

# The Polyclad Genus *Pseudoceros*, with Special Reference to the Indo-Pacific Region

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THE OCCASION of this article is the acquisition of three species of the polyclad genus *Pseudoceros* from the region of the Coral Sea. *Pseudoceros* is one of the most populous polyclad genera. In 1950, Marcus (1950: 84-88) listed 79 names in this genus, but the elimination of synonyms and of species that should be transferred to the genus *Acanthozoon* because of their papillate dorsal surface reduces the list to 72. The list, however, omits seven *Pseudoceros* species described from Japan by Stimpson (1855: 380; 1857: 25-26) and acknowledged as valid by Kato (1944: 298). Marcus further left out of consideration six more of the Kelaart-Collingwood species that are figured in color by Collingwood (1876: 90-97) and that probably belong to *Pseudoceros*. One of these, *Eurylepta affinis*, has been refound in the Philippines and is validated as a species of *Pseudoceros* by Stummer-Traunfels (1933: 3566). To these must be added two species described by Kato (1944: 301), three by Marcus (1949: 86; 1950: 81; 1952: 91), and four by me (Hyman, 1953: 363-370). I have further shown that *Amblyceraeus luteus* Plehn, 1898, must be transferred to *Pseudoceros* (Hyman, 1953: 366). One must further note that Stummer-Traunfels (1933: 3565) gave colored figures of 11 more species of *Pseudoceros* but did not name them; three of these came from the Siboga collections in the Netherland East Indies, six were taken by Semper in the Philippines, and one each came from Zanzibar and Batavia. Clearly there are at least 100 species of the genus mentioned in the literature.

The genus is characteristic of tropical and subtropical waters and appears to center in the Indo-West Pacific region. Two species are known from the Gulf of California and two from the California coast (Hyman, 1953: 363-370). *Pseudoceros canadensis* (Hyman, 1953: 368), from British Columbia and since found abundantly in Puget Sound, is a surprising exception to the usual limitation of the genus to warmer waters. This appears to be the most northerly record for the genus. Plehn (1896: 171) reported the occurrence of the Mediterranean species *P. splendidus* Stummer-Traunfels, 1933 (= *P. superbus* Lang, 1884) in the Galápagos Islands, but the identification appears dubious. In the western tropical Atlantic, four species were reported from Bermuda by Verrill (1900: 596; 1901: 42) of which three are endemic and one is the Mediterranean *P. splendidus*. Hyman (1939: 17) added another Bermudan species and reported the refinding of *splendidus* and of two of Verrill's species at Bermuda. Surprisingly there are no records of the genus in the West Indies and Caribbean except for *P. splendidus* at Puerto Rico (Hyman, 1954). The species *P. maculosus* Pearse (1938: 85) from the Gulf of Mexico is stated to have a papillate dorsal surface and therefore should presumably be transferred to the genus *Acanthozoon*. Three species have been described from the Brazilian coast by Marcus (1949: 86; 1950: 81; 1952: 91). Three species are recognized by Lang (1884: 538-542) from the Mediterranean, but there seem to be no other findings in the eastern tropical Atlantic. One species described by Palombi (1928: 605) from the Suez Canal, three by Meixner (1907: 465-473) from French Somaliland, and 22 listed

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by Kato (1944: 298-302) as Japanese may perhaps be regarded as belonging in the fringes of the Indo-Pacific region. This is certainly true of some of the localities on Kato's list. Thus, well over half the described species belong to the Indo-Pacific area, and this area has certainly not been thoroughly collected for polyclads. Outside this area, the various species appear to have a limited distribution as each region furnishes different species, except for *P. splendidus*, reported from the Mediterranean, Bermuda, and Puerto Rico. Within the Indo-Pacific area, species apparently may range widely.

