

TWO NEW CRINOIDS FROM THE NORTH PACIFIC OCEAN.

By AUSTIN H. CLARK,

Of the United States Bureau of Fisheries.

The remarkable crinoid which is described below was obtained by the U. S. Fisheries steamer *Albatross* on August 30, 1906, in $33^{\circ} 23' 30''$ north latitude, $135^{\circ} 34' 00''$ east longitude, Shio Misaki light, south coast of Nipon, Japan, bearing N. 75° E., 9.6 miles distant, the station being No. 4971. The bottom temperature was 38.1° F. (corrected), the depth 649 fathoms, with a bottom of brown and green mud, with numerous foraminifera.

PHRYNOCRINUS Clark, new genus.

The characters of this genus are included in the diagnosis of the type species as follows:

Type of the genus.—*Phrynocrinus nudus* Clark.

PHRYNOCRINUS NUDUS Clark, new species.

Type.—Cat. No. 22601, U.S.N.M.

The general aspect of the calyx is quite different from that in any known crinoid. In shape it is somewhat like an acorn, expanding rapidly from the top of the stem to about the fourth radial, where it attains a maximum width of 29 mm., gradually becoming narrower again in the region of the axillaries. Probably in life, however, the sides of the calyx are parallel or slightly diverging from the fourth radial upward. The most characteristic feature of the calyx is the broad naked space between the radials, which is equal in width to twice the diameter of the radials themselves, and is covered with a tough, leathery integument, in which as yet I have not succeeded in making out any interrarial plates whatever, although they may occur deeply embedded in the skin. The radials are small, and are subequal in size, the largest being the fourth or fifth in each arm, from which point the size diminishes in each direction; their number is very large, in one arm 18, including 7 syzygies, so that the total number of individual joints is 25. The radials radiate out from the very small basals,

