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THE ELLISELLIDAE (OCTOCORALLIA) AND THEIR
BEARING ON THE ZOOGEOGRAPHY OF THE
EASTERN PACIFIC

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The complete absence of the gorgonacean family Gorgonellidae (properly Ellisellidae) from the eastern Pacific has been cited as an example of distribution illustrating the view that the shelf fauna of the American Pacific coast is not as closely related to the western Pacific fauna as is that of the Caribbean (Ekman 1935: 66; 1953: 40). However, this idea of the distributional pattern of the Ellisellidae is the result of incomplete knowledge of the composition of the west American fauna, and seems to derive largely from the works of Kükenthal, notably his monograph of the Gorgonaria in the reports of the German Deep Sea Expedition (1919: 856-862). Material now in our hands, preserved in the collections of the U. S. National Museum and the Museum of Comparative Zoology, shows conclusively that members of the Ellisellidae do indeed occur along the Pacific coast of the Americas, a graphic demonstration that thorough faunal sampling is an indispensable foundation for zoogeographic speculation. In this case, increased knowledge of distribution does not alter the basic zoogeographic conclusion; it merely requires the selection of some new examples from a relatively unaltered body of evidence. Moreover, the two examples of gorgonacean genera cited by Ekman as occurring in the eastern Pacific as well as in its western parts, contrary to his theory—*Psammogorgia* and *Heterogorgia*—do not, in fact, have any such distribution. This erroneous notion resulted from a misunderstanding of the two genera, as well as from misidentifications made by Nutting

(1910a, 1910b) and mostly accepted by Kükenthal (1919, 1924). So far as we know at this writing, neither *Psammogorgia* nor *Heterogorgia* occurs anywhere outside of the Panamic province, a further demonstration that zoogeography is no better than the systematics upon which it is based.

FAMILY ELLISELLIDAE

This exceptionally well-defined family is characterized by a remarkably uniform type of spicule and a strongly calcified axial cylinder with its calcareous fibers oriented radially and without a soft, cross-chambered medulla. Its genera and species, on the other hand, are with few exceptions especially difficult to separate. The genera *Ctenocella* (Indo-west-Pacific) and *Rüsea* (Caribbean) are unmistakably recognized by their peculiar modes of branching, and *Junceella* (Indo-west-Pacific) by its spicules, but the rest—*Ellisella*, *Toeplitzella*, *Verrucella* and *Nicella*—are not always so easy to recognize. The genera as now accepted may be differentiated according to the following key:

- I. Colonies whiplike, flagelliform or, if branched, with only a few long, slender, and comparatively straight branches
 - A. Colonies branched in one plane, with several long, straight terminal branches arising in a lyrate or bipectinate manner . . . *Ctenocella* Valenciennes
 - B. Colonies simple or, if branched, not lyrate
 1. Cortical spicules include many symmetrical clubs . . . *Junceella* Valenciennes
 2. Cortical spicules are always dumb-bells, never clubs
 - a. The calicles contain spindles that are longer than the dumb-bells of the cortex . . . *Ellisella* Gray
 - b. The calicles contain only dumb-bells like those of the cortex . . . *Toeplitzella* Deichmann
- II. Colonies abundantly branched, the terminal branchlets rather short and usually quite crooked, sometimes anastomosing
 - A. Branching openly pinnate, terminal branchlets short, bearing only 1-4 polyps of which one is apical, bent like the bowl of a clay pipe; the diameter of the polyps is greater than that of the branchlets. Core of axis strongly eccentric . . . *Rüsea* Duchassaing and Michelotti
 - B. Branching lateral or asymmetrically dichotomous, the terminal branchlets developing many polyps; calicles hemispherical, not tubular, equal to the terminal branches in diameter or smaller. Core of axis about central
 1. The calicles contain numerous spindles that are conspicuously longer than the dumb-bells . . . *Nicella* Gray
 2. The calicles contain only spicules like those of the rind, no long spindles . . . *Verrucella* Milne Edwards and Haime

The material now before us contains three records of the genus *Ellisella* from Baja California. One of these was collected by Heinz A. Lowenstam of the California Institute of Technology, and another by the late Conrad Limbaugh of Scripps Institution of Oceanography, to both of whom we are most grateful. The third was collected by the steamer "Albatross" many years ago. The collections of the U. S. National Museum also contain specimens of a *Nicella* labeled "Gulf of California," possibly in error, which are mentioned so that investigators now active along the Pacific coast may be on the alert for new records to confirm this doubtful find.

