

**On the Variation of the Tentaculocysts of
Aurelia aurita.**

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With Plate 25.

It was a suggestion from Professor Weldon that led me to examine a large number of specimens of the ephyræ and adult stage of *Aurelia aurita* for the purpose of finding out the variation in the number of tentaculocysts, and if a variation occurred among the ephyræ to see how far it affected the adults.

All the specimens were collected and preserved at Plymouth by the officials of the Marine Biological Association, and I sincerely thank the director, Mr. Edward J. Bles, for the loan of so many specimens.

The ephyræ are divided into two sets; the first collected during the spring of 1893, the second specially obtained for me during the spring of 1894.

The ephyra of *Aurelia* normally has eight arms, each bearing a tentaculocyst, four perradial bundles of gastric filaments, and four mouth lappets.

The first table gives the numerical variation of the tentaculocysts of 359 specimens collected in 1893.

TABLE I.

The Numerical Variation of the Tentaculocysts of
359 Ephyrae collected in 1893.

Number of tentaculocysts.	Number of specimens.	Percentage.
Six	4	1.1
Seven	8	2.2
Eight (normal)	278	77.4
Nine	22	6.1
Ten	18	5.0
Eleven	12	3.3
Twelve	14	3.9
Thirteen	3	0.8

It will be seen from this table that no less than 81 specimens (22.6 per cent.) are abnormal in possessing more or less than eight tentaculocysts, and that the range of variation extends from six to thirteen tentaculocysts. There are only 12 specimens (3.3 per cent.) with less than eight tentaculocysts, and the remaining 69 specimens (19 per cent.) are above the normal number.

TABLE II.

The Numerical Variation of the Tentaculocysts of
1156 Ephyrae collected in 1894.

Number of tentaculocysts.	Number of specimens.	Percentage.
Five	1	—
Six	6	0.5
Seven	34	3.0
Eight (normal)	883	79.1
Nine	75	6.7
Ten	61	5.4
Eleven	35	3.1
Twelve	17	1.4
Thirteen	3	0.2
Fourteen	1	—

The second table shows in detail the variation of the tentaculocysts of 1156 specimens collected in 1894. On

comparing it with the first table it will be seen that the percentage of abnormal specimens is nearly the same. In the first set 22·6 per cent., and in the second set 20·9 per cent. of the ephyræ are abnormal.

The decrease is mainly due to a falling off in the number of specimens with twelve tentaculocysts amounting to $2\frac{1}{2}$ per cent.

By taking a larger number of specimens the range of variation has extended from five to fourteen tentaculocysts, but only one specimen of each of the two extremes has been found.

The ephyra with five tentaculocysts (fig. 1) has four perradial arms, equal in size; but the fifth is interradial and about half the size of the other arms.

The variation in the number of tentaculocysts does not affect the other organs of the body, which may vary independently of one another.

Two specimens have only three bundles of gastric filaments instead of the normal four; both have four mouth lappets; but one (fig. 2) of them has six and the other seven tentaculocysts. Six specimens have six bundles of gastric filaments and six mouth lappets; three possess eleven tentaculocysts (fig. 3) and the others have twelve.

A few curious abnormal growths of the arms were also observed. One specimen (fig. 4) has a perfect double arm with two tentaculocysts, like two arms united together. Another specimen (fig. 5) shows a bifurcation of an arm, each branch terminating with a tentaculocyst.

Perhaps the most interesting monstrosity is that which occurs in a specimen (figs. 6 and 7) with a large outgrowth on the aboral side of the umbrella. The outgrowth has two arms, and one of them bears a tentaculocyst. There are also seven other arms, with tentaculocysts, in the normal position and a vacant place for two more.

Adult Aurelia.

The adult specimens of Aurelia were also collected at Plymouth during the summer of 1894, and belong to the

same generation as the ephyrae taken in the spring of that year.

The umbrella of these specimens varied from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in diameter. The tentaculocysts of 383 specimens were examined, and the number possessed by each specimen is recorded in Table III.

TABLE III.

