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ELECTRA VENTURAENSIS, A NEW SPECIES (BRYOZOA: CHEILOSTOMATA: MEMBRANIPORIDAE) FROM SOUTHERN CALIFORNIA

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Abstract.—*Electra venturaensis* is described from shallow subtidal water near Ventura, California. It is distinguished from *E. monostachys* (Busk) by lacking typical lateral spines and possessing a calcified operculum, and from *E. crustulenta* (Pallas) by possessing numerous frontal heterozoids and occupying a non-estuarine habitat. Adventitious buds derived from reparative buds or kenozoids derived from spines may form pseudoancestrulae and subcolonies in later astogenetic stages.

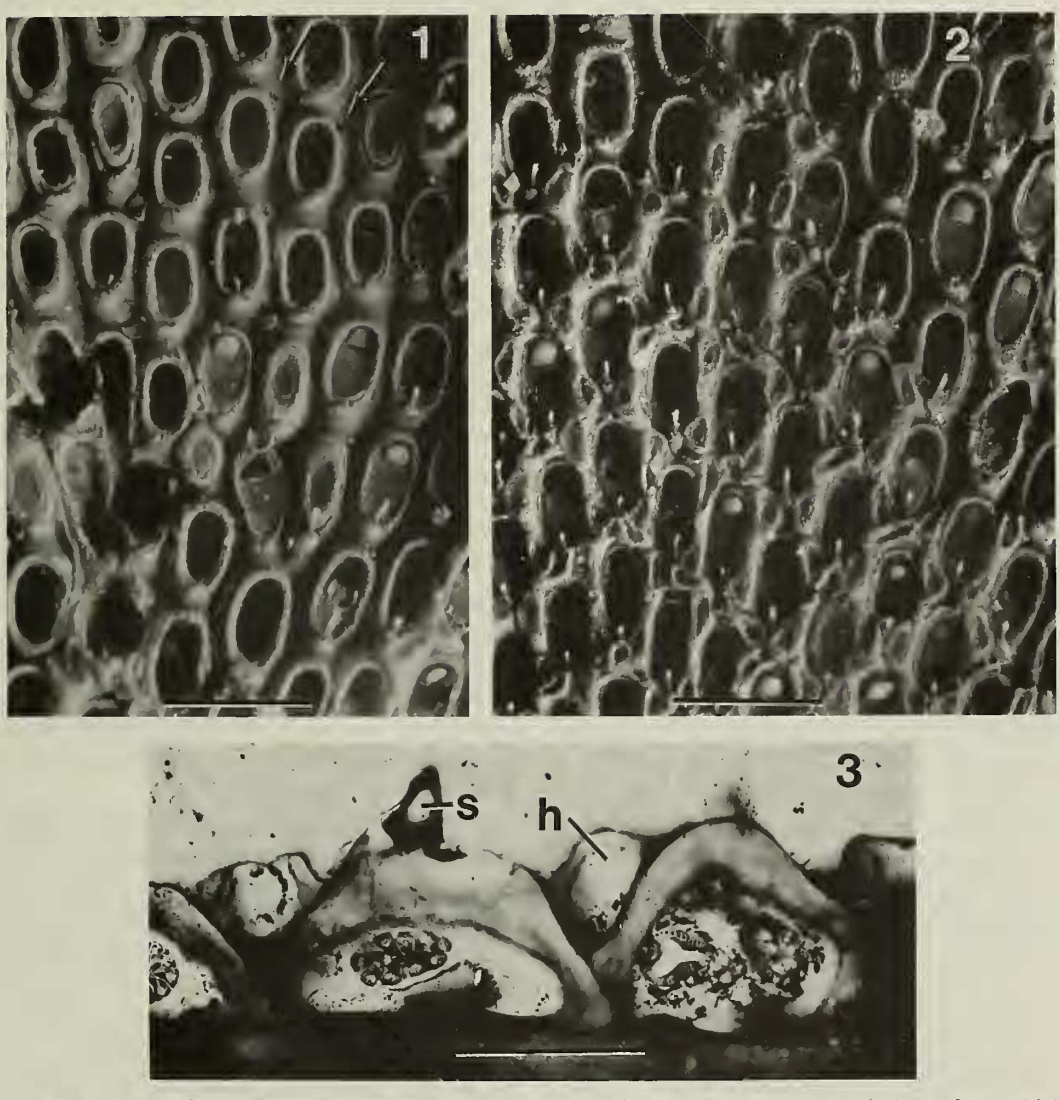
Methods and Materials

Pelecypod shells and other substrates were collected by snorkel in shallow subtidal waters off Rincon Beach, about 5 miles north of Ventura, California on 24 March 1968. Fragments of about 15 colonies were preserved in 70% ethyl alcohol. Some colony fragments were dried and treated varying times in 5% NaOCl or cleaned with dilute detergent in an ultrasonic cleaner. Dry specimens were dyed with 1% aqueous congo red and coated with sublimed ammonium chloride for light photomacrography (Kier et al. 1976). Some material was dehydrated in ethanol to propylene glycol and vacuum-imbedded in Epotuf resin for thin-ground sections containing calcareous tissues in place next to soft tissues (Nye et al. 1972). Additional topotype material: material encrusting sandstone collected 29 Jan 1965, one dry colony and one preserved in 70% alcohol; one dried colony on sandstone collected Dec 1963.

Family Electrinidae Stach, 1937
Genus *Electra* Lamouroux, 1816
Electra venturaensis, new species

Type material.—Holotype: National Museum of Natural History bryozoan Type USNM 477681, slide of dried material (Figs. 1, 2). Paratype: USNM 15005 and 15006, slides of dried material. Topotype material originally identified and labelled *Electra crustulenta arctica* (Borg) was collected at the same site in Dec 1963, and 29 Jan 1965 and preserved dry.