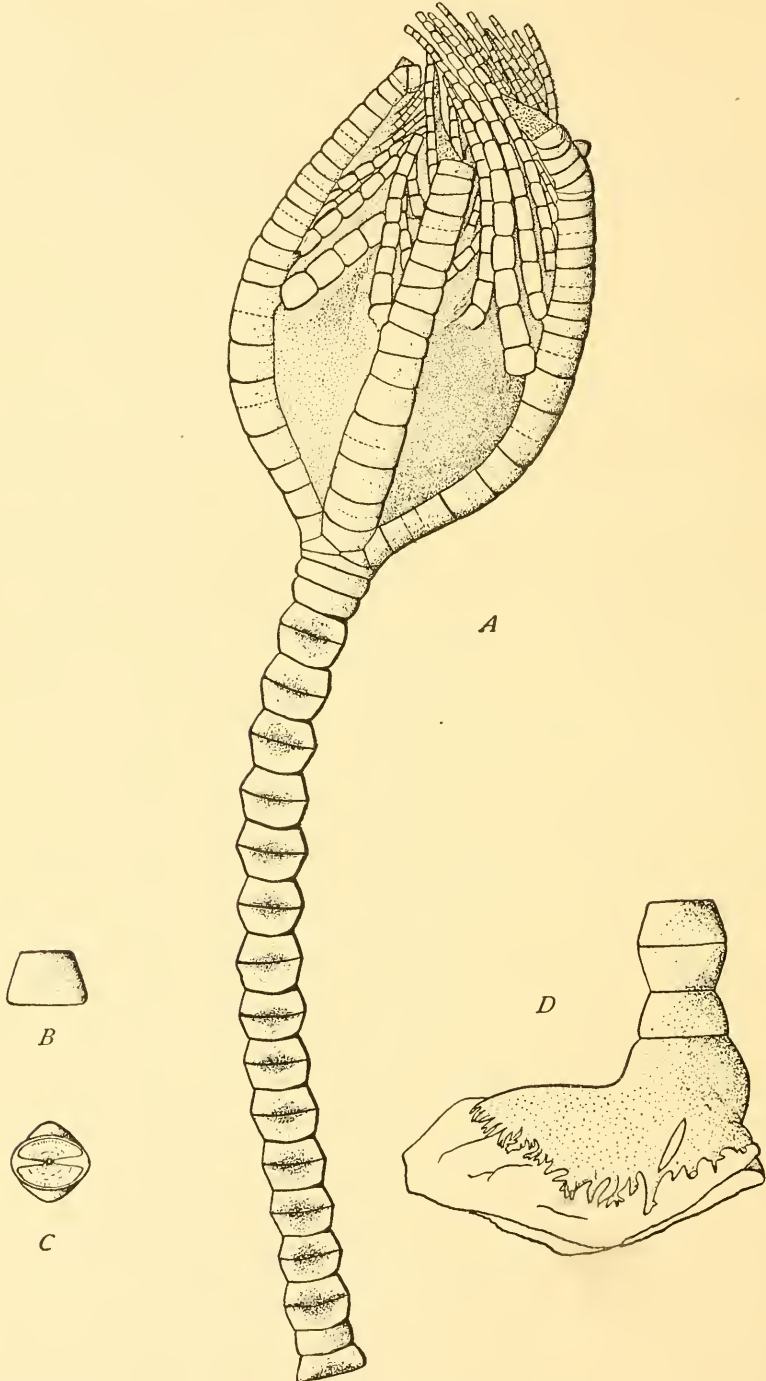


FIG. 1—*PHRYNOCRINUS NUDUS*. A, CALYX AND UPPER STEM JOINTS; B, STEM JOINT, LATERAL VIEW; C, STEM JOINT, END VIEW; D, ROOT AND LOWER STEM JOINTS. ENLARGED ONE-THIRD.

in five narrow lines over the surface of the calyx, widely separated from each other by the interrarial integument, which forms two-thirds of the superficial area of the calyx, the radials themselves collectively occupying only about one-third. (See fig. 1.)

The five basals are triangular in shape, 4 mm. long by 2 mm. high, and are in apposition all around (the lateral angles being slightly blunted at the point of contact) except in one place, where 2 adjacent basals do not quite meet, leaving a gap of about $\frac{1}{2}$ mm. They thus form a ring, interrupted in one place, about the lower part of the calyx. The lower (dorsal) edges of the basals are somewhat convex, giving the upper edge of the top stem joint a scalloped appearance.

The five first radials are practically equal in size, 5 mm. wide by 2.5 mm. high, and are produced dorsally into a shallow V where they enter the interbasal spaces. Each first radial is in close apposition to those on each side of it along its entire lateral edge, the five therefore forming a continuous ring about the base of the calyx. The outer surface of these, as of all the radials, is strongly convex, a cross section being practically a semicircle. The succeeding radials all have practically parallel sides, and are (the radials of the separate rays) separated from each other by a broad expanse of tough, leathery integument, equal in width in each interrarial area to about twice the width of the radials as far down as the fifth or fourth radial, then rapidly converging, forming a V, the apex of which rests on an interrarial suture of the first row of radials. The first and second radials are 5 mm. in width; distally the width increases slightly, reaching a maximum of 6 mm. on the fourth or fifth, then gradually decreasing again to 4 mm. on the sixteenth. The radials number from 12 to 18 (including the first axillaries), syzygies being distributed as follows: on one arm the second, fourth, sixth, tenth, twelfth, fifteenth, and nineteenth (axillary); on another the second, fourth, and twelfth; on another the second (a double syzygy of 3 components), fourth, sixth, ninth, eleventh, and fourteenth (axillary); on another the second, fourth, sixth, eighth, and eleventh, and on the last (arm broken off before the first axillary) the second, fourth, and eighth.

The proximal pinnules are 33 mm. in length, or about equal to the distance from the basals to the first axillary, in the arm having the maximum number of radials. They are at the base nearly the diameter of the first brachials (3 mm.), tapering gradually to a point, the number of joints being about 20. The first pinnule is given off as follows: on the right side of the sixth radial (the epizygal of a syzygy), on the right of the sixth radial (not a syzygy), on the left of the fifth radial (not a syzygy), on the left of the epizygal of the sixth radial, and on the left of the sixth radial (not a syzygy). The palmar pinnules are about 6 mm. in length, 1 mm. thick at the base, tapering gradually to a point, and are composed of about 20 joints.

The arms are all detached from the calyx and badly broken up; as nearly as I can judge they appear to branch twice, and occasionally three times. The axials and the second joint after each axial are usually syzygies; other syzygies are distributed at intervals of two, three, or four joints throughout the distichals and palmars. All the joints in the arms are dorsally and laterally somewhat concave, producing a bulging at the articulations, and giving a rough look and feeling to their dorsal surface.

The highly calcareous, hard, and rigid stem is composed of 106 joints, without any trace of nodes or cirri. Each joint is trapezoidal when viewed laterally, the base up when viewed in one position, the base down when viewed in a position at right angles to the first. This is due to the fact that the faces of each joint are elliptical in shape, with the axes of the ellipses of the superior and inferior faces at right angles to each other. The stem is 375 mm. in length, the lowest joint having for each face a maximum diameter of 8 mm. and a minimum diameter of 6 mm., with a height of 4.5 mm., the joints becoming gradually smaller, so that the topmost but one measures—longest diameter 6 mm., shortest diameter 5 mm., height 2 mm. The stem is quite uniform throughout, the only exception being the thirty-second joint from the calyx, which has the axes of both faces running in the same direction instead of at right angles to each other. After the one hundred and sixth joint, which differs from all the others in having its inferior face circular, the diameter of the circle equaling the greater diameter of the ellipse forming its superior face, the stem terminates in a solid, heavy, and very hard root, with a fringe of short radial processes, the whole being firmly attached to a small piece of pumice. The color in life is dull greenish yellow.