The genus *Pseudoceros* is easily recognized by the combination of a ruffled pharynx, marginal tentacles as upfolds of the anterior margin, and an anastomosed intestine that originates by many branches from the main intestine. If the species with small papillae over the dorsal surface are to be separated as a distinct genus, then the possession of a smooth dorsal surface becomes another character of *Pseudoceros*. Contrasting with the easy recognition of the genus is the great difficulty of separating the species; they are very similarly constructed, and the color pattern, which is often very striking, becomes almost the only means of distinguishing them. Preserved specimens not accompanied by color notes are almost impossible to identify. However, even with a full knowledge of the color pattern one is often puzzled to know whether the color correspondence with a described species is sufficiently close or not. Little is known of color variation in the genus except that some species are described as showing considerable color variation. Therefore, other possible identifying characters should not be neglected in a specific description in the genus, especially the details of the copulatory apparatus. Although the reproductive system, too, is very similarly constructed throughout the genus, minor differences are evident in the copulatory apparatuses and often prove helpful in species discrimination. The difficulties of species discrimination on the basis of color alone

will be evident in the following account.

#### *Pseudoceros bedfordi* Laidlaw, 1903

This species was originally described (Laidlaw, 1903: 314) from a defective specimen taken at Singapore. Later, Bock (1913: 254) came into possession of a perfect specimen collected off Billiton on the island of Mindanao in the Philippines. Bock's specimen was 35 millimeters long by 20 millimeters wide. He gave an excellent figure showing the very distinctive and unmistakable color pattern and also verified the paired condition of the male copulatory apparatus. Subsequently, Kato (1943: 87) reported the species as common in the Palau Islands, swimming about in shallow water. Kato also gave a good figure to illustrate the color pattern. His specimens were relatively small, ranging from 20 to 35 millimeters in length and 10 to 20 millimeters in breadth.

The present specimen is a fine, large, perfect example collected at Heron Island in the Great Barrier Reef of Australia in the summer of 1952. It is the largest specimen on record, measuring 60 millimeters in length and 45 in width. The color pattern quite agrees with the figures of Bock and Kato. On a purplish-brown ground (described by previous observers as greenish black or dark brown) are found numerous arcs and dashes of a buff color, distributed irregularly but in a bilateral pattern over the dorsal surface.

The specimen has been deposited in the American Museum of Natural History. The species is evidently widely spread throughout the Indo-Pacific area.

#### *Pseudoceros concinnus* (Collingwood)

1876

Fig. 1

*Proceros concinnus* Collingwood, 1876: 90, pl. 17, fig. 4.

Several specimens, assigned with some reserve to this species, were presented to me by Dr. A. G. Humes, who collected them on

November 5, 1944, under pieces of coral rock exposed by the tide at Mios Woendi, Padaido Island, near Biak, Dutch New Guinea.

This is a relatively small species, varying in length from 15 to 25 millimeters. The body is of elongate oval form (Fig. 1*a*), with the usual pair of tentacular folds at the anterior margin, bearing eyes as shown in Figure 1*b*. Shortly behind the tentacular folds in the middorsal line are found the two small clusters of cerebral eyes over the brain region. The color is stated by the collector to have been orange with a bright blue border 1/16-inch wide. No trace whatever of this color remains in the preserved specimens. Cleared whole mounts show the typical features of the genus, in addition to the tentacular folds (Fig. 1*a*). There is a short but broad, highly ruffled pharynx, consisting of a few greatly folded lateral branches. Immediately behind the pharynx is seen the single male apparatus and behind this the female gonopore surrounded by the usual radiating cement glands. The relative positions of male and female gonopores and of the sucker appear in Figure 1*a*. Behind the female gonopore the main intestine extends posteriorly, ending blindly some distance anterior to the posterior margin and giving off along its course numerous side branches that anastomose at once into a fine-meshed network as typical of the genus. Only the proximal meshes are drawn in Figure 1*a*. Along each side of the main intestine courses a uterus filled with eggs.