Diagnosis.—Colony pale tan, encrusting shells, unilaminar to multilaminar (1–3 layers). Autozoids arranged in quincunx, completely covering the substrate, without uniserial rows. Ten tentacles. Early astogenetic stages: unilaminar, with proximal, smooth, mostly imperforate gymnocyst occupying about one third of the frontal surface; cryptocyst a narrow, minutely tuberculated rim completely surrounding the opesium. A median proximal, pointed, cuticular spine, a quarter to a third the length of the opesium, projects obliquely forward over the opesium. The base of the spine becomes increasingly calcified with age, forming a centrally perforate hemispherical boss on the gymnocyst. Minute gymnocystal windows, from which frontal-marginal kenozoids will form, are present at the distolateral zoid corners (Fig. 1, arrows). No ovicells, avicularia or other spines. Operculum shaped like a thumbnail, with a straight transverse proximal border; always evenly calcified, white, translucent. Basal wall complete, thinly cal-



Figs. 1–3. 1: *Electra venturaensis,* new species, holotype. Distolateral gymnocystal windows, from which heterozoids develop, are indicated by arrows. Scale, 0.50 mm; 2: Another part of the holotype colony, showing heterozoids. Scale, 0.50 mm; 3: Transverse Epotuf thin section of paratype encrusting a pelecypod shell, showing heterozoids (h) and a spine (s). Scale, 0.10 mm.

cified. Later astogenetic stages: ectocystal buds, calcified basally and laterally, are produced frontolaterally from windows at the distolateral zoidal corners. These buds fill zoidal margins by a rim of frontal kenozoids, which may become partly to completely occluded by annularly calcifying gymnocyst and cryptocyst. Parts of the colony at this stage resemble species of *Conopeum* or *Antropora.* Finally, some kenozoids may enlarge into pseudoancestrular autozoids, which grow out over older colony layers to form subcolonies: superficial layers of autozoids and kenozoids which smother out older layers. Reparative buds, growing from septulae of damaged zoids, may also form new pseudocolonies.

