

Notes on Some Eastern Pacific Species of *Phialidium* (Leptomedusae)

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A COLLECTION OF *Phialidium* was sent to me by Dr. E. C. Roosen-Runge, University of Washington, Seattle, who wanted my opinion on their specific affinity. They were collected at Friday Harbor in Puget Sound, some few in August 1959, a great number in June 1960. They all belong to one species and agree perfectly with the species which was described by Murbach and Shearer (1903) under the name *Phialidium gregarium* (A. Agassiz). It is questionable, however, whether the medusa observed and carefully described by Murbach and Shearer really belonged to the same species, which was briefly described by Agassiz as *Oceania gregaria*.

According to the first description by A. Agassiz (in L. Agassiz, 1862: 353), *Oceania gregaria* had "four pale-yellow, linear ovaries, extending from the circular tube along half the length of the chymiferous tubes. Thirty-six short tentacles, not capable of great expansion. Lips of actinostome very thin, convoluted. Three quarters of an inch in diameter." It was found in the Gulf of Georgia, from May to September. A. Agassiz (1865: 74, fig. 103) did not repeat the description, but emphasized "the great length of the slender lips" in contradistinction to the eastern American species *Oceania languida*, from which it also differed in the colour of the gonads and tentacle bulbs, which were "a beautiful pale yellow, in strong contrast to the dark coloring of our species" (i.e., *O. languida*). "The whole surface of the water for several miles was often thickly covered with these Medusae." *O. languida* was said to have 32–40 tentacles, and "the ovaries and the base of the digestive cavity are light brown; the base of the tentacles is somewhat darker." Haeckel (1879: 188) quoted Agassiz's description of *O. gregaria*, but as to

the position of the gonads he used the somewhat stronger expression "den Schirmrand unmittelbar berührend."

Murbach and Shearer (1903: 179, pl. 20, fig. 1, 1a) thought they saw two species in Victoria Harbor, *Phialidium languidum* and *P. gregarium*, but the descriptions of both are almost completely alike, except that in *P. languidum* there are two marginal vesicles between successive tentacles, in *gregarium* one, occasionally two; both were 12 mm. in diameter; in *P. languidum* there were 60 tentacles, in *P. gregarium* the number of tentacles and "buds destined to develop" likewise 60. The short diagnosis of *P. gregarium* in Mayer (1910: 272) is derived from Murbach and Shearer, and he doubts the occurrence of *P. languidum* in Puget Sound. Since then, *P. gregarium* has repeatedly been recorded from Puget Sound; the hydroid was reared by Strong (1925: 384, figs. 1–6), and physiological experiments were carried out by Hyman (1940: 282ff) and Bonner (1955: 18–20, fig. 1, A–E).

An important account is given by Foerster (1923: 259), who examined Atlantic specimens of *P. languidum* in comparison with the Pacific forms; he found that "there seem to be differences between the common Atlantic form, *P. languidum*, and the common Pacific form. Yet there are intergrading forms, such as *P. languidum* Murbach and Shearer and *P. lomae* Torrey, which have characteristics common to both species and thus are united to the older species." Foerster, therefore, found it "advisable to consider the Pacific form of *Phialidium* a variety of the Atlantic form, *P. languidum*." His comparison, however, seems to me to reveal such considerable differences that the two species cannot possibly be identified, which is confirmed by my own examination of specimens from both areas. (As to *P. lomae*, see below.)

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The specimens are up to 21 mm. in diameter, most of them between 15 and 20 mm.; unfortunately there are very few younger specimens. The umbrella is watchglass-shaped, the stomach is small, its perradial diameter less than 3 mm., its base distinctly cruciform. The mouth lips are fairly long and narrow, spread outward, tapering, but not sharply pointed, the margins densely and regularly crenulated throughout the entire length, without any difference between the various portions of the margin.

The gonads are laterally compressed bands, up to 1 mm. in height, more or less wavy with up to three bendings to either side; in good-size specimens the gonads occupy the distal half of the radial canals or slightly more, reaching almost, but usually not quite to the ring canal; male and female gonads are of the same length and shape. The sample contains slightly more female than male individuals. Dr. Roosen-Runge tells me (in a letter) that he has observed sex reversal from male to female; in the sample examined by me no hermaphroditic specimens were found.

The tentacle bulbs are almost globular, as broad as long; the extended tentacles are almost equally thin throughout their length and uniformly armed with nematocysts. The velum is thin, up to 1 mm. broad. In specimens 16–20 mm. wide the number of fully developed tentacles varies between 48 and 65, and averages 56. There are always a few young bulbs not yet developed into tentacles; in specimens 16–20 mm. wide the average total number of tentacles plus young bulbs is 60, varying between 51 and 67, and in the somewhat younger specimens, 13–15 mm. wide, the average number is very nearly the same, 59.

