pores. The outer wall above them appears, however, to be perfectly homogeneous. It seems clear that spores formed in the manner described can not be referred to as conidia, and the term chlamydospore comes nearer than any other to describing their true nature.

The spores of the Brazilian specimen are more variable in size than those of the Panamá and Colombia material, some of them reaching 28μ in diameter, and the peglike protrusions from the lumen, while often present, are usually fewer in number and sometimes not evident. I doubt whether such differences are of taxonomic significance.

No suggestion of possible connection with a perfect stage is to be found in any of the material at hand. Lacking information to the contrary it may be assumed that any perfect stage will prove to be a member of the Thelephoraceae.

ZOOLOGY.—Boccardia proboscidea, *a new species of spionid worm from California.*[1] OLGA HARTMAN. (Communicated by WALDO L. SCHMITT.)

The commonest representative of the family Spionidae, of the genus *Boccardia*, occurring in the intertidal zones of California, remains unnamed and undescribed. This species is of interest not only because it occurs in abundance in the littoral zones where it is readily available but also because of several biological features, which may warrant more thorough investigation.

My attention was first called to this species several years ago, when I was a member of Prof. S. F. Light's courses in invertebrate zoology at the University of California. At that time its designation was questionable, and after a perusal of the literature I (Univ. California Publ. Zool. **41**: 48. 1936) referred it to *Boccardia natrix* (Söderström) without, however, consulting Söderström's type materials. Since then the species has been noted many times along the coast of California. At the Scripps Institution of Oceanography, through the courtesy of Dr. Martin W. Johnson, it was possible to observe it also as an element in the plankton and to maintain adults and larvae under laboratory conditions.

This study has been supported through a grant from the American Association of University Women. I wish to express my thanks not only for the privileges already mentioned, but also to Dr. Waldo L. Schmitt, of the United States National Museum, for further courtesies.

[1] Received March 30, 1940.

Boccardia proboscidea, n. sp. Fig. 1

?Polydora californica Treadwell, Univ. California Publ. Zool. 13: 203–204, pl. 12, figs. 23–29. 1914 (not *Spio californica* Fewkes, 1889, which is a *Polydora*, sensu latiore).

Boccardia natrix Hartman, Univ. California Publ. Zool. 41: 48. 1936. Journ. Washington Acad. Sci. 26: 32. 1936 (not *Polydora natrix* Söderström, 1920; *not* Berkeley, 1936).

The general form of the body is long, depressed, widest in the region of the eighth to sixteenth segments, and tapers gradually posteriorly. Number of segments is about 125 to 150; total length 30 to 35 mm but capable of much greater extension in life; greatest width (preserved) is about 1.5 mm. Color in life is deep yellow to orange, with bright-red branchial filaments, and considerable dusky pigment along the prostomial ridges and palpal grooves; in preserved individuals all color fades except the sooty markings along the prostomium and some along the palpal length.

The prostomium is an elongate, entire lobe, without median groove such as characterizes most species of this genus; a weakly developed emargination is visible only on the ventral side (Fig. 1, *a*). The lobe is snoutlike (for which the specific name is proposed), it extends posteriorly between the palpal bases where it forms a low crown visible in lateral view (Fig. 1, *d*) and passes more posteriorly as a low, broad ridge to the posterior margin of the third setigerous segment (Fig. 1, *b*). In the region just anterior to the insertion of the palpal bases there are two or three pairs of dark eye spots, clearly visible when the palpi are pushed somewhat to the side. In immature specimens there may be several additional dark spots in these areas, but at least two pairs persist even in the largest individuals. The prostomial lobe is sharply set off from the peristomium by grooves at the sides of the snoutlike elevation. The lateral and ventral sides of the oral opening are bounded by the apodous, achaetous peristomial ring (or first segment). Except for some longitudinal and transverse furrows and some wrinkles of contraction, it is quite smooth (Fig. 1, *a*, *b*, *d*).

