 mm. long (station 4239). Length of cup 150; greatest antero-posterior diameter 67 mm., lateral diameter 66 mm. (station 4253).

The penis is extremely long, 30 mm., tapering, flesh colored, and extremely finely and closely annulate.

The mandible (fig. 4, C) has four principal teeth, decreasing in size from the upper to the lower one. The inferior extremity is rounded, and like the lower margin is densely hairy. The maxilla (fig. 4, A) is remarkable for its square, even edge, densely beset with large and small spines.

The first cirrus stands well apart from the others. It has a greatly enlarged basal joint and short, equal rami composed of about 16 joints. The second cirrus (fig. 4, B) is longer, but still is shorter than the following cirri. The joints protrude and are densely bristly on the forward side. The diameters of the rami decrease regularly and slowly from the second to the last pair, but the length is about the same in pairs iii to vi. The third pair of cirri has rami of about 32 joints, and 22 mm. long. The last pair of rami has about four pairs of spines on each joint.

Type, no. 41840 U. S. National Museum, from *Albatross* station 4239, junction of Clarence Strait and Behm Canal, Alaska, in 206 to 248 fathoms, coarse sand and rocky bottom, July 9, 1903. Cotypes, no. 32404 U. S. National Museum, from same station. Taken also at station 4253, Stephens Passage, Alaska, in 131 to 188 fathoms, July 14, 1903.

This is one of the finest species of *Balanus* yet described, remarkable for its great size, the uncemented sutures, and the gaping orifice of the outer shell. The weakness of the ridges and crests of the inner faces of the valves is also notable. Until nearly adult the plates of the wall may be readily separated without breaking them; and even the full-grown barnacle has only a membranous attachment between the valves and the base.

The species is closely related to *B. hameri* (Ascanius) of the North Atlantic, as defined by Darwin, but differs in numerous details. The spur of the tergum is much narrower, only about half as wide as the space between it and the basi-scutal angle. The scutal and carinal margins of the tergum are more nearly straight. The articular ridge is weaker in both scutum and tergum. The maxillæ have no "deep notch under the two upper great spines," having an even edge. The inferior angle of the mandible is not spinose. The segments of the second pair of cirri scarcely protrude in front in either *B. evermanni* or *B. hameri*. The opercular valves show traces of radial (longitudinal) striæ only near the apices. They exceed in size the large fossil valves of *B. hameri* figured by Darwin in the Monograph on the Fossil Balanidæ (pl. 1, fig. 7c, 7d).

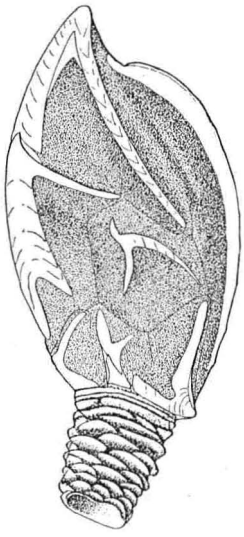
B. evermanni grows in clusters, one mounted upon another. The structural weakness consequent upon the lack of sutural cement is evidently a modification correlated with a deep water habitat. No littoral barnacle of such feeble structure could exist.

Balanus (Conopea) galeatus Linnæus.

[Pl. VII, fig. 5–6, and pl. IX, fig. 8–11.]

Several dead specimens were brought up at *Albatross* station 4432, Brockway Point, Santa Rosa Island, in 272 fathoms gray mud, attached as usual to gorgonians. The cups were empty or filled with sand, but from the débris I obtained two scuta and a tergum. As no species of this section of *Balanus* has been reported from the west coast of America hitherto, and *B. galeatus* has been known heretofore as an exclusively warm-water form of the Antillean region, some details regarding the Pacific specimens may be useful.

The cups are rather short, only one (fig. 5) showing the tendency to lengthen the carina into a point, as is so characteristic of *B. galeatus*. The base is somewhat porous, but less so than the Atlantic specimens of *galeatus* compared. The parietes are solid, and normally grooved inside. The scutum (pl. IX, fig. 10, 11) is triangular, less widely truncate apically than in typical *galeatus* as figured by Darwin. The articular ridge is very thick and prominent. The tergum (pl. IX, fig. 8, 9) resembles that of *B. galeatus* as figured by Darwin, its apex having a squarely truncated appearance, due to the projection of the articular ridge.