All the specimens are sexually mature. In view of the difficulties of species identification in the genus, the sexual region of one specimen was sectioned and a sagittal view of the copulatory apparatuses is given in Figure 1*c*. The expanded sperm ducts unite to a short, common sperm duct that enters the rear end of the male apparatus, consisting of a long tubular seminal vesicle with thick muscular wall of circular fibers, and a small oval prostatic vesicle. The ducts of these two vesicles enter the small penis papilla within which they unite. The penis papilla bears the usual

stylet surrounded by a penis sheath, and papilla and sheath lie in the inner end of a somewhat extensive and irregularly formed male antrum that opens below by the male gonopore. The female gonopore leads into a vertical tubular female antrum that opens into the short, laterally expanded cement pouch; this receives on all sides the usual masses of cement glands. From the cement pouch the vagina continues dorsally with a backward curve and soon receives the two uteri. All of the features of the copulatory apparatuses are typical of the genus but the details should serve to distinguish this species from others of similar coloration. The most distinctive feature of the copulatory apparatuses is the long, tubular, and thick-walled seminal vesicle, contrasting with the relatively small prostatic vesicle.

Unfortunately, none of the preceding descriptions assigned to *P. concinnus* give any details of the sexual anatomy, and as the statements about the color are somewhat discrepant I am not able to identify my specimens with certainty as *P. concinnus*. In the original description the length is given as 15 millimeters, hence averaging less than the present specimens, and the color is described as cream, approaching yellow, with a blue border composed of contiguous spots, and a narrow middorsal blue streak. The type locality is Labuan Island, off Borneo.

Lang (1884: 593) merely repeated the original description of *Proceros concinnus* without offering any opinion as to its systematic position. Laidlaw (1903: 315) reported several specimens obtained from the Straits of Malacca that were "colored exactly like *Proceros concinnus* Coll., viz., they are blue, with orange margin and median stripe"! This is either a slip of the pen in reverse or, more likely, the coloration actually was the reverse of that of Collingwood's species. As Laidlaw's specimens were also very small, 8 to 10 millimeters in length, it appears certain that they were not *P. concinnus*. The surmise of Laidlaw, accepted later by Kaburaki (1923: 643), that