Additional description of the holotype.—

Table 1.—Measurements of the holotype, of *Electra venturaensis* $n = 30$, measurements in mm.

Metric	Autozoid		Opesium		Operculum	
	Length	Width	Length	Width	Length	Width
Mean	0.457	0.236	0.335	0.157	0.111	0.095
SD	0.034	0.021	0.028	0.017	0.014	0.011
Min	0.380	0.190	0.270	0.120	0.080	0.080
Max	0.500	0.290	0.380	0.190	0.140	0.120
Range	0.120	0.100	0.110	0.070	0.060	0.040

The holotype comprises several NaOCl-treated fragments of a single colony which encrusted a pelecypod shell. Measurements are given in Table 1. All the features described in the diagnosis are represented except parts lost in cleaning, notably opercula and distal parts of the spines. Distal and lateral septulae are multiporous pore plates, which become surrounded by thick vertical and oblique calcareous buttresses. The gymnocyst is usually imperforate, but minute cuticular windows may occur on its distal-frontolateral face. These windows are the source of kenozoid buds, which appear in later astogeny. The asynchronous development of buds and autozoids is reflected in the structure of the interzoidal walls viewed in section (Fig. 3). Cuticle is present between autozoids and heterozoids in all planes of section except those passing through the relatively small pore plates. Kenozoids contain cells and sometimes parietal muscles, but no polypide. They communicate basally with the parent zoid; this arrangement, together with their location suggests that they represent highly modified, flattened spines.

The first signs of frontal kenozoids occur in distal regions after at least 10 zoidal generations of simple *Electra* morphology. Frontal budding in this species, therefore, may represent either programmed astogenetic change or a response to some microenvironmental cue (Boardman et al. 1969).

Generic placement.—The most widely accepted generic concept of *Electra* is that of Ryland & Hayward (1977:64) who studied European type material. It includes simple malacostegans with relatively large gymnocysts, small cryptocysts, and a median proximal spine, often with additional spines near the opesium. A consistently calcified operculum is rare among cheilostomes, but found in some species of *Electra,* notably *E. crustulenta* Pallas, 1766:39. The generic diagnosis is herein revised to include *E. venturaensis,* which possesses frontal kenozoids.

Etymology.—The species name refers to the city of Ventura, California, derived from archaic Spanish, meaning 'good luck,' 'happiness,' and 'fair destiny.'

Related species.—Horowitz (1992) lists 38 species and subspecies referred to *Electra.* Most closely related is *E. crustulenta typica* (Borg 1931:27), a European stenohaline marine species (Prenant & Bobin 1966:153). A proximal median spine is usually the only spination and there is a calcified operculum with a straight or concave proximal border. It differs from *E. venturaensis* in lacking regular frontal budding, in having more elongated autozoids with a greater average length, 0.72 mm long according to Borg 1931:30, compared to 0.46 for *E. venturaensis*). *Electra crustulenta baltica* (Borg 1931:27) is similar to *E. crustulenta typica,* an exclusively estuarine species frequently lacking median proximal spines. *Electra monostachys* (Busk 1854:61), a British estuarine species, forms uniserial to oligoserial (2–3 rows) stellate or dendritic patches. The median proximal spine may be lacking and numerous spines frequently occur around the opesium; a pair of spines

is usually present lateral to the operculum and the operculum is uncalcified (Ryland & Hayward 1977:70). *Electra artica* (Borg 1931:27), is circumpolar, stenohaline (Powell 1968:2282), sometimes pluriserial, the operculum is calcified and the gymnocyst is extensive and imperforate; frontal heterozoids are absent (see Powell & Crowell 1967: 339). Specimens from Alaska identified by Osburn as *Electra crustulenta arctica* (Borg) in the reference collections of the National Museum of Natural History are largely oligoserial and lack frontal heterozoids.

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