As opposed to the comparatively slight variation in number of tentacles, the number of marginal vesicles is very variable. There may be one or two, exceptionally three, marginal vesicles in the spaces between successive tentacles (including young bulbs). Usually it has not been possible to count the marginal vesicles in the entire margin of the specimens, but in a great number I have been able to calculate the percentage number of spaces with two and with only one marginal vesicle. The results are seen in the following table.

NO. OF TENTACLES + YOUNG BULBS	PER CENT OF SPACES WITH ONLY ONE MARGINAL VESICLE	
	Average	Variation
51–55	63	43–78
56–60	71	43–88
61–65	63	41–80
(66–71)	64	62–69)
51–60	66	43–88
61–71	66.5	44–80

It appears from these figures that in most of the specimens examined there are more spaces with one than with two marginal vesicles, but in some specimens the opposite is the case, and the percentages are independent of the number of tentacles in the individuals. Examination of young specimens might have revealed a certain regularity in the succession of the development of the marginal vesicles (see below on *Phialidium lomae*).

A feature which apparently has escaped the attention of previous observers is the pigmentation, which consists of fine, black granules. They are present everywhere in the walls of the stomach, and are especially dense along the lines of attachment to the subumbrella; the lips are very faintly pigmented except along the free, crenulated margins, where the granules are densely set; the radial canals have no black pigment, but granules are evenly distributed on the gonads, mainly on their adoral margin; the tentacle bulbs are evenly and rather densely pigmented, but not so densely that they are conspicuously dark; on the umbrella margin, on the other hand, the pigmentation is so concentrated that the margin appears as a sharp, jet-black rim, very conspicuous when seen on a white background; the marginal vesicles are destitute of pigment. In no other species of *Phialidium* have I seen a similar pigmentation.

Comparison with Other Species

The delimitation of the numerous species of *Phialidium* is very difficult, and the genus certainly needs revision. Among the species which have been described from Pacific waters, we may at once exclude the small medusae with only 16 tentacles: *ambiguum* (Agassiz & Mayer) from the Fiji Islands, *pacificum* (Agassiz & Mayer)

likewise from the Fiji Islands, *rangiroae* (Agassiz & Mayer) from the South Pacific; likewise *simplex* Uchida from the Palau Islands, with up to 28 tentacles, and *pacificum* Maas from the Malayan Archipelago, Torres Strait, and China, with up to 32 tentacles. (The two latter species shortly will be provided with new names.) There are, however, a few Pacific species, which may have a size and a number of tentacles similar to the common Puget Sound species generally named *Phialidium gregarium*. One of them is *P. simplex* Browne; it is up to 22 mm. wide, with 60–85 tentacles and a few young bulbs; it differs from our species in having somewhat longer gonads, only one marginal vesicle between successive tentacles, and a complete lack of black pigmentation; moreover its occurrence is far removed from the Pacific coast of North America: Falkland Islands, Brazil, South Africa and northeastern Australia.

Phialidium lomae was described by Torrey (1909: 22, fig. 8) from San Diego in California. It was 9–12 mm., rarely 14 mm., in diameter, with 28–34 tentacles, rarely more, though one specimen had as many as 66; rarely did it have more than one marginal vesicle between successive tentacles; it had gonads along the distal half of the radial canals; and the lips were short. I have seen a few specimens of this species from the coast of Chile (Kramp, 1952: 7, figs. 3–5), and numerous others from San Juan Island, Wash., collected in August 1954 by H. H. Osborn. They are up to 18 mm. in diameter, and none of them have more than 36 tentacles. The collection is particularly interesting, because it contains specimens of all sizes between 6 and 18 mm. in diameter, so that it represents a valuable developmental series. The mouth lips are generally short and blunt, but during growth they become more folded and pointed, though not as much as in the medusa from Puget Sound. In young specimens the gonads first appear in the middle of the radial canals, whence they are gradually prolonged outwards; in specimens more than 8 mm. wide the gonads occupy the distal half of the radial canals, or slightly less, though they do not quite reach to the ring canal; they are of equal shape in both sexes.

The number of fully developed tentacles increases gradually from 22 in the smallest speci-

mens to 36 in specimens more than 14 mm. wide, but there is a corresponding decrease in the number of young bulbs, from 14 in the youngest to 2 or 3 in the largest, so that the total number of tentacles and young bulbs remains unaltered, between 32 and 40, independent of the age within the sizes observed, and with remarkably slight variation.

Of particular interest is the number of marginal vesicles, which increases considerably during the growth of the individuals. The number of marginal vesicles between successive tentacles is generally considered an important character for distinction of species within the genus *Phialidium*, but the present collection makes this distinguishing character less reliable. In specimens up to 9 mm. wide the number of marginal vesicles is very nearly the same as the number of tentacles plus young bulbs, but in specimens more than 9 mm. wide the number increases, in the largest specimen observed, 18 mm. wide, even to somewhat more than twice the number of tentacles plus bulbs; in the larger specimens there are two vesicles in most of the spaces, but occasionally one or three.