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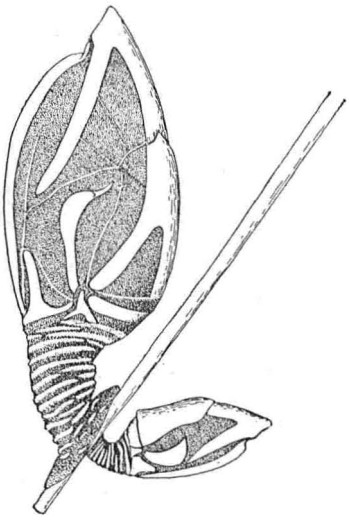

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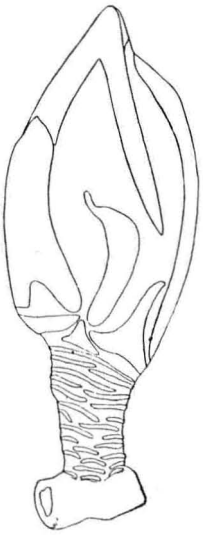

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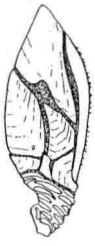

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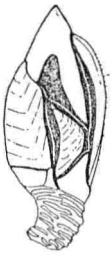

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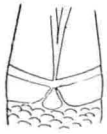

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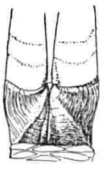

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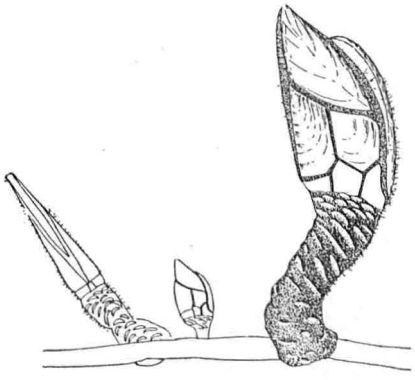

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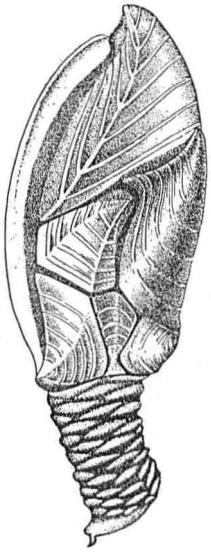

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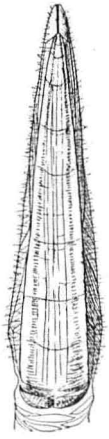

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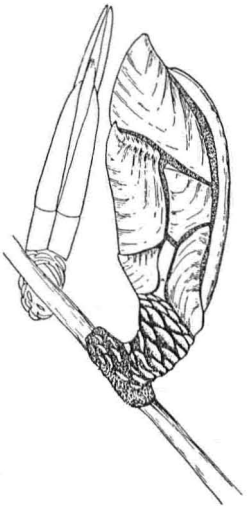

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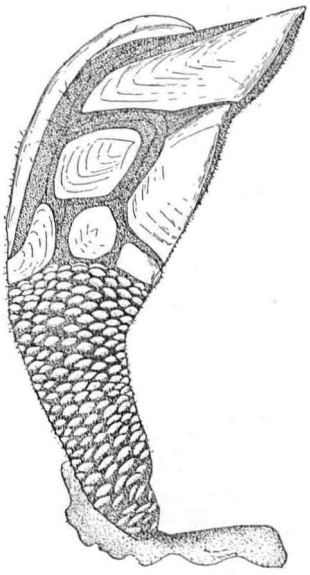