Genus *Ellisella* Gray

Ellisella Gray 1858, Proc. Zool. Soc. London 1857 (vol. 25): 287. (Type species, *Gorgonia elongata* Pallas, by subsequent designation: Nutting 1910: 31.)

Diagnosis: Simple or sparingly branched colonies with long terminal branches not arising in a regular lyrate plan. Cortical spiculation consisting of short double heads and somewhat longer double rods or spindles, the latter most heavily concentrated in the calicular part of the polyps. Pharyngeal walls containing slender rods with usually two belts of angular warts.

The discrimination of species in this genus is a vexing matter. The characters usually employed are: (1) form of colony, including manner and extent of branching; (2) arrangement and size of calices; (3) shape and relative size of the calicular rods in comparison with the spicules of the general cortex; and (4) the type of double-head spicules predominating in the cortex, i.e., the double sphere or "dumb-bell" type, which has two uniformly warted spheroidal heads connected by a constricted neck; or the "capstan" type, which has two whorls or transverse girdles of rather irregular tubercles, and terminal clusters, separated by a rather wide neck. These characters are without exception difficult both to evaluate and to express in words and keys and, to complicate matters, are also subject to variation.

The specimens before us share so many characters that we are convinced we are dealing with a single species. Although we are unable at the present time to reconcile it with any species of *Ellisella* heretofore described, a thorough revision of the genus may show it to be identical with one of the Indo-west-Pacific species already known.

***Ellisella limbaughi*, new species**

(Figs. 1-2)

Material examined: (Holotype) Baja California: southwest of Holcombe Point at entrance of San Ignacio Lagoon, Pacific coast. Depth, 28 fathoms. Heinz Lowenstam, May 1950. (Mus. Comp. Zool. cat. no. 3939.)

(Paratype) Baja California: south of Cape San Lázaro, Pacific coast, 24° 38' 00" N, 112° 17' 30" W. Depth, 51 fathoms. U. S. Fish Com-

mission steamer "Albatross" station 2833, 2 May 1888. (One specimen in alcohol, U.S.N.M. cat. no. 51577.)

(Additional specimen) Baja California: Cape San Lucas Canyon. Depth, 100-200 feet; taken by diving. Conrad Limbaugh and J. Stewart, March 1959. (One specimen dry, U.S.N.M. cat. no. 51576.)

Diagnosis: Colonies sparingly branched, with long, slender terminal branches. Polyps in two lateral bands, set in strongly oblique rows of 3-6, except near the branch tips where there may be only 2 (i.e., in alternating double rows). Calicular rods rather blunt, 0.08-0.1 mm long, not much larger than the double heads, which measure at most 0.06-0.08 mm; double heads including many of the capstan type as well as double spheres. Color, dull orange; calicles and rind identically colored.

Descriptive remarks: The three colonies are similar in their rather small size and sparse branching. The polyps are separated by two naked bands into two lateral tracts in which they are arranged diagonally in rows of 3-5, except near the base where there may be 6 polyps in the diagonal rows, and near the branch tips where there may be as few as two. In the two colonies in which the base is preserved, there are no polyps on the proximal part of the main trunk. The calicles are preserved differently in each of the three specimens. In U.S.N.M. no. 51577, preserved in alcohol, they are up-turned but prominent and the tentacles are extended (Fig. 1 a). In one of the dry specimens (the holotype), M.C.Z. no. 3939, they are appressed upward in a scale-like manner (Fig. 1 c), as if the colony had been stimulated to the fullest degree of contraction before it was dried, whereas in the third specimen, U.S.N.M. no. 51576, they are in an intermediate condition (Fig. 1 b). In this genus, the prominence of the calicles in preserved specimens is not a reliable character because it depends so much upon the methods of preservation used, the condition of the colony, and the reaction of individual polyps, as occasionally can be seen even in a single colony.