The Numerical Variations of the Tentaculocysts of
383 Adult Aurelia collected in 1894.

Number of tentaculocysts.	Number of specimens.	Percentage.
Six	2	0.5
Seven	18	4.7
Eight (normal)	296	77.2
Nine	33	8.6
Ten	16	4.1
Eleven	10	2.6
Twelve	7	1.8
Thirteen	0	—
Fourteen	0	—
Fifteen	1	—

There are 87 specimens (22.8 per cent.) with a variation in the number of tentaculocysts, 20 having less than the normal number and 67 showing an excess.

On comparing the abnormal number of tentaculocysts of the adults with those of the ephyra stage, it will be seen from the percentages that there is only a slight difference. The ephyrae have 22.6 per cent. abnormal in 1893, and 20.9 per cent. in 1894; the adults show 22.8 per cent. It is clear from these figures that the abnormal ephyrae do not appear to suffer from their abnormality, but are able to reach in safety the adult stage. The figures also show a slight increase of abnormal forms in the adult stage. This may be due to an insufficient number of adult specimens; the small number is due to their scarcity at Plymouth.

On comparing the 359 ephyrae taken in 1893 and the 383 adult specimens taken in 1894, it will be seen that the per-

centages of abnormality are very close for nearly the same number of specimens. It is probable that if a thousand adults could have been obtained at Plymouth the percentage of abnormal forms might have been closer than 2 per cent. of the ephyrae taken in 1894. The adult specimens were taken at random out of large jars; and it is interesting to note how close the percentage of abnormality of each complete hundred comes to the mean abnormality. The first hundred showed 23 per cent., the second 22 per cent., and the third hundred 24 per cent. of abnormal forms. An examination of the specimens does not show that any particular position on the margin of the umbrella is favoured either by an increase or decrease of the tentaculocysts.

Eighteen specimens possess seven tentaculocysts, and in eleven of these the missing tentaculocyst is a perradial one, and in seven it is adradial. The presence of an extra tentaculocyst may either affect the symmetry of a single quadrant or one half of the umbrella, and in a few cases by being very close to another not even upset the symmetry.

Ten specimens with nine tentaculocysts show that the extra tentaculocyst is in one quadrant of the umbrella, and thirteen specimens have one half of the umbrella containing five tentaculocysts about equal distances apart, and the other half possessing the normal four. Five specimens have eight tentaculocysts occupying their normal positions, and an extra one only separated from a normal one by a few marginal tentacles. When the tentaculocysts exceed nine in a specimen their position is by no means constant, and a different arrangement occurs in almost every specimen. In some the tentaculocysts are about equal distances apart, and in others one half of the umbrella contains the greater number.

A few specimens have three tentaculocysts very close together, and usually separated by a few marginal tentacles.

One specimen of an adult *Aurelia* has fifteen tentaculocysts with the normal number of genital pouches and arms. This exceeds the maximum number reached among the ephyrae. None of the adults have, however, either thirteen or fourteen

tentaculocysts. Their absence is probably due to the examination of an insufficient number of specimens.

A variation in the number of tentaculocysts does not interfere with the other organs of the body. There appears to be a correlated variation between the number of genital pouches and buccal arms, and eight specimens show it.

One specimen has three genital pouches, three buccal arms, and nine tentaculocysts.

Three specimens have three genital pouches, three buccal arms, and each one has traces of a fourth genital pouch and a fourth arm. Two have eight tentaculocysts, and the other has ten tentaculocysts.

One specimen has five genital pouches, five buccal arms, and eight tentaculocysts.

Three specimens have six genital pouches, six buccal arms; two have eleven tentaculocysts, and one has twelve tentaculocysts.

I have not given drawings of these specimens, as somewhat similar forms have already been figured by Ehrenberg (1) and Romanes (2). Mr. Bateson, in his recent book, 'Materials for the Study of Variation,' gives abstracts and figures from the papers of Ehrenberg and Romanes. He also gives a table which shows that 26 specimens (1.49 per cent.) out of 1763 adult *Aurelia*, washed ashore on the Northumberland coast in 1892, have more or less than four genital pouches. The Plymouth specimens show 2.08 per cent. with an abnormal number of genital pouches.

