

**Redescription and Range Extension of the
Sea Anemone *Cnidopus ritteri* (Torrey)
(Coelenterata: Actiniaria)**

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ABSTRACT: The actinian *Cnidopus ritteri*, type species of the genus, is redescribed, with particular attention to the 2 sorts of columnar ectodermal specializations, and the generic definition is revised. The species was previously recorded only from Alaska; this report extends its range to central California.

The genus *Cnidopus*, of the anthozoan family Actiniidae, was established by Carlgren (1934) with *C. ritteri* as the type species. This animal had originally been called *Epiactis ritteri* by Torrey (1902), but Carlgren (1934) placed it in a separate genus "... owing to the very numerous nematocysts present at the sides of the protuberances and between them in the lowest part of the column" (p. 351). Both Torrey's and Carlgren's descriptions were based on specimens from Alaska. In this paper we report and describe *Cnidopus ritteri* from central and northern California and from Oregon, the first record of its existence outside Alaska. This species is extremely cryptic and not very abundant, which probably accounts for its omission from guides to Pacific coast intertidal sea anemones (Hand, 1954; MacGinitie and MacGinitie, 1968; Ricketts and Calvin, 1968) and from Hand's (1955) otherwise comprehensive study of the intertidal central California Actiniidae.

These observations were made on a great many live animals, both in the field and in the laboratory, dissection of several, and histological sections of five others. Nematocyst measurements are from 6 individuals.

Cnidopus ritteri (TORREY, 1902:393).

1902. *Epiactis ritteri* TORREY:393.

1934. *Cnidopus ritteri* CARLGREN:351.

1949. *Cnidopus ritteri* CARLGREN:61.

DISTRIBUTION. We have found *Cnidopus ritteri* in the vicinity of the Bodega Marine Laboratory and at Shell Beach, Sonoma County, California. It has also been reported from Crescent City in northern California and from Pigeon Point, San Mateo County, California (Dr. Ralph Bushnell, personal communication), and it is common in the low intertidal at Cape Arago near Charleston, Oregon. Earlier records of this species are from Popof Island, St. Georges Island, and possibly Bering Island, all in Alaska. It is therefore likely that it occurs all along the Pacific coast from Alaska to central California, and perhaps further south as well, but has escaped notice due to its cryptic character.

HABITAT. *Cnidopus ritteri* occurs very low in the rocky intertidal near the Bodega Marine Laboratory and at Shell Beach, both in Sonoma County, normally below the zero tide level, attached to the sides of large boulders or rock outcrops which usually rise from a sand or gravel bottom. It also occurs in deep tide pools and under ledges where they are protected from direct wave action.

SIZE. The base of *C. ritteri* often exceeds 50 mm. in diameter. In expanded specimens the oral disc is about the same diameter as the base, and the height of the animal is somewhat less than its diameter. Contracted specimens may become exceedingly flat, a large individual being only 5-10 mm. tall.

BASE. The pedal disc of *C. ritteri* is usually circular in outline, and the animal can be pried from the substrate quite easily. There are radiating white lines around the base, but its ground color is identical to that of the column.

COLUMN. The column, which is dark red, maroon, or brown in color, is covered with adherent sand grains, making the animal extremely cryptic in its normal habitat, particularly when it is

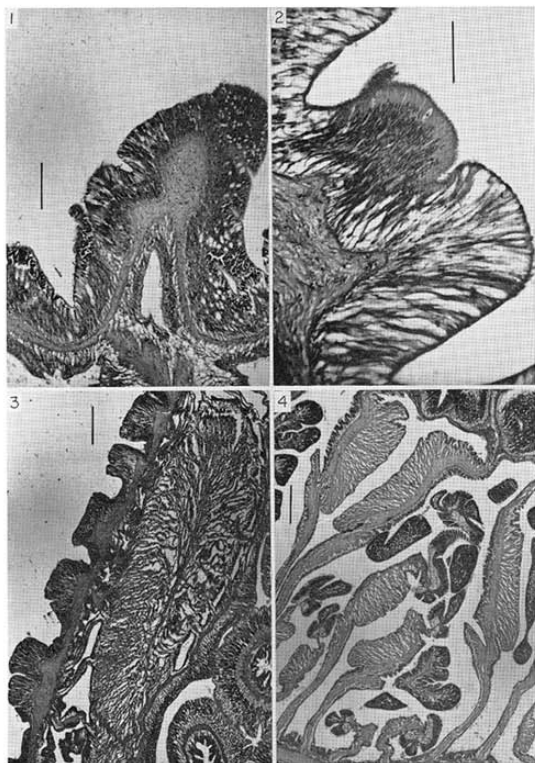


FIGURE 1. Section through a columnar protuberance (verruca). Batteries of atrichous nematocysts can be seen along each side. (Scale = 100 μ m.)

FIGURE 2. Section of specialized ectodermal area with closely-packed cells ("sucker"). (Scale = 50 μ m.)

FIGURE 3. Slightly tangential section of sphincter. (Scale = 200 μ m.)

FIGURE 4. Section through column showing free-flap of parietobasilar muscle on both complete and incomplete mesenteries. (Scale = 200 μ m.)

contracted. A diagnostic feature of the genus is the protuberances of identical histological character to most of the rest of the column wall (fig. 1). The sides of the protuberances usually contain many large nematocysts, although occasionally such concentrations also occur at the tips of the protuberances, and the sides of some are devoid of stinging capsules. The protuberances are virtually restricted to the lower end of the column although batteries of the large atrichous nematocysts are found higher. In all respects except having terminal nematocysts, the protuberances appear to be verrucae, and Carlgren (1952) referred to them as such in discussion of another species of the genus *Cnidopus*.