The holotype, M.C.Z. no. 3939, is a once forked branch 28 cm in length, lacking both main trunk and branch tips. At the lowest part it has a diameter of 2.5 mm, in the uppermost part 1.5 mm. The contracted calicles, which are depressed into pits in the cortical surface, are oval, scale-like, somewhat bilobed above, and measure roughly 0.5-0.7 mm across. The calicular rods (Fig. 1 e) are conspicuously constricted at the waist, tapered, but not acute. They are at most about 0.08 mm long and thus not much longer than the largest double heads, which measure 0.06 mm. The double heads include capstans with conspicuous terminal clusters, and smaller dumb-bells in which the warts show little or no tendency to separate into transverse girdles and terminal tufts (Fig. 1 f). The axial sheath contains capstans up to 0.06 mm in length, not so strongly sculptured as those of the outer rind (Fig. 2 a). The pharyngeal walls contain slender rods with two transverse belts of tubercles (Fig. 1 d, left), about as long as the calicular rods but much slimmer. The tentacles contain irregularly sculptured rods (Fig. 1 d, right two) that grade quickly into the typical spicules of the calicular walls proximad. The

spicules are pale amber yellow except those of the axial sheath, tentacles, and pharynx, and some of the calicular rods, which are nearly or quite colorless.

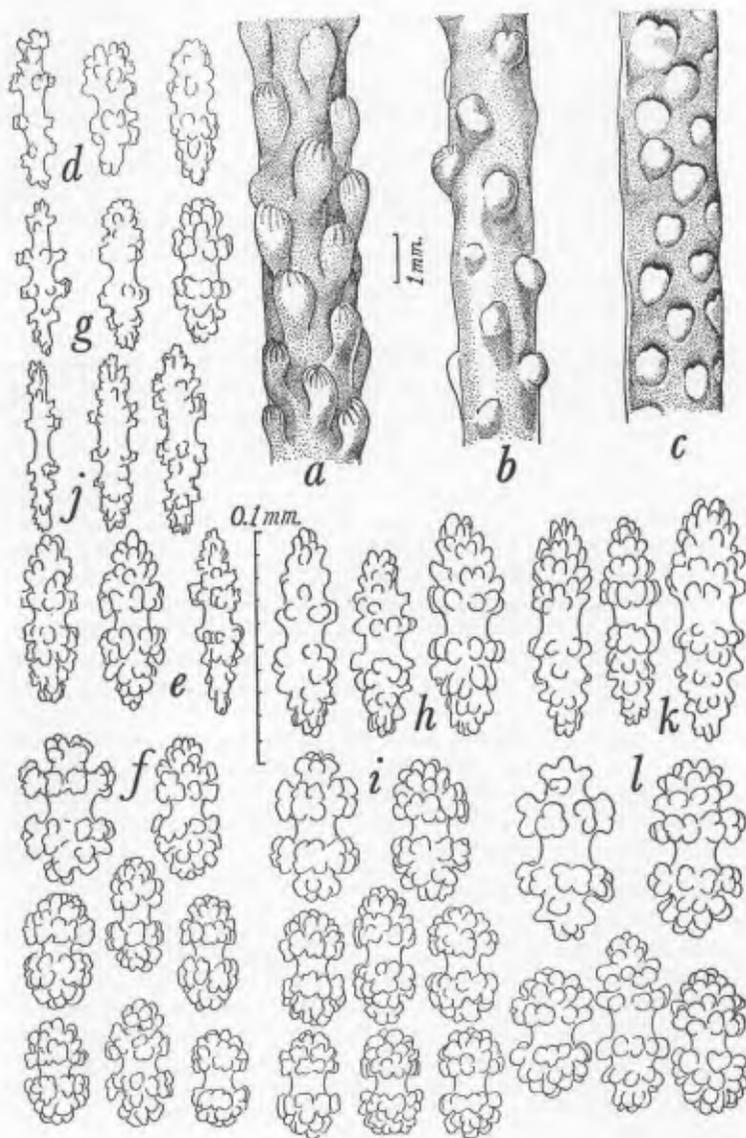


FIG. 1

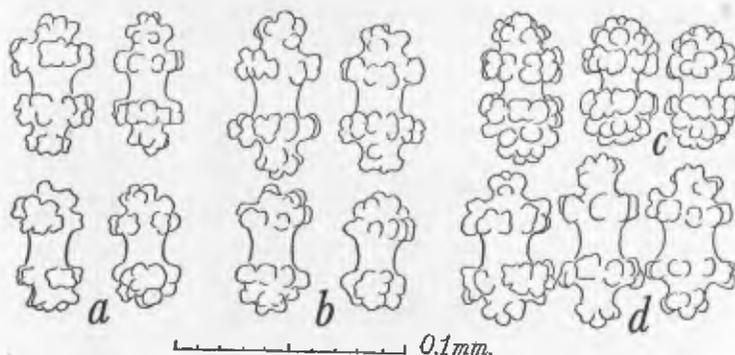


FIG. 2

The paratype, U.S.N.M. no. 51577, is a forked colony 18 cm tall, with its basal disk but lacking the uppermost parts, which are eroded away. Just above the base, the main stem has a diameter of 3 mm; the uppermost branch measures 2.5 mm in diameter. The main branch was terminally eroded during the life of the colony, and the lower branch and its secondary branch are entirely decorticated. The calicles are upturned, not much contracted, somewhat more than 1 mm tall with tentacles extended; they are arranged in oblique rows of 3-5, which form two lateral bands as in the holotype. The spicules are very similar in form to those of the holotype, but are slightly larger. The calicular rods (Fig. 1 h) reach a length of 0.1 mm and the double heads (Fig. 1 i) 0.065 mm. The pharyngeal and tentacular rods (Fig. 1 g), and the capstans of the axial sheath (Fig. 2 b) are practically identical with those of the holotype.

