

CRINOIDS FROM THE UPPER CRETACEOUS OF TAMAULIPAS, MEXICO.

By FRANK SPRINGER.

Associate in Paleontology, United States National Museum.

The crinoid stems described in this paper were submitted to me by Dr. L. W. Stephenson, who collected them on two American-owned ranches, known, respectively, as Chocoy and Las Flores (or Manuel), on the line of the National Railways of Mexico, between Tampico and Monterrey, in the State of Tamaulipas, Mexico. The circumstances of the discovery of these and other Upper Cretaceous fossils are explained by Doctor Stephenson in Article 1 of this volume of the Proceedings.

These stem fragments apparently all belong to the genus *Balano-crinus*, which ranges from the Jurassic to the Upper Cretaceous—a form thus far known only by the stem, no other parts having yet been found. *Balano-crinus* falls under the family Pentacrinidae, which is characterized by a stem development far exceeding that of other crinoids, attaining in the typical genus, *Pentacrinus*, a length variously reported from 5 to 21 meters or 15 to 70 feet. These fragments are evidently remnants of stems of similar vigorous growth, as is indicated by the very large lateral cirri seen on some of them, and confirmed by the fact that one specimen, about 25 cm. or 10 inches long, is part of a stem which was traced in the rock for a distance of about 5 meters or 16 feet. *Balano-crinus* is distinguished from the more widely known *Pentacrinus* by the sculpturing of the joint faces at the line of union of the columnals, which here takes the form of crenulations around the outer edge of the joint face, and not along the sides of the petaloid sectors into which the central part of the face is divided. This character is thoroughly well marked in these specimens, and by it the occurrence of the genus is proved for the first time in America to my knowledge. The extreme development of stem, although to be expected, has not before been so well shown in this genus.

Determination of species from the stem characters alone is unsatisfactory, because, while a definite stem structure is recognized for the genus, the minor details vary considerably in different parts of the same stem, and we have no means of ascertaining whether any of them are correlated with other characters so as to make them of spe-

cific value. However, as a record of the first known occurrence of the genus in America, and of the more full exhibition of the stem characters than has been hitherto available, it is advisable to describe it as a new species, for which I propose the name:

BALANOCRINUS MEXICANUS, new species.

Plate 1, figs. 1-11.

Known only from the stem. Stem cylindrical, large, and attaining a great length. A fragment 25 cm. long (pl. 1, fig. 1), here designated the type, tapers from 12 to 10 mm. in diameter, and the stem from which it was detached was more than 5 meters in length, traces of it having been seen for about that distance in the formation where it occurred. Other fragments range from 18 mm. diameter to 6 mm. The columnals vary from 2 to 4 mm. in length (relatively shorter in the larger stems), the shortest ones being the nodals, which occur at intervals of 17 to 20 ossicles, and bear strong cirri, either singly or two to each nodal, about opposite. The cirri are long and strong, two of them being preserved in place to lengths of 14 and 15 cm.; they taper from 4 to 2 mm. and have 48 and 52 ossicles, respectively; two others, somewhat displaced, are preserved to nearly the same length.

The cirrus sockets occupy the greater part of two ossicles, the nodal and a shorter supranodal or infranodal, separated by what is doubtless a syzygial joint, the characteristic structure of which can rarely be seen in the specimens; it is uncertain which of the two is uppermost, but from analogy with the living pentacrinoids it is probably the longer one, in which case figures 2, 3, 7, and 9 should be reversed.

The axial canal is circular and very small throughout; it is surrounded by five triangular depressed areas known as "petaloid sectors" (a term applied to these areas in the genus *Pentacrinus*, in which they are elongate and leaf-like), which are fossae for the lodgment of ligaments; these are separated by partitions connecting with the peripheral crenelated band that forms the contact surface of the stem ossicles; the septa are linear and well marked, and they sometimes appear as if divided by a median groove.

The circular area occupied by the ligament fossae varies in size in different parts of the stem¹ from one-third to one-half, or even two-thirds, the radius of the joint face, but usually about one-half. The radiating crenelations which extend continuously around the periphery of the joint face form a rather deep band, ordinarily about half the radius in width; they are usually about 10 to each sector, but are

¹ Springer, On the crinoid genus *Scyphocrinus*. Smithsonian Publication 2440, 1917, p. 37, pl. 8, figs. 2-5.

frequently reduced to 5. The sectors are rather deeply impressed when freely exposed, but in the specimens as here preserved are usually obscured by matrix.

Occurrence and horizons.—Upper part of San Felipe formation and lower and upper parts of the Mendez formation of the Upper Cretaceous, at several localities on Chocoy and Las Flores ranches, 65 to 85 kilometers northwest of Tampico, in the State of Tamaulipas, Mexico, as enumerated below:

Upper part of San Felipe formation—Las Flores hacienda in an arroyo about 6 kilometers west by south of Manuel station (M. G. O. Acq. Nos. 138 and 268); and in an arroyo about $3\frac{1}{2}$ kilometers west by north of Manuel station (M. G. O. Acq. No. 135); Chocoy hacienda, in an arroyo about 3 kilometers west-northwest of Chocoy station (M. G. O. Acq. No. 142); and in an arroyo four-fifths of a kilometer north of old Chocoy hacienda house (M. G. O. Acq. No. 143), and loose in material thrown from an excavation for a tank four-fifths of a kilometer south of old Chocoy hacienda house (M. G. O. Acq. No. 270).

Lower part of Mendez formation—On Chocoy hacienda, in a gully just west of the track of the National Railways of Mexico, $1\frac{1}{3}$ kilometers northwest of Chocoy station (M. G. O. Acq. 141), and in a ditch along the Tampico road, half a kilometer south of the old Chocoy hacienda house (M. G. O. Acq. No. 271).