Many other features of this strange form are of great interest, but would be out of place in a preliminary description. I hope, however, to be able to publish a detailed account of it later, with a sketch of its anatomy, and a discussion of its probable affinities. It appears to represent an entirely new family, which may appropriately be called "Phrynocrinidæ."

BATHYCRINUS PACIFICUS Clark, new species.

Type.—Cat. No. 22602, U.S.N.M.

It is with great pleasure that I am able to add the genus *Bathycrinus* to the fauna of the abyssal Pacific, as the genus has hitherto only been known from the Atlantic, where, however, it has a very wide range, from 65° 55' north latitude to 46° 46' south latitude, through more than 110° of latitude. The discovery of a species in the Pacific gives this genus the most extensive range of all the genera of recent stalked crinoids. No specimen of *Bathycrinus* up to the present time has been obtained in less than 1,050 fathoms of water; the type

of *B. pacificus* was taken in 905 fathoms, 145 fathoms less than the previous record.

The individual described was taken on August 31, 1906, at U. S. Fisheries steamer *Albatross* station No. 4974, in 33° 18' 10" north latitude, 135° 40' 50" east longitude, Shio Misaki light, south coast of Nipon, Japan, bearing N. 25° E., 8.7 miles distant, being within a few miles of the locality where, on the previous day, the remarkable *Phrynocrinus nudus* was secured. The depth was 905 fathoms, the bottom brown and green mud, with numerous foraminifera, and the bottom temperature 36.6° F. (corrected).

Basals united into a smooth ring, slightly wider above than below, where it is of the same diameter as the upper stem joints; on its upper surface rests the funnel-shaped cup composed of the united radials, resembling most nearly that of *B. aldrichianus*, but when viewed from the side more regularly trapezoidal (the short sides of the trapezoid with no trace of constriction) and when viewed from below less scalloped and more rounded, with the sutural lines less depressed. The radial cup is slightly less in height than the second radial, but slightly more than the third (axillary). In *B. aldrichianus* and *B. campbellianus*, the nearest related species, it is slightly less than either. The second and third radials are trapezoidal in form, widening from below upward, about as in *B. campbellianus*; a low rounded ridge extends down their median line, bifurcating just before the axillary joint, but is much less marked than in the other species. The sharp edges of the axillaries are continued for 3 or 4 joints onto the brachials, after which the brachials become more cylindrical in form. The two lowest are approximately square, but from the third on they are rather longer than wide. The first pinnule is usually on the eighth brachial. The arms and pinnules are essentially as in *B. campbellianus*. (See fig. 2.)

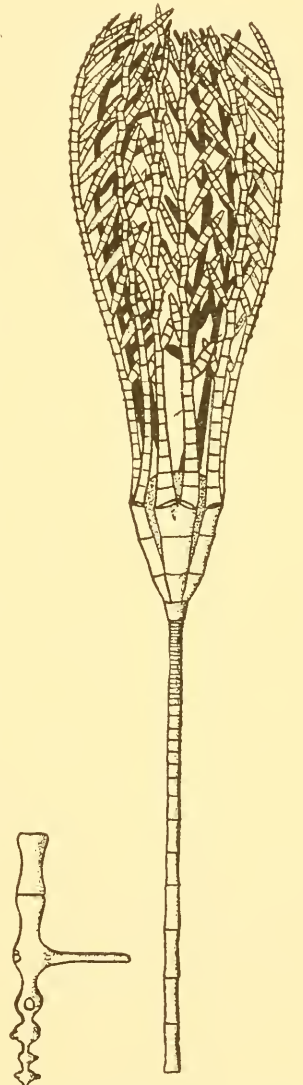


FIG. 2.—BATHYCRINUS PACIFICUS. CROWN AND ROOT. THREE TIMES NATURAL SIZE.

The stem contains about 100 joints, ending in a short unbranched (possibly broken) root, about 6 mm. above which is a simple lateral root, and resembles in character that of other members of the genus. The color in life is very light yellow.

This interesting species will be discussed more fully in a paper now in course of preparation on the crinoids of the Pacific.