A third specimen, U.S.N.M. no. 51576, is similar to the types in most respects. It is a slender, weakly branched colony with long, ascending terminal branches. Complete with base and all but a small tip of the uppermost branch, it has a height of 38.5 cm. The main stem forks three times unilaterally in rapid succession to produce four closely placed terminals. The main trunk measures 2.5 mm in diameter; in the middle of the colony the diameter is about 2 mm, tapering to 1 mm near the branch tips. The polyps are low, upturned and somewhat clavate, not so fully contracted as in the holotype. They are placed on the branches in lateral bands composed of 2-5 individuals in oblique rows (Fig. 1 b). The spicules are practically identical in form with those of the types but are consistently larger. The longest calicular rods measure slightly more than 0.1 mm (Fig. 1 k). The largest double heads measure 0.08 mm and the smaller dumb-bells are commonly 0.06 mm in length (Fig. 1 l, 2 c). The capstans of the axial sheath (Fig. 2 d) may be 0.07 mm in length, a few slightly larger.

Ellisella limbaught clearly belongs to the *elongata* group of species as

indicated by its colonial form and by the relatively small size of its calicular rods. However, its colonies are much more delicate than those of either *E. elongata* (Pallas) or *E. grandis* (Verrill), both of which are huge species, and its spicules include many dumb-bells in which there is no differentiation of terminal clusters of tubercles. *Ellisella limbaughi* most closely approaches certain of the colonies included by Simpson (1910: 339) under *Scirpearia furcata* from the Indian Ocean, a species that was removed to *Ellisella* (= *Toeplitzella* Deichmann) by Toeplitz because it seems to lack the special calicular rods of *Scirpearia*. It may eventually prove that *E. limbaughi* is identical with one of them, but this would give it an exceptionally wide distribution for a shallow-water gorgonian.