The second segment (herein designated the first setigerous) is proximal to the peristomium; it bears a dorsal and a ventral fascicle of pointed setae, each provided with a small postsetal lobe (Fig. 1, *d*). These parapodial structures are comparatively weakly developed, less than half as large as those of the following segment, the setae both fewer in number and shorter. The second setigerous segment resembles the next two. There are well-developed setigerous fascicles, the dorsal and ventral postsetal lobes are auricular, and there is a long, filamentous branchia (Fig. 1, *d*). The fifth (modified) setigerous segment is nearly twice as long as the preceding; it is provided with a dorsal fascicle of stout hooks and an inconspicuous ventral fascicle of capillary setae (Fig. 1, *i*); there are no postsetal lobes. The stout hooks are of two kinds—a longer, falcate, smooth hook, accompanied by an equally heavy, though shorter, bushy-topped seta. In unworn condition (Fig. 1, *h*) the falcate spine terminates distally in a tapering fang; the other has a characteristic subterminal constriction, then widens suddenly and ends in a spinous cap that is strongly asymmetrical (Fig. 1, *h*). In worn condition both of these spines lose these characters (Fig. 1, *j*), but the cuplike base of the latter is still notable.

The next (sixth setigerous) segment is provided with pointed setae in both dorsal and ventral fascicles; its structures are similar to those of the second to fourth segments, but the postsetal lobes are progressively larger. From the seventh the neuropodium is provided with about eight hooded