It may be difficult to notice in a few years what effect the numerical variability of the tentaculocysts has upon the adult *Aurelia*. The variation shows a tendency for an increase of the tentaculocysts, since the specimens displaying an increase are about three times as numerous as those possessing a diminished number. Whether this will change the present characteristic features of the species or not can only be found out by examining the ephyrae and adults at long intervals of time, and comparing the results with previous records.

References.

1. EHRENBERG, C. G., 1834.—'Abh. K. Ak. Wiss.,' Berlin, pp. 199—202, plates.
2. ROMANES, G., 1876.—'Journ. Linn. Soc. Zool.,' vol. xii, p. 528; vol. xiii, p. 190, plates xv, xvi.
3. BATESON, W., 1894.—'Materials for the Study of Variation,' pp. 426—429, fig. 128.

DESCRIPTION OF PLATE 25,

Illustrating Mr. Edward T. Browne's paper "On the Variation of the Tentaculocysts of *Aurelia aurita*."

FIG. 1.—Ephyra with five arms. Aboral view. $\times 25$.

FIG. 2.—Ephyra with six arms, three bundles of gastric filaments, and four mouth lappets. Aboral view. $\times 35$.

FIG. 3.—Ephyra with eleven arms, six bundles of gastric filaments, and six mouth lappets. Oral view. $\times 25$.

FIG. 4.—Ephyra with a perfect double arm, seven tentaculocysts, four bundles of gastric filaments, and four mouth lappets. Aboral view. $\times 40$.

FIG. 5.—A portion of the umbrella of an ephyra, showing a bifurcation of an arm. $\times 40$.

FIG. 6.—Ephyra with an outgrowth of two arms from the aboral side of the umbrella. Aboral view. $\times 35$.

FIG. 7.—A lateral view of Fig. 6. $\times 25$.

Fig. 1.

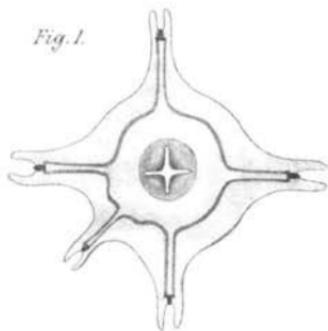


Fig. 2.

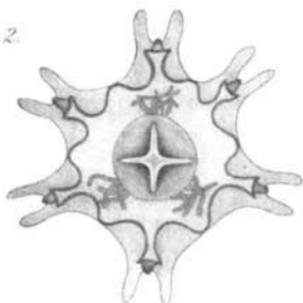


Fig. 3.

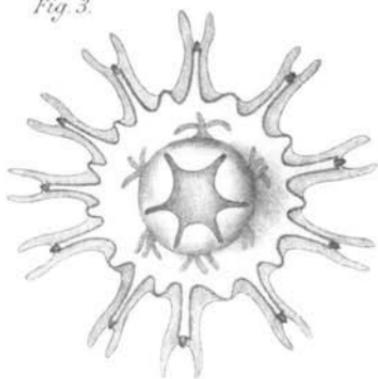


Fig. 4.

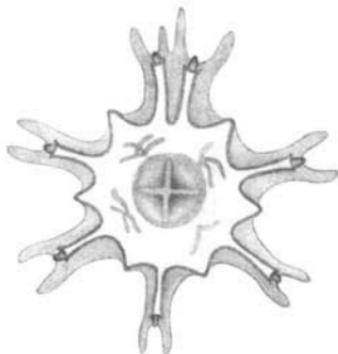


Fig. 5.



Fig. 6.

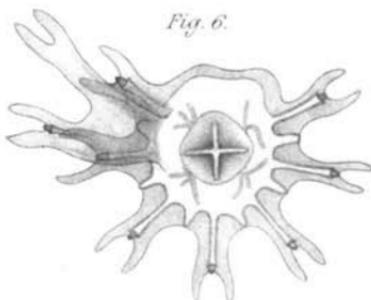


Fig. 7.