This species is named in memory of Conrad Limbaugh, who recently lost his life in a diving accident.

Genus *Nicella* Gray

Nicella Gray 1870, Cat. Lithophytes Brit. Mus.: 40. (Type species, *Nicella mauritiana* Gray 1870 = *Scirpearia dichotoma* Gray 1859, by monotypy.)

Nicella, Deichmann 1936, Mem. Mus. Comp. Zool. 53: 216.

Diagnosis: See Deichmann 1936: 216.

Nicella guadalupensis (Duchassaing and Michelotti)

Verrucella guadalupensis Duchassaing and Michelotti 1860, Mém. Corall. Antill.: 33, pl. 4, Figs. 5-6. (Guadeloupe.)

Nicella guadalupensis, Deichmann 1936, Mem. Mus. Comp. Zool. 53: 218, pl. 36. (Various localities from Dry Tortugas to Barbados.)

Material examined: Two large dried specimens (one of them broken into three pieces) labeled "Gulf of California," collected by W. J. Fisher and received from R. E. C. Stearns (U.S.N.M. cat. no. 8972). Although other gorgonians in the Fisher collection are typical Panamic species, some of the material received from Stearns came from diverse localities, suggesting that an error of labeling may have occurred.

Remarks: The two specimens from the "Gulf of California" differ conspicuously in spiculation but they both fall well within the remarkable range of variation observed in West Indian *Nicella guadalupensis*. One of the specimens has long, acute calicular rods, as in U.S.N.M. 7617 from Havana, Cuba; the other has short, blunt rods, as in U.S.N.M. 44134 from Barbados. Both colonies are dull yellow with nearly white calicles, a color pattern commonly found in *N. guadalupensis*.

GORGONIANS AND THE ZOOGEOGRAPHY OF THE AMERICAN PACIFIC COAST

Although the discovery of Ellisellidae on the coast of Baja California removes one important item of evidence from Ekman's contention that the eastern Pacific shelf-fauna is not so closely related to the western Pacific as is the Caribbean, this is offset by the fact that *Psammogorgia* and *Heterogorgia* are endemic to the west American shelf-fauna and do

not occur also in the western Pacific as Ekman had been led to believe by the literature. The gorgonians of both Atlantic and Pacific coasts of tropical America show a marked degree of endemism and are closely related, as is clearly indicated by the preponderance of gorgoniids and plexaurids. However, at somewhat greater depths—down to 100 fathoms—there are other gorgonians whose distribution supports the opinion of Ekman, among them the genera *Bebryce*, *Villogorgia*, *Placogorgia*, and *Eunicella*, which actually are not known to occur along the Pacific coast. All that can be said is that the Atlantic and Pacific American gorgonian faunas form a closely related unit with conspicuous amphi-American elements, and the Atlantic component bears somewhat closer ties with the Indo-west-Pacific fauna than does the Pacific component, as suggested by Ekman.

EXPLANATION OF FIGURES

Fig. 1. *Ellisella limbaughi* sp. nov.: a.—Part of branch of paratype, U.S.N.M. 51577. b.—Part of branch of U.S.N.M. 51576. c.—Part of branch of holotype, M.C.Z. 3939. d-f.—Spicules of holotype (d, rod from pharynx and two intermediate forms from tentacles; e, calicular rods; f, cortical capstans and double heads). g-i.—Spicules of paratype (g, rod from pharynx and two intermediate forms from tentacles; h, calicular rods; i, cortical capstans and double heads). j-l.—Spicules of U.S.N.M. 51576 (j, rod from pharynx and two intermediate forms from tentacles; k, calicular rods; l, cortical capstans and double heads).

Fig. 2. *Ellisella limbaughi* sp. nov.: a.—Capstans from inner layer, holotype. b.—Capstans from inner layer, paratype. c.—Outer cortical double heads, U.S.N.M. 51576. d.—Capstans from inner layer, U.S.N.M. 51576.

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