

A medium-sized male specimen, recently preserved in alcohol, measured 145^{mm} from the base of the dorsal arms to the posterior end of the body; length of body, 120^{mm}; length of caudal fin, 70^{mm}; breadth of fin, 75^{mm}; length of first pair of arms, 42^{mm}; of second pair, 50^{mm}; of third, 60^{mm}; of ventral pair, 53^{mm}; of tentacular arms, 150^{mm}. (For other measurements see tables B to E.)

Astoria, Long Island, 1870, (Robert Benner).

This form has been received, hitherto, only from the western part of Long Island Sound, where it is abundant with the schools of menhaden, on which it feeds.

Reproduction of lost parts.

I have observed in this species, as well as in *Ommastrephes illecebrosus*, numerous instances in which some of the suckers have been torn off and afterwards reproduced. In such examples new suckers of various sizes, from those that are very minute up to those that are but little smaller than the normal ones, can often be found scattered among the latter, on the same individual. It seems to me possible that some of the specimens having the suckers on the tentacular arms unusually small, may have reproduced all those suckers, or still more likely, the entire arm.

I have seen specimens of this species, and also of *O. illecebrosus*, which, after having lost the tips, or even the distal half of one or more of the sessile arms, have more or less completely reproduced the lost parts.* In such cases the restored portion is often more slender and has smaller suckers than the normal arms, and where the old part joins the new there is often an abrupt change in size. Probably this difference would wholly disappear, after a longer time.

An unquestionable and most remarkable example of the reproduction of several entire arms occurs in a small specimen taken off Newport, R. I., Aug., 1880. This has the mantle 70^{mm} long; dorsal arms 22^{mm}, 3d pair of arms 30^{mm}. The three upper pairs of arms are perfectly normal, but both the tentacular and both the ventral arms have evidently been entirely lost and then reproduced, from the very base. These four arms are now nearly perfect in form, but are

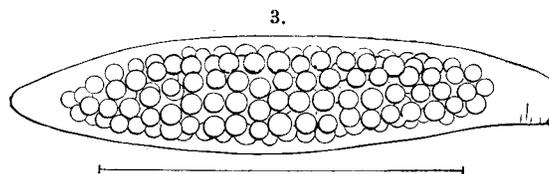
* Perhaps the *Dosidicus Eschrichtii* Steenstrup is only an *Ommastrephes* or *Sthenoteuthis* which had lost and partially reproduced the tips of all the arms. Aside from the solid cone of the pen, characters have not been given sufficient to distinguish it generically. My former reference of this species (p. 250) to the *Teuthidae*, was an error, due to the brevity of the original description.

scarcely half their normal size on the left side, and still smaller on the right side. The left tentacular arm is only 24^{mm} long, and very slender, but it has the normal proportion of club, and the suckers, though well formed, are diminutive, and those of the two median rows are scarcely larger than the lateral ones, and delicately denticulated. The right tentacular arm is less than half as long (12^{mm}) being of about the same length as the restored ventral one of the same side; it is also very slender and its suckers very minute and soft, in four equal rows. The right ventral arm is only 14^{mm} long; the left one 15^{mm} long; both are provided with very small but otherwise normal suckers.

In another specimen from Vineyard Sound, a female, with the mantle about 150^{mm} long, one of the tentacular arms had lost its club, but the wound had healed and a new club was in process of formation. This new club is represented by a small tapering acute process, starting out obliquely from the stump, and having a sigmoid curvature; its inner surface is covered with very minute suckers. The other arms are normal.

Eggs and Young.

The eggs are contained in many elongated, fusiform, gelatinous capsules (cut 3), which are attached in clusters by one end to seaweeds or some other common support; from the point of attachment



they radiate in all directions. These clusters are often six or eight inches in diameter, containing hundreds of the capsules, which are mostly from two to three inches long and filled with numerous eggs, the number varying from 20, or less, up to about 200. The transparent eggs are arranged, in the well-formed capsules, in six or more rows and are so closely crowded that they touch each other and often take polygonal forms, especially when preserved.

How many of these capsules are deposited by one female is very uncertain. Probably several females are concerned in the formation of the larger clusters. The eggs are mostly laid in June and July, but many are laid in August, and some even in September. By the

11th of June, in the vicinity of New Haven, many of these eggs contain embryos in advanced stages of development (Plate XLI, figs. 2, 3; Plate XLV, fig. 4). The embryos, before hatching, can swim around inside the eggs.

These embryos are very beautiful objects to observe under the microscope.

