

A NEW FOSSIL SPECIES OF CARYOPHYLLIA FROM CALIFORNIA, AND A NEW GENUS AND SPECIES OF TURBOLID CORAL FROM JAPAN.

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A NEW FOSSIL SPECIES OF CARYOPHYLLIA FROM CALIFORNIA.

The coral described below was in some material sent by Mr. Ralph Arnold, of Leland Stanford Junior University, to the U. S. National Museum to be named. Mr. W. H. Dall kindly placed the specimen in my hands for determination. As it proved to be undescribed, the following diagnosis has been prepared.

CARYOPHYLLIA ARNOLDI, new species.

(Plate XVI, figs. 1, 2.)

Form of corallum slightly deformed inverted cone-shaped. A basal scar present, but the coral in its later stages was evidently unattached. Base subacute, calice nearly circular in transverse outline.

Dimensions.—Greater diameter of calice, 16 mm.; lesser diameter of calice, 15.3 mm.; height of corallum, 16.5 mm.; depth of fossa, about 6.5 mm.

Costæ very distinct, low, broad, rounded, or flattish, show no ornamentation, but the specimen is worn and they were probably minutely granulated. There is a tendency to alternation in size, which is pronounced near the base. There is no observable epitheca. The wall is stout, solid, a distinct pseudotheca. The costæ are wide and the intercostal spaces very narrow, simply furrows, and the septa are thickened at the wall. The upper margins of the septa project very slightly above

the upper limit of the corallum wall. There are four complete cycles of septa (forty-eight in all), arranged as follows: Twelve large thick septa, joined to the columella by very thick pali. The width of each palus is equal to the width of its corresponding septum; the upper margins of the palus stands about 2 mm. above the upper surface of the columella, and fully 1 mm. above the notch dividing the palus from the septal lamina. The width of the pali is about 2.5 mm. From the upper margin of the septum to the notch between septum and palus is about 4.5 mm., may be slightly greater. The inner ends of the pali are fused solidly around the columella and to it. On the septal faces are small granulations arranged in curves parallel to the upper septal margins. On the faces of the pali are granulated or serrated crests arranged in curves parallel to the upper margins of the pali. Between each pair of these larger septa are three smaller (one of the third cycle and two of the fourth). The members of the third cycle are narrow above the level of the upper termination of the columella; below this they widen, but do not seem ever to reach the columella. The members of the fourth cycle are narrow, and thin except where they arch over the walls. The columella is essential, is composed of several pieces, trabeculæ, which are firmly soldered one to another and to the inner terminations of the pali by solid basal calcareous deposit. From the upper margins of the septa to the upper termination of the columella is about 6.5 mm.; that is, the calicular fossa is about 6.5 mm. deep. The greater diameter of the upper termination is 5 mm., the lesser 3.5 mm., above whose level, as may be gathered from what preceded, the pali form a regular crown.

Locality.—San Pedro Hill, San Pedro, California.

Geological horizon.—Pleistocene.

Type.—Cat. No. 157509, U.S.N.M.

A NEW GENUS AND SPECIES OF TURBINOLID CORAL FROM JAPAN.

The specimen upon which the subsequent descriptions are based was sent to the U. S. National Museum by Rev. H. Loomis, Yokohama, Japan. Mr. W. H. Dall asked me to determine it, and as it proves to belong to both a new genus and species, the following generic and specific diagnoses have been prepared:

LEVIPALIFER, new genus.

Salient generic features.—Simple Turbinolid; corallum very short, inversely conical in shape, almost discoid; no sign of attachment, living free. Wall naked. Septa within the wall possess entire or faintly crenate margins; external to the wall beset with rounded dentations. Costæ dentate, the dentations with blunt or rounded ends. Four complete cycles of septa; *pali* are before all septa and have entire margins. Columella essential, trabecular.

LEVIPALIFER ORIENTALIS, new species.

(Plate XVI, figs. 3-7.)

Corallum, without any sign of attachment, subdiscoid in form, the base pointed. Transverse outline of the calice circular.

Dimensions.—Diameter, 20 mm.; altitude, 9 mm.

Costæ well developed, thin, distant, correspond to all septa; those of the first and second cycles of the same size; those of the third slightly smaller, and those of the fourth still smaller. They are rather tall at the calicular edge of the wall, becoming lower as the base is approached. Two cycles are continued to the apex of the base. The costal margins are beset with rather tall, rounded or blunt dentations. In some instances the ends of the dentations are swollen. Each dentation marks the emergence on the surface of a small ridge (or stria) along which are arranged rather tall but not very sharp pointed granulations. The lateral faces of the costæ are perpendicular to the corallum wall; that is, the costæ show no, or almost no, thickening at the wall.