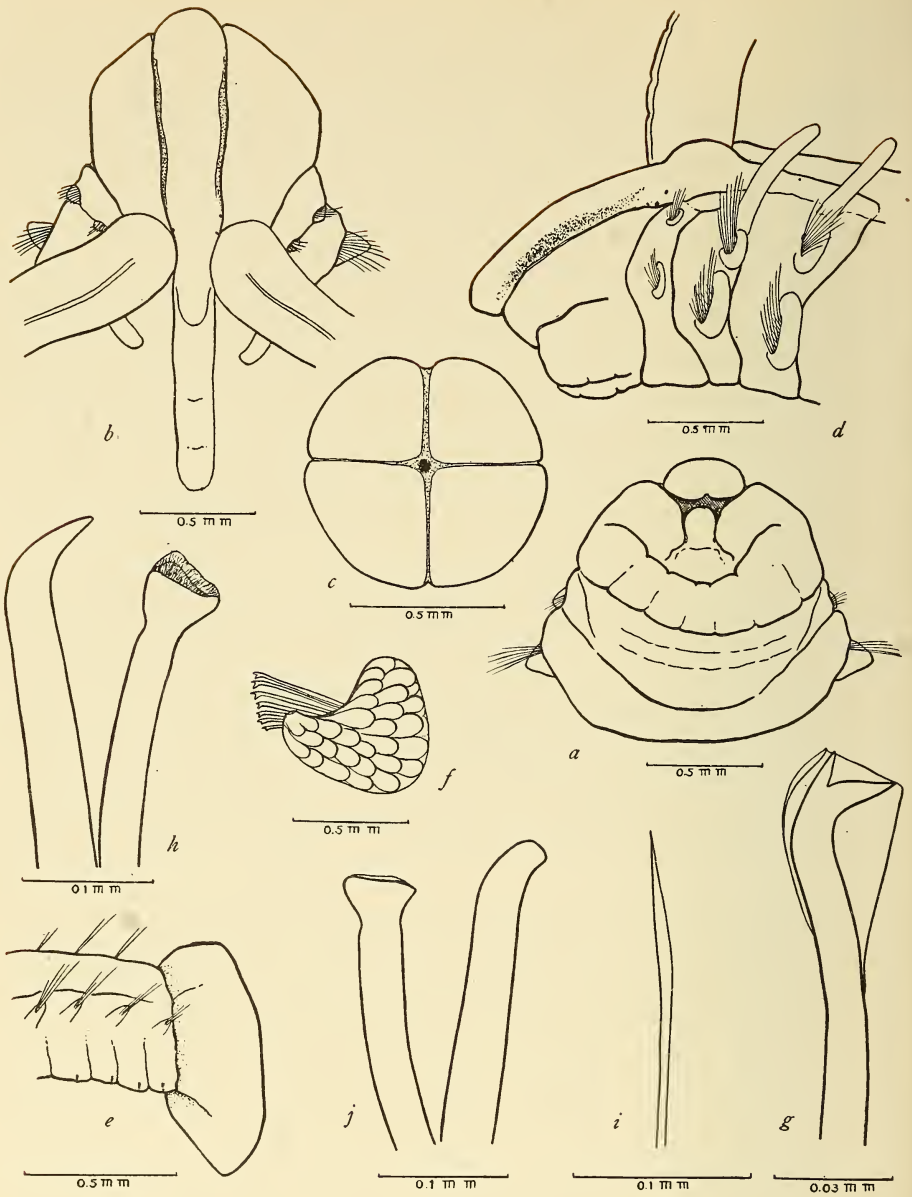

Fig. 1.—*Boccardia proboscidea*, new species: *a*, Anterior end, in ventral view, showing the rounded margin of the prostomial lobe and the peristomial ring bounding the oral aperture, followed by the first two setigerous segments; *b*, the same, in dorsal view, with only the palpal bases shown, the prostomial caruncle continued posteriorly; the eye spots are largely hidden because of their position at the sides of the prostomial lobe; *c*, anal disk in posterior view, showing the 4-lobed arrangement; *d*, anterior end from the left side, the left palpus removed so that the eyes may be seen, setal fascicles indicated; *e*, posterior end from the left side, showing the prolongation of the ventral lobes of the disk; *f*, parapodial gland from the ninth segment seen from the front, showing its characteristic outline; *g*, hooded crotchet from tenth neuropodium; *h*, companion stout setae from the fifth setiger in unworn condition; *i*, pointed seta from inferior fascicle of the modified fifth setigerous segment; *j*, worn companion setae from the fifth setigerous segment.

crotchets, disposed in a single vertical series, and a smaller, inferior fascicle of about five or six slender, pointed setae. The latter persist through about four segments, but from the eleventh there are only hooded crotchets. Notopodia are provided with only pointed setae throughout. Hooded crotchets of anterior and posterior segments resemble one another. The distal end is bifid, the lateral fang nearly at right angles to the main stem, the distal tooth smaller (Fig. 1, *g*).

Branchiae are distributed on setigerous segments 2 to 4, and from the sixth to near the posterior end; the last few (two to four) segments are abranchiate. Setigerous glands, characteristic of members of this family, are best developed posterior to the modified segment; they form a thick, sacklike, slightly L-shaped, pouch (Fig. 1, *f*), terminating under the body wall adjacent to the hooded hooks. The last setiger is followed by a broad, flaring anal disk (Fig. 1, *c*, *e*) unequally 4-lobed, the dorsal lobes the smaller. The anal aperture lies in the depression near the center of the disk (Fig. 1, *c*).

B. proboscidea is thus characterized in having branchiae distributed on setigerous segments 2 to 4, and from segment 6 nearly to the posterior end; the first setigerous segment has weakly developed nodopodial and neuropodial fascicles; hooded crotchets are present from the seventh, the first few accompanied by an inferior fascicle of pointed setae, the rest forming a single series of hooks only; the prostomial lobe is long, entire, snoutlike, without median emargination; it is continued posteriorly as a ridge to the posterior margin of the third setigerous segment; the modified segment is provided with smooth falcate setae and bushy-topped setae in which the spinous area is asymmetrical. Its affinities are with *B. polybranchia* (Haswell), from which it differs in its entire prostomial lobe and in having setal fascicles both dorsally and ventrally in the first setigerous segment. Another nearly related species is *B. natrix* (Söderström), but this has well-developed parapodial lobes on the first setigerous segment and the prostomial lobe is bifid; also the bushy-topped setae have paired bosses subdistally.

Holotype.—U.S.N.M. no. 20217. Caspar, Calif.

Distribution.—*B. proboscidea* inhabits a great variety of niches in the intertidal zones of California, south at least to San Diego and north to Mendocino, but its range may extend north to Puget Sound, Wash. It has never been encountered in dredged collections from deeper water. Careful investigations in other areas, however, may extend these ranges.

Biology.—*B. proboscidea* is conspicuously abundant in shale and limestone reefs, penetrating the softer rocks, boring usually at right angles to the surface, and sometimes present in such numbers as to cause the rock to break away. It is also an interesting dweller in high tide pools, where hollows are formed in sedimentary rocks. In such places the minute burrows of the spionid may be observed at the apertures of which the two long, waving palpi of the worm reach far out, after particles of food in the vicinity. A common association in such pools is with a small red harpacticoid copepod, of the genus *Tigriopus*, on which the spionid feeds. Prof. S. F. Light, of the University of California, has often called attention to this association, as well as to the high incidence of the *Boccardia* in these areas. An abundance of the latter is usually correlated with small numbers of *Tigriopus*. Its presence in such habitats is also indicative of great tolerance for variations in

salinity and temperature. Another favorite habitat is in narrow crevices in intertidal zones. Under such conditions a loosely constructed tube surrounds the individual.