Even at this early period some of the chromatophores are already developed in the mantle and arms, and during life, if examined under the microscope, these orange and purple vesicles can be seen to contract and expand rapidly and change colors, as in the adult, but the phenomena can be far more clearly seen in these embryos owing to the greater transparency of the skin. In the young the chromatophores are very regularly and symmetrically arranged, on the arms, head, and mantle. At this stage of development the eyes are brown. In these embryos a remnant of the yolk-sac (*y*), appears to protrude from the mouth, but it is really connected with the space around the mouth and pharynx, and into this it is eventually absorbed.

The more advanced of the embryos were capable of swimming about, when removed from the eggs, by means of the jets of water from the siphon (*s*), which is developed at an earlier stage. The arms (*a''-a'''*) are then short, blunt, very unequal, with few minute suckers; the dorsal arms are very small, while those of the 2d and 3d pairs are successively longer, and have distinct suckers; the tentacular arms (*a'''*) are longer and larger than any of the others, and have larger suckers, which already, in some examples, can be seen to form four rows; the ventral arms (*a''''*) are about as long as the 2d pair, and bear several suckers. The mantle (*m*) is short, and the caudal fins (*f*) are very small, short, lateral, and separately attached to each side of the blunt posterior end of the body, thus recalling their adult condition in *Rossia*. The eyes (*e*) are large and prominent; the rudimentary beak (*d*) and odontophore (*l*) are distinctly visible. The two otoliths (*o*) are very distinctly visible, as highly refracting ovate bodies, above the basal part of the siphon, one on each side. The ink-sac (*i*), attached to the rectum (*l*), is conspicuous on account of its dark color; the gills (*g*) are provided with a small number of transverse processes; the heart (*h*) and the branchial auricles (*h' h'*) are easily seen, while they continue to pulsate. The pen exists only in a rudimentary condition, as a thin cartilage.

During July and August the young (fig. 5) from less than a quarter of an inch to an inch or more in length, swim free at the surface, and may often be taken in immense quantities with towing

nets. They were particularly abundant in the summers of 1871 and 1873, in Vineyard Sound.

These young squids are devoured in inconceivable numbers by fishes of many kinds, and also by the adult squids of the same species, and by the larger jelly-fishes, and many other marine animals. The larger sizes, and even the adults, are also greedily devoured by blue-fish, black-bass, striped-bass, weak-fish, mackerel, cod, and many other kinds of fishes. Therefore these "squids" are really of great importance as food for our most valuable market fishes. They are extensively used as bait by the fishermen.

Rate of Growth.

I am not aware that any definite information has hitherto been published as to the rate of growth or length of life of any of our Cephalopods. By some writers it has been stated that the squids are all annual, but this seems to be a mere assumption, without any evidence for its basis.

Therefore, I have, for several years past, preserved large numbers of specimens of the young of *Loligo Pealei*, collected at different seasons and localities, in order to ascertain, if possible, the rate of growth and the size acquired during the first season, at least. One of the following tables (I) shows some of the data thus obtained.

There is considerable difficulty in ascertaining the age of these squids, owing to the fact that the spawning season extends through the whole summer, so that the young ones hatched early in June are as large by September as those that hatch in September are in the following spring. Owing to the same cause, most of the large lots of young squids taken in mid-summer include various sizes, from those just hatched up to those that are two or three inches long. They are often mixed with some of those of the previous year, considerably larger than the rest. Earlier in the season (in May and the first part of June), before the first-laid eggs begin to hatch, the youngest specimens taken (60 to 100^{mm} long) are presumed to belong to the later broods of the previous autumn, while those somewhat larger are believed to be from earlier broods of the previous summer, and to represent the growth of one year, very nearly.

Taking these principles as a guide, I have arrived at the following conclusions, from the data collected:

1. The young squids begin to hatch at least as early as the second week in June, on the southern coast of New England, and continue to hatch till the middle of September, and perhaps later.

2. By the second week in July, the first hatched of the June squids have grown to the size in which the body (or mantle) is 30 to 48^{mm} long; but these are associated with others that are younger, of all sizes down to those just hatched. But they begin to show a disposition to go in "schools" composed of individuals of somewhat similar sizes.

3. By the second week in August, the largest June squids have become 50 to 68^{mm} in length of body, and the later broods are 5 to 30^{mm} long. As before, with these sizes occur others of all ages down to those just hatched. It should be observed, however, that in those of our tabulated lots taken by the trawl, the very small sizes are absent, because they pass freely through the coarse meshes of the net.

4. By the second week in September, the June squids have the mantle 60 to 82^{mm} long. All the grades of smaller ones still abound. A few larger specimens, taken the last of August, and in September, 84 to 110^{mm} long, may belong to the June brood, but they may belong to those of the previous autumn.

5. In the first week of November, the larger young squids taken had acquired a mantle length of 79 to 85^{mm}, but these are probably not the largest that might be found. Younger ones, probably hatched in September and October, 8 to 20^{mm} in length of body, occurred in vast numbers Nov. 1, 1874. The specimens taken November 16, off Chesapeake Bay, having the mantle 70–90^{mm} long, probably belong to the schools hatched in summer.