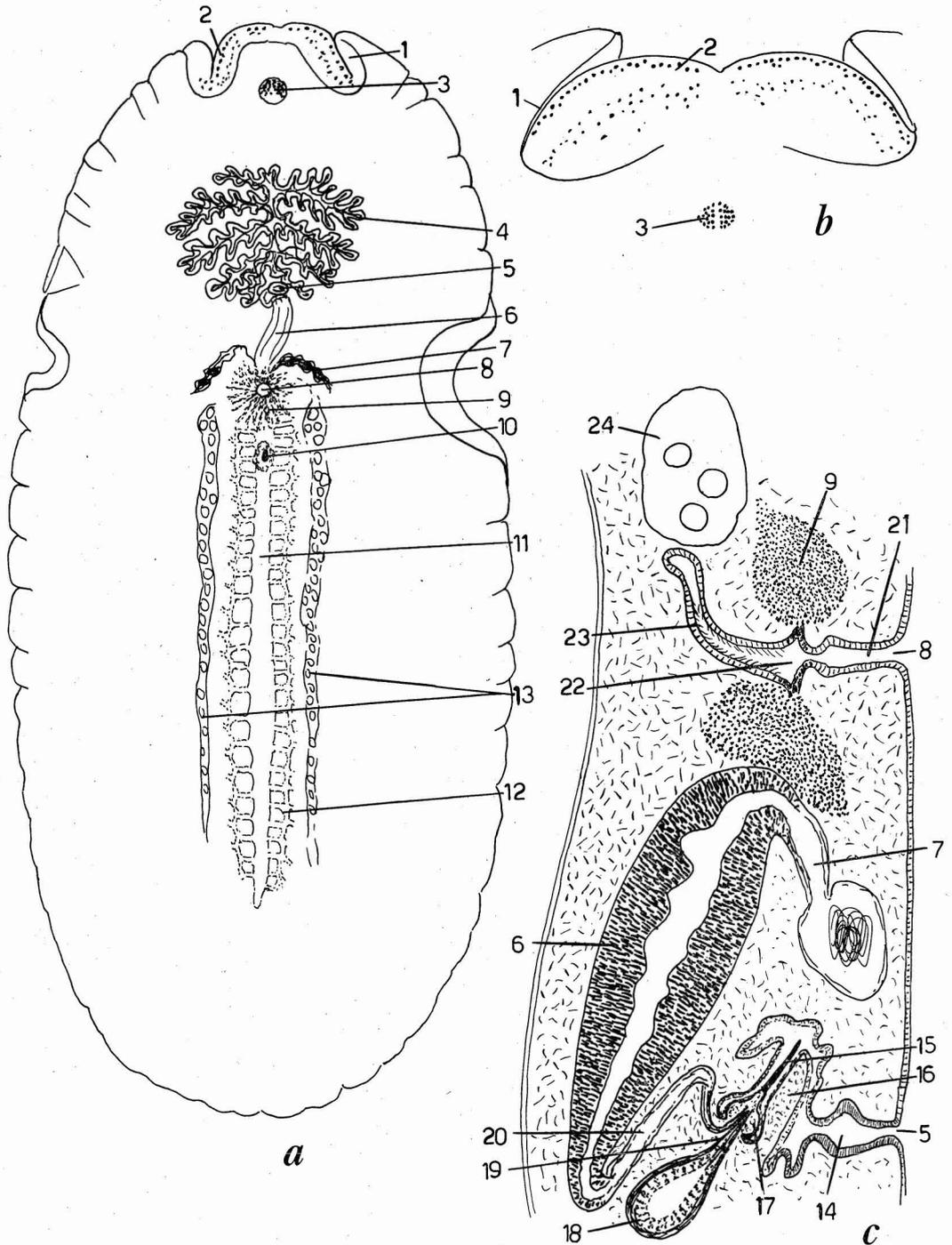


FIG. 1. *Pseudoceros concinnus*. *a*, Entire specimen as cleared whole mount; *b*, anterior end showing tentacular folds and eye arrangement; *c*, sagittal view of the copulatory apparatuses, anterior end below. 1, Tentacular folds; 2, tentacular eyes; 3, cerebral eyes; 4, ruffled pharynx; 5, male gonopore; 6, seminal vesicle; 7, sperm duct; 8, female gonopore; 9, cement glands; 10, sucker; 11, main intestine; 12, lateral branches of main intestine; 13, uteri; 14, male antrum; 15, penis stylet; 16, penis sheath; 17, penis papilla; 18, prostatic vesicle; 19, prostatic duct; 20, ejaculatory duct; 21, female antrum; 22, cement pouch; 23, vagina; 24, one of the uteri.

*P. concinnus* is a euryleptid is clearly erroneous as Collingwood definitely notes the presence of an "arbusculiform alimentary tube occupying the anterior third." In other words, Collingwood's species had a ruffled pharynx and hence is definitely a *Pseudoceros*. Kaburaki (1923: 642) assigned to *P. concinnus* a single specimen collected at Tawi Tawi, Philippines. This was estimated to have been 55 millimeters long when alive, extended, and the color is stated to have been pale cream buff with a narrow border of cobalt blue and two longitudinal blue lines on the median dorsal region. The correctness of Kaburaki's identification is certainly open to doubt. Stummer-Traunfels (1933: following p. 3596) presents a colored plate on which there are depicted a number of species of *Pseudoceros*, mostly undescribed and unnamed. One of these, his Figure 9, is said to be *P. concinnus*, but this specimen is blue with three dorsal longitudinal yellow stripes, hence does not agree at all with the original description. On the other hand, Figure 16 on the same plate, said to be an undescribed *Pseudoceros* collected by Semper in the Philippines, is deep yellow with a blue border composed of spots and hence agrees very well with the present specimens and with the original description except for the lack of a middorsal blue stripe. This specimen is 22 millimeters long, and I judge it to be identical with the present specimens.