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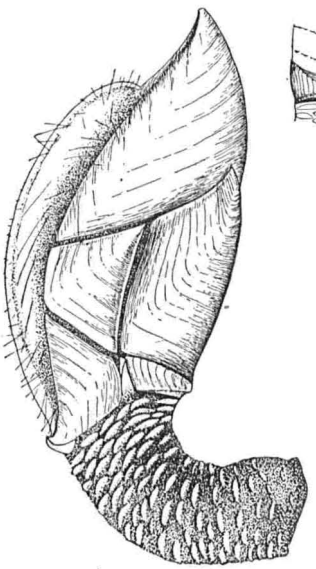
1. *Scalpellum phantasma.* Type.
2. *Scalpellum larvale.* Type and a young individual.
3–6. *Scalpellum larvale.* Variety from station 4382, showing changes with growth. Capitula 3, 5, 6, and 10 mm. long.
7. *Scalpellum californicum osseum.* Type and a young specimen.
8. *Scalpellum californicum.* Rostral plate and adjacent parts.
9–11. *Scalpellum proximum.* Dorsal, lateral, and ventral views of type.
12. *Scalpellum perlongum.* Type, and ventral view of a cotype.
13. *Scalpellum californicum.*



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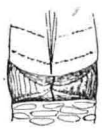

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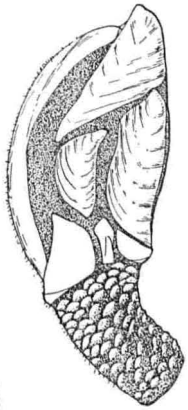

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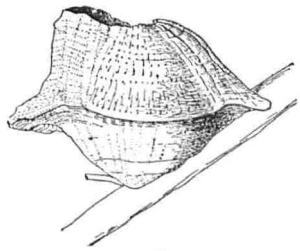

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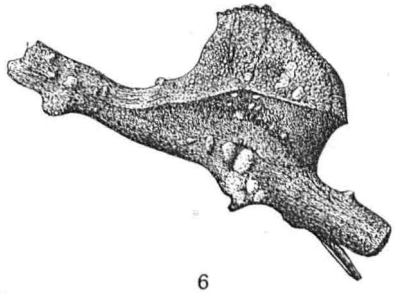

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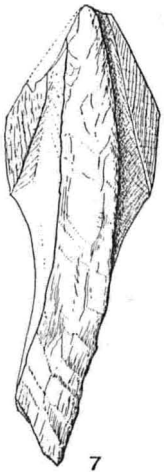

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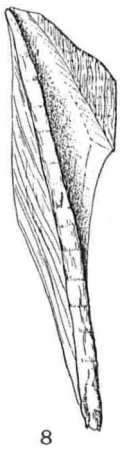

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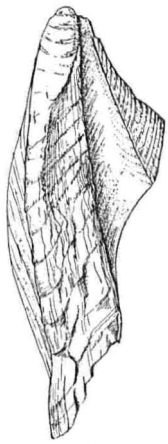

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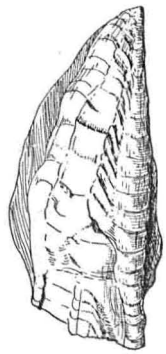

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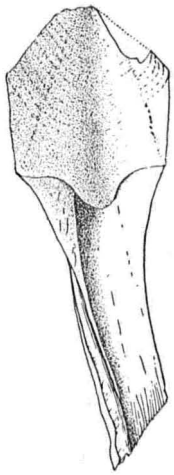

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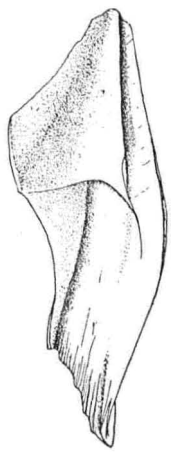

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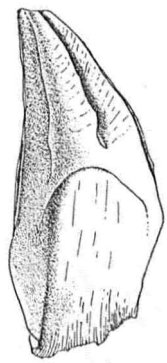