B. proboscidea is a voracious predator, feeding not only on algal particles, Bryozoa, Hydrozoa, and other attached organisms but actually capturing free-swimming animals. The greatly extensile, prehensile palpi are the chief organs of food getting; the tip senses out favorable objects for ingestion and is firmly wrapped about any desirable object that is nipped off, taken up in the ciliary groove, moved orally, and swept into the mouth.

Only fragmentary information is known of the life history. The eggs are deposited in ovoid capsules, 50 or more eggs in each, and five or more capsules in a tube. Aeration, produced by rhythmic movement of the adult, is continued while the young develop. The rate of development in any one capsule may be about equal for the various individuals, or very irregular. Development is fairly rapid and can be conveniently observed because of the ease with which they develop under laboratory conditions.

Capsules collected from the tube of a single adult differ among themselves. Some will have numerous larvae, all in a similar stage of development, with as many as 40 or more rapidly moving young. When such a capsule is split open there is a great scurry to escape. If given nourishment, they flourish as plankton organisms and after some weeks metamorphose into settling young. In other capsules there may be only one or two much larger larvae, cannibalistic on the other contents in the capsule, and escaping only when all food has been used. Whether the other eggs fail to develop because of injury or some enzymatic influence has not been ascertained. At any rate, when such young emerge they are ready to settle immediately. Incidence of the larvae in the plankton is readily observed because of a unique pigmentation pattern; already in a 7- to 9-segmented stage the modified segment is differentiated.

Systematic discussion.—Several species of *Polydora* (sensu latiore) have been described from the west coast of the Americas, but the status of some of them is still in doubt. Unless type specimens are extant, some of the names may need to be dropped. The first spionid to be described from California was *Spio californica* Fewkes (Bull. Essex Inst. 21: 37–38. 1889) from Santa Barbara. It is difficult (perhaps impossible) to know what this is, but it must be considered in this discussion because of the statement, "On the second, third and fourth body segments, counting from the head, we find a dorsal and ventral bundle of setae, and a dorsal and a ventral cirrus. The ventral cirrus [postsetal lobe?] is smaller than the dorsal. **In the fifth body segment** [modified segment?] there is a fan-shaped, deeply embedded bundle of large spines in addition to the dorsal and ventral clusters." There is, however, no mention of the distribution of branchiae, nor is it clear that the author distinguished between branchiae and postsetal lobes, nor what is meant by dorsal and ventral cirrus. It is not possible to distinguish it as either a *Boc-*

cardia or *Polydora* (sensu stricto). There is another statement regarding its tubes, which contradicts its inclusion in the family Spionidae: "The tubes . . . resemble those of *Sabellaria* but differ from them in color, size, and form of the openings. The edges of the orifices are sharper and the tubes themselves are more compact." I know of no spionid which constructs such tube masses. However, the head is said to have "two long tentacles" (as in Spionidae) but they are described as papillated (Magelonidae??). Other features exclude it from the latter. I am unable to regard this as anything more than a *Polydora* in the broad sense.

Later *Polydora californica* Treadwell (Univ. California Publ. Zool. **13**: 203–204, pl. 12, figs. 23–29. 1914) was described, its locality given as unknown. I have seen the single incomplete specimen, deposited in the collections of the University of California. It may be the same as the species herein described, but since the name turns out to be a questionable homonym, it should be replaced by another. A few years ago, while going over the collections at Berkeley, I reported this as *B. natrix* (Univ. California Publ. Zool. **41**: 48. 1936), and identified Treadwell's name with it. Since then, I have seen Söderström's type of *B. natrix* and found it to be something quite different. Through the courtesy of Prof. Sixten Bock, of the Swedish State Museum at Stockholm, these materials were made available. The results are being reported on in a separate study. It is sufficient here to say that *B. natrix* is an inhabitant of a sponge, from a depth of 135–150 meters, off southern South America, that it is clearly separable morphologically from the California species, and that *B. natrix* can not be applied to the latter. *B. natrix* has a prostomial lobe that is clearly bifid at its anterior margin, the groove continued for some distance along the dorsal surface; there are eye spots but differently disposed; the first setigerous segment has unusually well developed fascicles and postsetal lobes, nearly or quite as large as those of the following segments, and the modified hooks of the fifth segment are provided with paired lateral bosses. *Polydora* (*Boccardia*) *natrix* was later reported by Berkeley (Ann. Mag. Nat. Hist. (10) **18**: 472. 1936) from the Nanaimo district. These specimens are partly described, showing therein differences from Söderström's species, but differing also from *B. proboscidea*. Dr. Berkeley recorded the absence of eyes and described the prostomium as bifurcate.