Evidently there are common throughout the Indo-Pacific area members of the genus *Pseudoceros* that are of relatively small size and slender form and that are colored cream to orange with a blue border and with or without one or two middorsal blue stripes. Whether all these are the same species and whether all or some are *P. concinnus* must remain uncertain in the present state of information. The present specimens have been deposited in the American Museum of Natural History.

*Pseudoceros corallophilus* n. sp.

Fig. 2

A single specimen collected at Heron Island, Great Barrier Reef of Australia, in the

summer of 1952, has been given a new trivial name with some hesitation, but as it does not appear to correspond to any described species, naming it may offer a certain convenience.

The specimen (Fig. 2) is 22 millimeters long by 12 millimeters wide, but as it is somewhat contracted and, further, is juvenile, the species would evidently attain a much larger size. The form is oblong oval. No color notes accompanied the specimen, but the color appears well preserved and the pattern differs from that of any described species, as far as I can ascertain. The ground color is a dusky brown, and there is a heavy black border; to

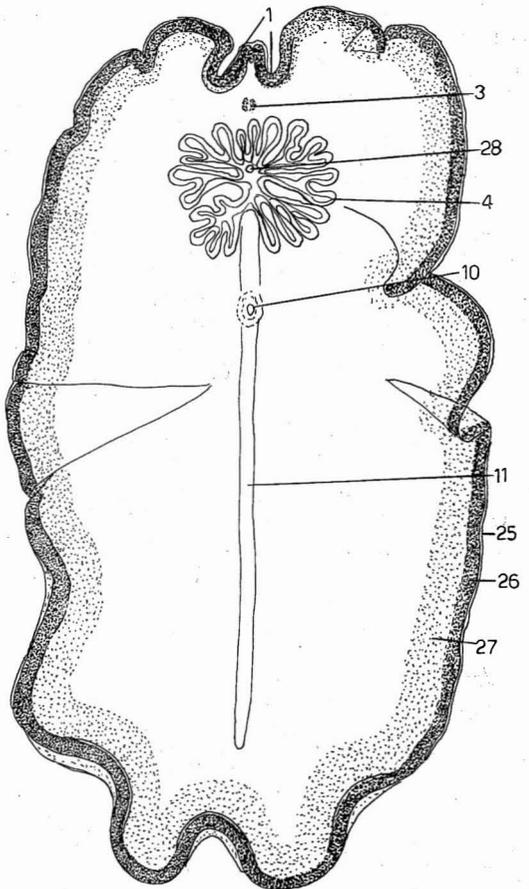


FIG. 2. *Pseudoceros corallophilus*, entire specimen as cleared whole mount. 1, Tentacular folds; 3, cerebral eyes; 4, ruffled pharynx; 10, sucker; 11, main intestine; 25, white margin; 26, black border; 27, yellowish-brown band; 28, mouth.

the outer side of this black border is a very thin white or pale margin, and to its inner side is a rather wide band of a yellowish-brown hue, indicated by light stippling in Figure 2. Because of the black border, eyes could not be detected on the tentacular folds at the center of the anterior margin. Behind these folds are the usual small paired clusters of cerebral eyes. The pharynx is short and broad, with a few much-branched lateral folds. From behind the pharynx the main intestine extends posteriorly in the middorsal region, terminating blindly well anterior to the posterior margin. The net-like intestine, originating from the main intestine by numerous branches and spread throughout the body, is plainly seen on the whole mount but has not been represented in Figure 2. The position of the sucker is shown in Figure 2. The animal is totally without any part of the reproductive system, except that the position of the female gonopore is indicated by a few cement glands. The type specimen as a whole mount has been deposited in the American Museum of Natural History. It has been left unstained and preserves the original coloration.

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