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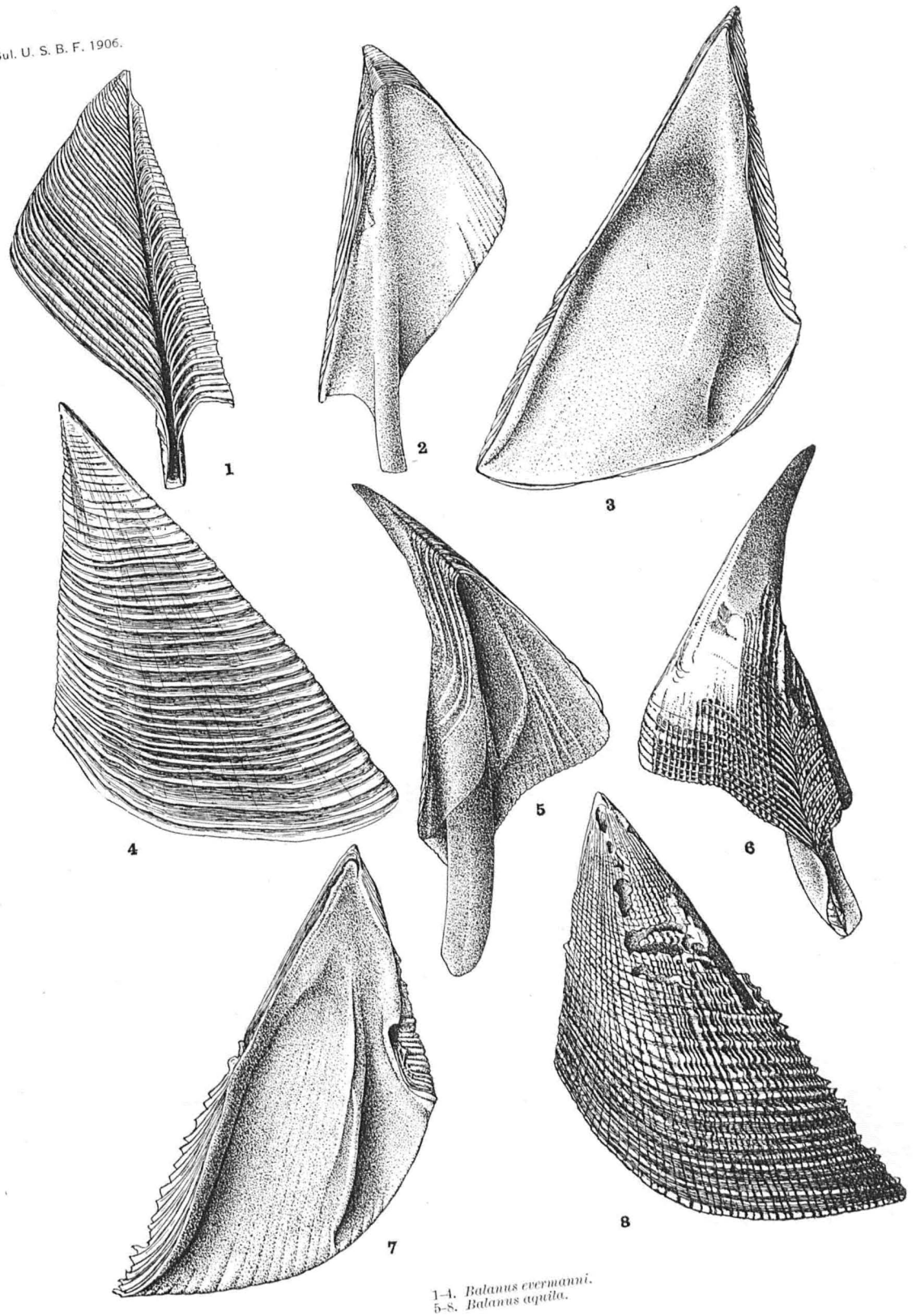
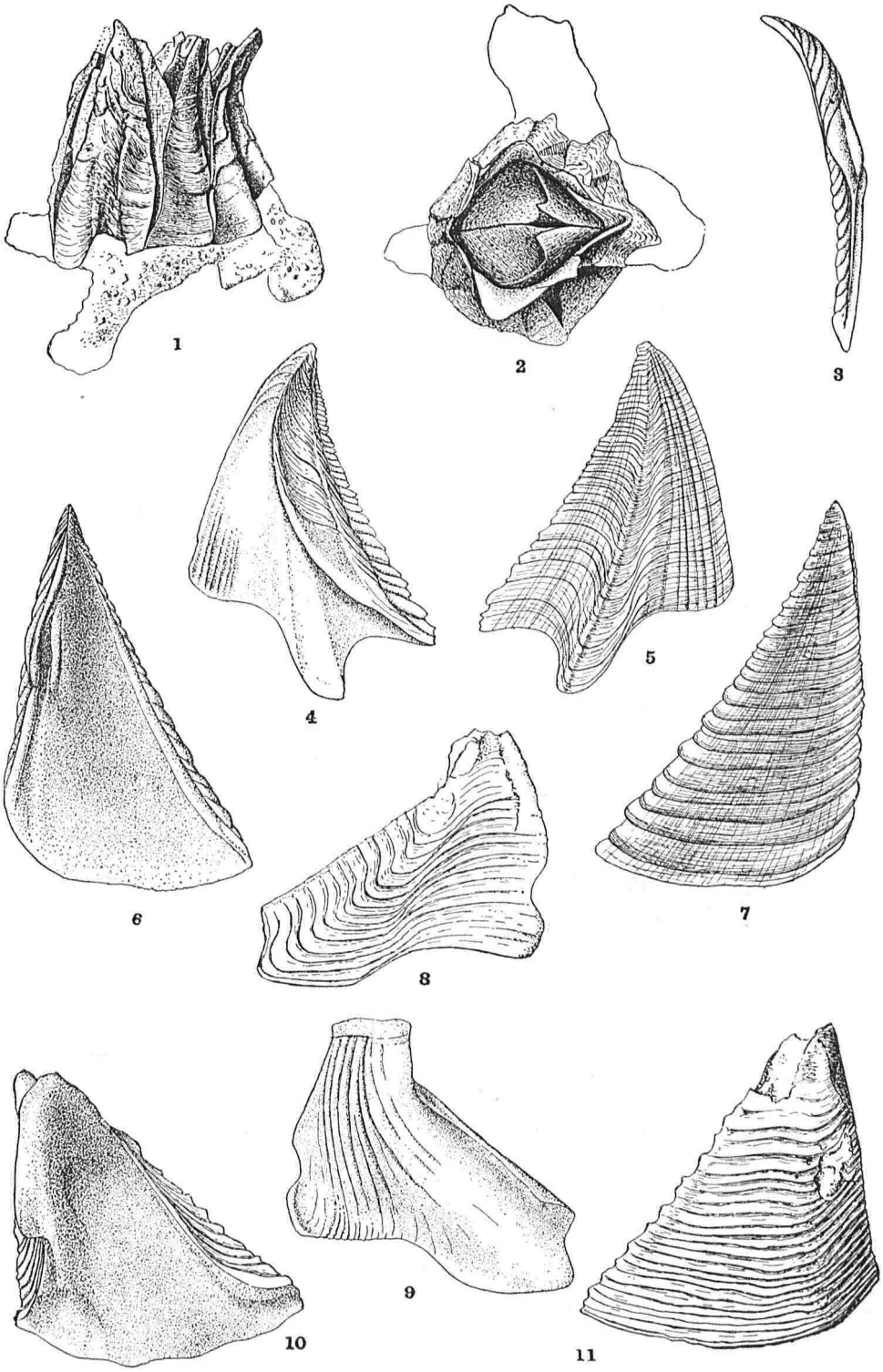
1–3. *Scalpellum gruvelianum.* Lateral view with ventral and dorsal details.
4. *Scalpellum gruvelianum secundum.* Type.
5–6. *Balanus galeatus.* From station 4432.
7–10. *Balanus evermanni.* Carina, right-carinal, and right-rostral latera and rostrum of a cotype. Exterior view.
11–14. *Balanus evermanni.* Interior view. All about ½ natural size.