There are four complete cycles of septa, arranged in six definite systems. Six of the septa stand isolated from the other septa and extend directly to the columella. Between each pair of these six is a definite group of septa belonging to higher cycles. Those of the third cycle bend toward those of the second, and the members of the fourth bend toward those of the third. Quite frequently the members of the fourth cycle are longer than the inclosed members of the third. The longer member of the fourth cycle for any given half system is the one standing next to the septum of the first cycle. This arrangement is the common one in the Eupsammidæ. The fusion of the septa into the groups above indicated is affected by the pali. The lateral ornamentation of the septa consists of ridges or striæ, which possess a line of divergence slightly interior to the wall and parallel to it, and granulations placed along the striæ. Within the line of divergence the striæ bend toward the interior of the corallum, and exterior to it they bend outward, ultimately downward. On the inner side of the line of divergence the septal margin is entire or shows very faint crenations. Exterior to it each ridge is terminated by a dentation, not very long just at the line of divergence, but quite soon the dentations are larger. The dentations on the peripheral ends of the septa, that is, the costæ, have already been described. When one looks directly at the edge of a septum the striæ are seen to alternate in position, and the septum is usually faintly undulate in a direction parallel to the long axis of the striæ. The granulations are placed along the striæ and are arranged in curves parallel to the septal margin. The granulations are rather tall, but are not sharp-pointed; their tips are blunt or rounded. The septal margins project considerably above the upper edge of the wall; the members of the first and second cycles are equally prominent, and are more exsert than those of the third and fourth

cycles, which are equal in prominence. The septa are distant, thin, weak, and show no marked thickening at the wall.

Pali are before every cycle of septa. Those before the first cycle are the broadest. The pali belonging to each septal group included between the members of the first cycle are deltoid in arrangement. The arrangement is well shown in Plate XVI, fig. 6. The pali are broad and are simple lobes, excepting usually there is an inner tooth before the delta composed of the pali of each group of septa of the third and fourth cycles. *The margins of the pali are entire.* The trabecular make-up of the pali is the same as that of the septa; each palus has its own line of divergence, etc. The fusion of the septa into deltas through the pali is effected usually by synaptacula. Excepting these synaptacula the interseptal loculi are entirely vacant.

Some hints have already been thrown out as to the make-up of the wall. It is entirely naked, imperforate, and rather thin, thickening very little from internal calcareous deposit; no processes extending inward from it between the septa (such as are quite common in some Turbinolid genera) were seen. As the septa and costæ do not thicken in crossing the wall, this coral would be said to possess a *eutheca*. In my mind the point to be emphasized is that the septa are distant and thin, and the connecting wall is also thin. The wall between the costæ possesses no ornamentation.

The columella is large, well-developed, trabecular, and spongy.

Locality.—Boshiu (=Awa), eastern coast of Japan.

Type.—Cat. No. 19391, U.S.N.M.

Bathymetric distribution not known.

Remarks.—The natural group to which this coral belongs is very evident. It is very closely related to *Trochocyathus* and *Deltocyathus*. It is separated from the latter genus solely by possessing one more crown of pali. The genus *Leptocyathus* Milne-Edwards and Haime, was founded to receive the coral from the London Clay, designated by them *Leptocyathus elegans*,¹ which, according to them, possesses denticulate pali before all cycles of the septa. The pali of *Leptocyathus*, according to the figure (Plate III, fig. 6c), are small, and do not exhibit a noticeably deltoid arrangement. There are other differences; the septa are much thickened at the wall, and the costæ possess very broad bases. Pourtalès² has described a species, found off Conch Reef and Tennessee Reef, Florida waters, as *Leptocyathus stimpsoni*. I doubt if this coral is really a *Leptocyathus*. It possesses many points of difference from the type species *L. elegans*, and certainly is not closely related to the species here described.

It may be repeated that *Levipalifer* is most closely related to *Deltocyathus*.

¹Monograph Brit. Foss. Corals, Paleontograph. Soc., 1850, pp. xiv, 21, 22, pl. III, figs. 6, 6a-c.

²Ill. Cat. Mus. Comp. Zool., No. IV (Deep Sea Corals), 1871, p. 12, pl. III, figs. 1-3.

EXPLANATION OF PLATE.

[All drawings made by Dr. J. C. McConnell.]

PLATE XVI.

Figs. 1, 2. *Caryophyllia arnoldi*, new species. Cat. No. 157509, U.S.N.M.

Fig. 1, upright view; height of corallum, 16.5 mm.; fig. 2, view of calice from above; greater diameter of calice, 16 mm.

3-7. *Levipalifer orientalis*, new genus and new species. Cat. No. 19391, U.S.N.M.

Fig. 3, view of base; diameter of base, 20 mm.; fig. 4, upright view; altitude, 9 mm.; fig. 5, portion of costa and exsert portion of septum, looking at edge, enlarged, shows character of granulations on the septal faces; fig. 6, one complete system of septa, enlarged, shows the arrangement of the pali; fig. 7, view of the sides of a septum of the fourth cycle, and one of the first cycle, showing pali in profile, the septal granulations, etc. The notch behind the pali is usually deeper than in the case of the palus in the foreground.