It must still be mentioned that no black pigmentation like that in the medusae from Puget Sound is found in *P. lomae*.

Mayer (1910: 495) could "not distinguish this California medusa from the common *Phialidium languidum* of the Atlantic coast of North America." A direct comparison between the two species, however, strongly contradicts the supposition that they should be identical; and, as will appear from the above statements, it is also excluded that the medusa from Puget Sound may belong to *P. lomae* Torrey.

On a previous occasion (Kramp, 1933: 239) I have examined a collection of *Phialidium languidum* from the Gulf of Maine, where this eastern-American medusa is very abundant. It is well described by Mayer (1910: 269, pl. 33, figs. 4–8, pl. 34, fig. 5). *P. languidum* is usually 15–20 mm. in diameter; the walls of the umbrella are fairly thin and flexible; the manubrium is small and tubular; the mouth has four small, slightly recurved and simple lips; the gonads are linear along the outer 1/2–2/5 of the radial canals. In specimens from the New England coast there are usually 32 tentacles, but according to Mayer specimens from Florida may

have a somewhat larger number of tentacles; the number of marginal vesicles between successive tentacles is usually two, though sometimes one or three. I have re-examined the collection previously dealt with by me and compared it with the collection from Puget Sound, and I find the two species entirely different. Nothing like the long, pointed, crenulated lips in the Puget Sound medusa are found in *P. languidum*, the medusa from Puget Sound has a larger number of tentacles, and in most of the spaces between the tentacles there is only one marginal vesicle. Moreover *P. languidum* is entirely destitute of the characteristic black pigmentation mentioned above.

My previous examination of *P. languidum* was made in order to compare it with the common European *P. hemisphaericum*; I found the medusae of the two species indistinguishable, their range of variation being overlapping, but I hesitated to unite them owing to the available accounts of their hydroids.

Dr. Roosen-Runge, in a letter to me, is inclined to think that some of the specimens collected in Puget Sound in June 1960 belonged to *P. hemisphaericum*; this species, however, has never been recorded in literature from the eastern Pacific, and none of the specimens sent to me can be referred to it. *P. hemisphaericum*, it is true, seems to have a much more extensive distribution than was known up to now. I have recently examined a great number of *Phialidium* specimens from the southwestern Pacific and the Malayan Archipelago, which I cannot distinguish from our common European species; but I dare say that the western-American medusa commonly called *P. gregarium* is very different from *P. hemisphaericum*.

We then return to the question, whether the medusa described by Murbach and Shearer (1903) was identical with *Oceania gregaria* Agassiz. The statements that both forms may occur in enormous quantities in the same waters and at the same season suggest that they belong to the same species. The characteristic shape of the mouth lips likewise points towards a unification of the two forms. The great obstacle is that in *Oceania gregaria* Agassiz the number of tentacles was only 36, even in specimens $\frac{3}{4}$ in. (20 mm.) in diameter, whereas

there were many more tentacles in specimens of corresponding sizes observed by Murbach and Shearer. We may presume, perhaps, that Agassiz overestimated the size of his specimens; or that young bulbs and developing tentacles, were present between the fully developed tentacles, increasing the total number towards a number similar to that stated by Murbach and Shearer.

CONCLUSIONS

The results of the present investigations may be summarized as follows: (1) The medusae, which every summer abound in Puget Sound, belong to the same species which was described by Murbach and Shearer (1903). (2) The description of *Oceania gregaria* as given by Agassiz is insufficient for a reliable determination. (3) Accordingly, we cannot with certainty identify *Phialidium gregarium* Murbach and Shearer with *Oceania gregaria* Agassiz. (4) From the comparative studies reported in this paper it is evident that none of these can be referred to any other known species of *Phialidium*.

It seems highly deplorable, however, to add a new name to the long list of species of *Phialidium* and to do away with the specific name *gregarium*, which since 1903 has been generally applied to the common species of the Vancouver Island region on the Pacific coast of North America. In the present situation, where the original material of Agassiz has disappeared, it seems to me that we may reason as follows:

Agassiz described an extremely common species from the vicinity of Puget Sound, and if that species is not the same one as the admittedly extremely common species more thoroughly described by Murbach and Shearer, then Agassiz's species seems to have been unobserved ever since his time. This is so highly improbable that we are forced to accept the description given by Murbach and Shearer as covering the same species as described by Agassiz. So, I propose to call the species *Phialidium gregarium* (Agassiz), with a note that this name is taken in the sense as defined by Murbach and Shearer.

The specimens examined by me, and now deposited in the Zoological Museum of Copenhagen, may be designated as neotypes of *Phialidium gregarium* (Agassiz).

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