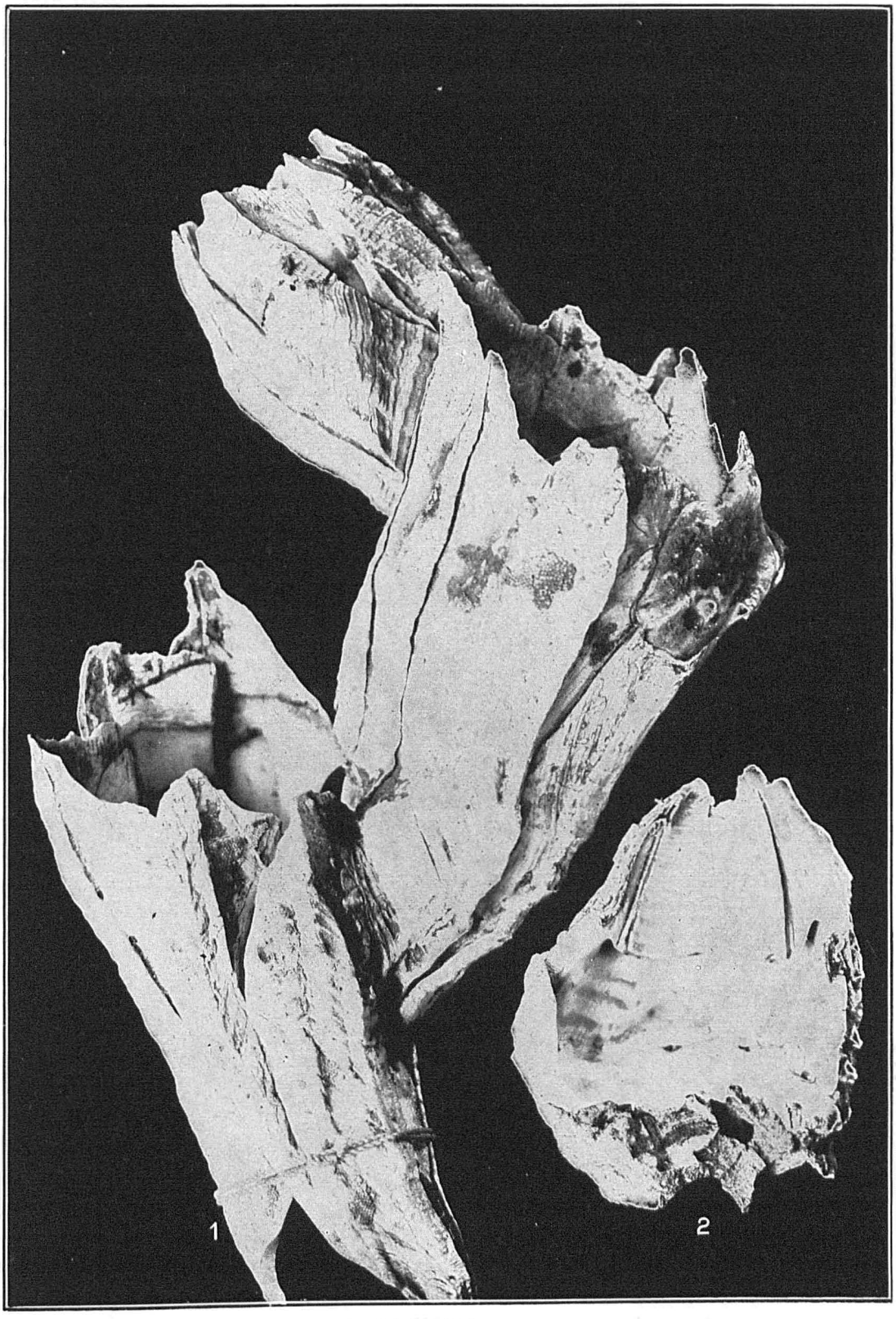
Bul. U. S. B. F. 1906.