In addition, the ectoderm of *Cnidopus ritteri* has histologically and histochemically specialized areas in the form of closely packed non-glandular cells (fig. 2) which are found the entire length of the column and which never contain nematocysts. These appear very similar to what Stephenson (1928) and Carlgren (1949) define as "suckers," although both state that they are found only in anemones of the genus *Sagartia*. It is probably this structure that is responsible for the adhesion of sand grains to the column of *C. ritteri*.

The ectoderm of some specimens of *Cnidopus* also appears to have vesicular protuberances, especially in the lower part of the column. We had originally thought that these structures represented a third type of body-wall specialization, but we now believe that Carlgren (1934) was correct in stating that ". . . it is probable that the protuberances ["verrucae"] . . . in the extended state [of the animal] have a more vesicle-like appearance" (p. 351) and that these vesicular-looking structures are part of the verrucae.

When uncovered at low tide, the anemone contracts, entirely withdrawing its tentacles. Its sphincter is strong, endodermal, circumscript, oval in shape, and pinnate (fig. 3).

ORAL DISC. The lipless, slightly elongate mouth of *Cnidopus* can be raised to form a small oral cone, but the disc is usually flat. Its color is identical to that of the column, with a tapering white bar extending from the base of each tentacle toward the mouth. The radial musculature of the oral disc is ectodermal.

TENTACLES. The blunt-tipped tentacles are the same color as the rest of the animal. They are regularly arranged and about the length

of the radius of the oral disc. Their longitudinal musculature is ectodermal and the circular musculature is endodermal.

MESENTERIES AND INTERNAL ANATOMY. The mesenteries are regularly arranged, 96 pairs being the maximum observed. The retractor muscles are diffuse to somewhat restricted, and the strong parietobasilar muscles have a short free flap at their inner edge (fig. 4). The green, ribbed throat has 2 siphonoglyphs. Mesenteries of the first 2 cycles are sterile, as are those of the fifth cycle. Mesenteries of the third order may be complete. *Cnidopus ritteri* appears to be dioecious, although the possibility exists that it is a protogynous hermaphrodite since the 1 male was larger than the 4 females examined histologically. In *Cnidopus* the young are brooded internally, apparently harboring only a few at a time and retaining them until they achieve considerable size.

No zooxantellae have been observed in this species.

CNIDOM. Spirocysts, basitrichs, atrichs, microbasic p-mastigophores.

DISTRIBUTION AND SIZE OF NEMATOCYSTS. The number in parentheses at the end of each set of measurements represents the number of nematocysts measured for each type.

Tentacles:

Spirocysts	22.0-38.0 × 2.5-3.0 μm. (43)
Basitrichs	19.0-32.0 × 2.5-3.0 μm. (45)

Column:

Basitrichs	14.4-26.0 × 1.9-2.5 μm. (57)
Atrichs	26.9-42.0 × 3.8-5.0 μm. (82)

Actinopharynx:

Basitrichs	15.0-20.0 × 2.0-2.5 μm. (12)
Basitrichs	24.0-33.0 × 2.9-3.8 μm. (29)

Filaments:

Basitrichs	14.0-19.0 × 2.0-2.5 μm. (11)
Basitrichs	20.0-34.0 × 4.0-5.0 μm. (23)
Microbasic p-mastigophores	21.0-27.0 × 4.5-5.5 μm. (21)

DISCUSSION. The foregoing description expands on the previous ones of Torrey (1902) and Carlgren (1934), which varied with one another and with the present one mainly in regard to the character of the protuberances on the column, and reports the details of the cnidom. It was the protuberances which prompted Carlgren to create a new genus for this animal, and the main intent of this report

is to clarify the types of ectodermal specializations present on the column of *Cnidopus ritteri* and to record the presence of this species in California and Oregon. In view of the new facts presented here, we propose modification of the generic description of *Cnipodus* (Carlgren, 1934, 1949) as follows (revised portions italicized):

Genus *Cnidopus* Carlgren, 1934:351

Actiniidae with broad pedal disc. Column, especially in its lower part, provided with low protuberances, often very close-set and sometimes containing extraordinarily numerous atrichs. In some species the column ectoderm also formed into adhesive sucker-like areas which lack nematocysts. Sphincter circumscript. Tentacles rather short, comparatively numerous, as a rule arranged hexamerously. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal. Usually 2 siphonoglyphs. Mesenteries for the most part perfect, and more numerous than the tentacles. Retractors not strong, parietobasilar and basilar muscles strong. Mesenteries of the first and second cycles sterile, with gonads on the stronger (including perfect) mesenteries of the later orders. Cnidom: spirocysts, basitrichs, microbasal p-mastigophores, atrichs.

Although in his monograph of the actinians of the world Carlgren (1949) lists only 1 species of *Cnidopus*, he later (1950) assigned the Australian *Actinia veratra* Drayton in Dana, 1846, to this genus, and in another paper (1952), he referred the Japanese sea anemone called *Epiactis prolifera* by Uchida (1934) and Uchida and Iwata (1954) to the genus as *C. japonicus*. Both of these species should be re-examined to determine if they conform to the generic definition as revised here.

In California, *Cnidopus ritteri* strongly resembles the anemone *Epiactis prolifera*, particularly when expanded in the laboratory, although the latter species is usually found brooding young externally. In 1901, McMurrich noted that an "*Epiactis prolifera*" he examined "either had an abnormal sphincter or else belonged to a different species from the others" (p. 41). Although he deemed the latter alternative unlikely, it is possible that he had 1 specimen of *Cnidopus* among the *Epiactis* series. It may be, therefore, that *E. prolifera* is not as variable as the literature would indicate, but that some accounts of it actually refer to *C. ritteri*.

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