Upper part of Mendez shale—On Chocoy hacienda, in gullies at Los Borregas, 4 kilometers east by south of Chocoy station (M. G. O. Acq. No. 272).

The stem fragments are found through a vertical range of 200 or 250 meters. The type (pl. 1, fig. 1) was found in the upper part of the San Felipe formation, 6 kilometers west by south of Manuel station. Modifications of species doubtless occurred during the time interval represented by so great a deposit, but these can not be determined from the present material. A species was described by de Loriol from the Upper Cretaceous of Africa in Tunis² as *Balanocrinus africanus*, which was evidently a less robust form, having small cirri and more delicate crenulations on the joint faces.

Along with the stem fragments in the upper part of the Mendez formation are some remains of an echinoid with numerous very small spines, not sufficiently perfect for determination of the genus, but evidently of similar type to some forms which have been found in the Upper Cretaceous of Texas and Alabama.

² In Peron, Exploration scientifique de la Tunisie, 1893. Paleontologie, pl. 31, figs. 39-53.

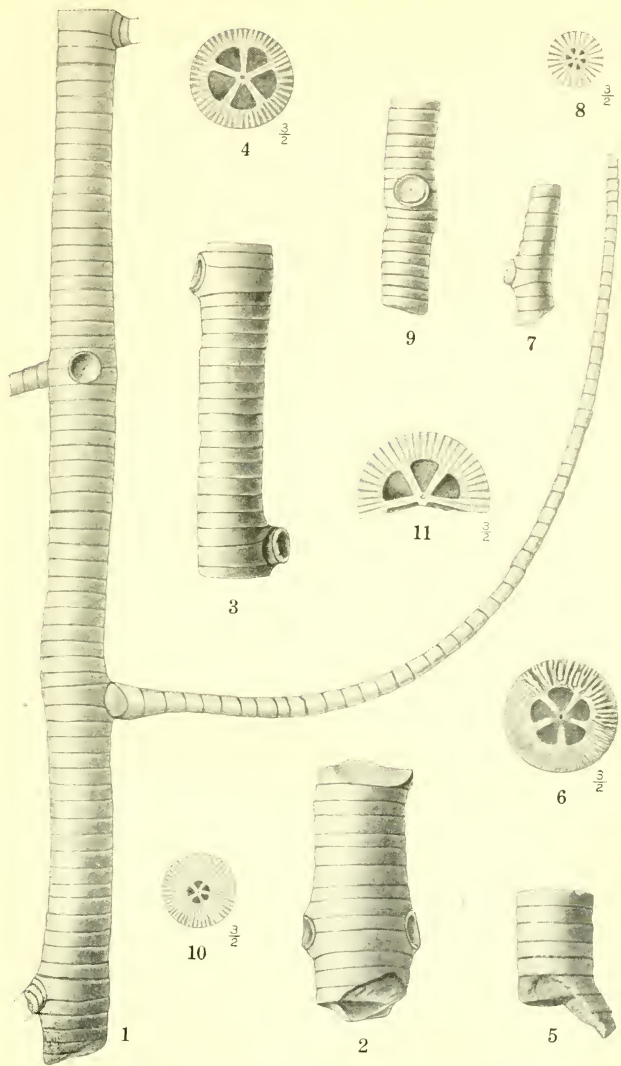
EXPLANATION OF PLATE.

All figures natural size unless otherwise indicated.

Balanocrinus mexicanus, new species.

FIG. 1. The type. Part of a large stem fragment 25 cm. long, 12 mm. to 10 mm. in diameter, belonging to a column traced in the rock to a length of 5 meters; it shows 3 complete internodes of about 20 columnals each, and a nearly complete cirrus about 15 cm. long, composed of 52 ossicles and tapering from 4.5 to 2 mm.; it also shows the origin of 2 opposite cirri from one nodal. The entire fragment from which the figure is made has 4 internodes, and 4 more or less complete cirri preserved. Acq. No. 268.

2. Stem fragment of about maximum diameter—17 mm.—showing 2 opposite cirrus sockets. Acq. No. 135.
3. Stem fragment containing 2 cirrus-bearing nodal columnals, of which the lower one has 2 cirri (one not visible, in this view) and the upper only one, with 16 internodals between them. Acq. No. 142.
4. Joint-face of same, showing triangular sunken areas of the ligament fossae, or petaloid sectors, having about the usual relative proportions, with crenulations limited to the peripheral band, about 10 to each sector. $\times \frac{3}{2}$.
5. Fragment of larger stem—15 mm. diameter. Acq. No. 135.
6. Joint face of same, with crenelation deeply exposed, showing alternate grooves rather strong, enclosing intermediate grooves which may sometimes be undeveloped, leaving less than 10 apparent in the fossil. $\times \frac{1}{2}$
7. Fragment of small stem, 6 mm. diameter, with a single cirrus socket. Acq. No. 138.
8. Joint-face of same. $\times \frac{3}{2}$.
All the foregoing from upper part of the San Felipe formation.
9. Stem-fragment 8 mm. diameter, containing a nodal columnal with a single cirrus. Acq. No. 147. Lower part of Mendez formation.
10. Joint-face of stem fragment 8 mm. in diameter, with petaloid sectors unusually small and crenate peripheral band correspondingly wide. $\times \frac{3}{2}$. Acq. No. 271. Same horizon.
11. Joint-face of large stem fragment, 14 mm. diameter. $\times \frac{3}{2}$. Acq. No. 271. Same horizon.



A NEW CRINOID FROM THE UPPER CRETACEOUS OF MEXICO.

FOR EXPLANATION OF PLATE SEE PAGE 4.