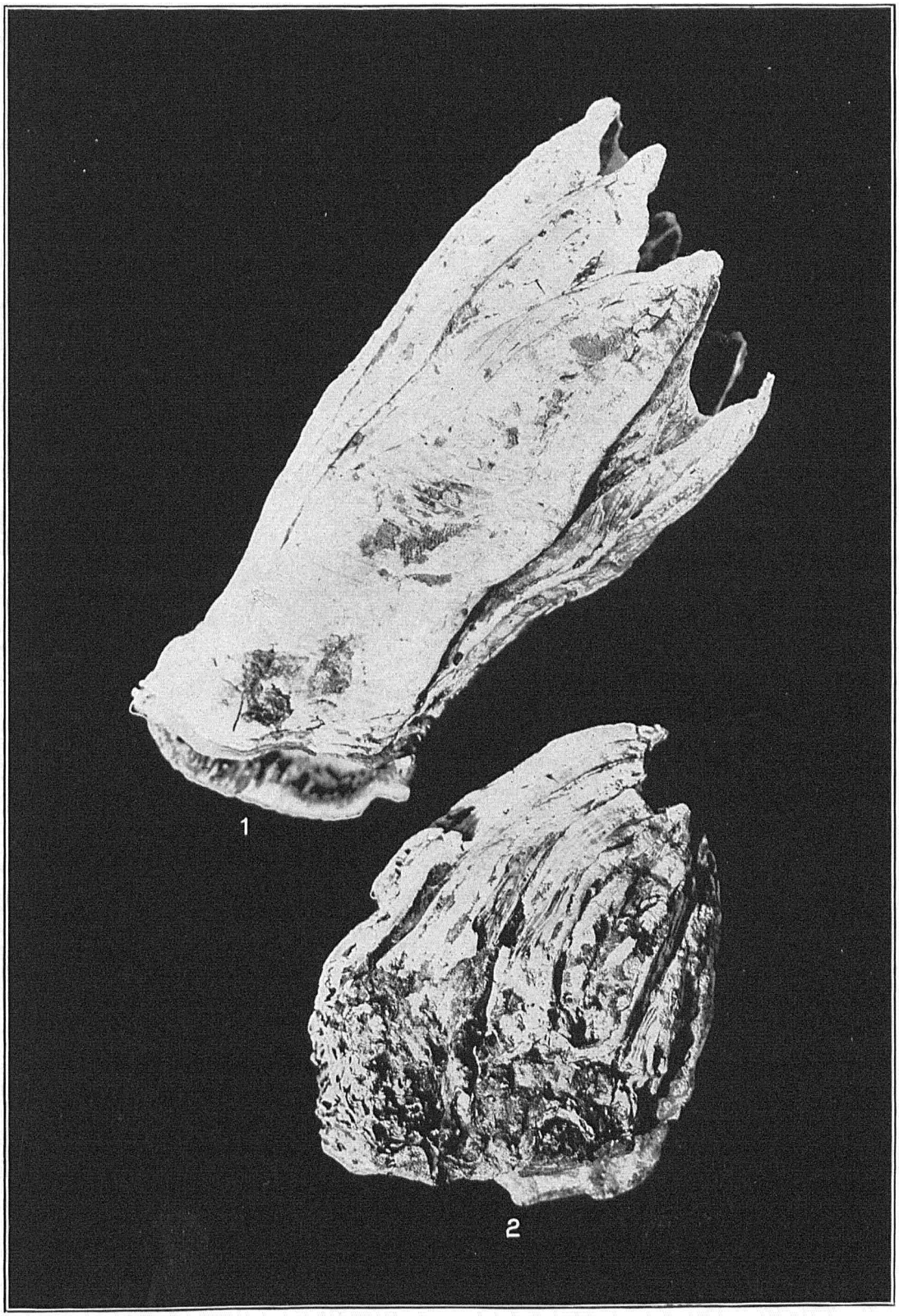
1–4. *Balanus evermanni.*
5–8. *Balanus aquila.*



1–7. *Balanus flos.*
8–11. *Balanus galeatus.*



1. *Balanus evermanni.*
2. *Balanus aquila,* interior of wall.



1. *Balanus evermanni.*
2. *Balanus aquila.*