6. In May and June the smallest squids taken, and believed to be those hatched in the previous September or October, have the mantle 62 to 100^{mm} long. With these there are others of larger sizes, up to 152 to 188^{mm}, and connected with the smaller ones by intermediate sizes. All these are believed to belong to the various broods of the previous season. In these, the sexual organs begin to increase in size and the external sexual characters begin to appear. The males are of somewhat greater length than the females of the same age.

7. In July, mingled with the young of the season, in some lots, but more often in separate schools, we take young squids having the mantle 75 to 100^{mm} long. These we can connect by intermediate sizes with those of the previous year, taken in June. I regard these as somewhat less than a year old.

8. Beyond the first year it becomes very difficult to determine the age with certainty, for those of the first season begin, even in the autumn, to overlap in their sizes those of the previous year.

9. It is probable that those specimens which are taken in large quantities, while in breeding condition, during the latter part of May and in June, having the mantle 175 to 225^{mm} long in the females and 200 to 275^{mm} long in the males, are two years old.

10. It is probable that the largest individuals taken, with the mantle 300 to 425^{mm} long, are at least three years, and perhaps, in some cases, four years old. The very large specimens generally occur only in small schools and are mostly males. The females that occur with these very large males are often of much smaller size, and may be a year younger than their mates.

11. When squids of very different sizes occur together, in a school, it generally happens that the larger ones are engaged in devouring the smaller ones, as the contents of their stomachs clearly show. Therefore it is probable that those of similar age keep together in schools for mutual safety.

12. Among the adult specimens of *var. pallida*, taken in autumn, at Astoria, there are several young ones, from 75 to 120^{mm} in length, with rudimentary reproductive organs. These may, perhaps, be the young of the year, hatched in June.

Distribution.

This species is found along the whole coast, from South Carolina to Massachusetts Bay.

It is the *common squid* from Cape Hatteras to Cape Cod. In Long Island Sound and Vineyard Sound it is very abundant, and is taken in large numbers in the fish-pounds and seines, and used, to a large extent, for bait. It is comparatively scarce, though not rare, north of Cape Cod. The young were trawled by us in many localities, in Mass. Bay, in 1878. Large specimens were taken in the pounds at Provincetown, Mass., August, 1879. It was taken in considerable quantities, in breeding condition, in the fish-pounds on Cape Ann, near Gloucester, Mass., May, 1880, (*var. borealis*). It has not been observed north of Cape Ann. Its southern limit is not known to me, but it appears to have been found on the coast of South Carolina.

In depth, it has occurred from low-water mark to fifty fathoms. The eggs have often been taken by us in the trawl, in great abundance, at many localities along the southern shores of New England, in five to twenty-five fathoms.

It is known to be a very important element in the food-supply of the blue fish, tautog, sea-bass, striped bass, weak-fish, king-fish, and many other of our larger market fishes.

B.—Table to show sexual variations. (Measurements in inches.)

<i>Loligo Pealei</i> ♂ and ♀.	♂ 1G														♀ 17V																
	♂ 4V	♂ 6V	♂ 5V	♂ a'	♂ 9V	♂ 8V	♂ 10V	♀ 13V	♀ 14V	♀ 12V	♀ 2V	♀ 11V	♀ 5G	An. ♀	♀ 17V	♂ 4V	♂ 6V	♂ 5V	♂ a'	♂ 9V	♂ 8V	♂ 10V	♀ 13V	♀ 14V	♀ 12V	♀ 2V	♀ 11V	♀ 5G	An. ♀	♀ 17V	
Length to dorsal mantle edge.....	11.70	11.50	11.40	11.00	10.30	10.00	9.55	10.00	9.40	8.62	8.30	8.25	8.00	7.30	7.75	11.70	11.50	11.40	11.00	10.30	10.00	9.55	10.00	9.40	8.62	8.30	8.25	8.00	7.30	7.75	
Length to base of dorsal arms.....	13.80	12.50	12.50	12.00	11.50	10.90	10.60	11.40	10.50	9.75	9.50	9.75	9.35	8.20	9.25	13.80	12.50	12.50	12.00	11.50	10.90	10.60	11.40	10.50	9.75	9.50	9.75	9.35	8.20	9.25	
Length of dorsal arms.....	3.50	3.10	3.30	3.25	3.40	2.80	2.70	3.60	3.40	2.82	3.30	3.15	3.10	2.80	2.80	3.50	3.10	3.30	3.25	3.40	2.80	2.70	3.60	3.40	2.82	3.30	3.15	3.10	2.80	2.80	
Length of caudal fin.....	7.90	7.40	7.10	7.00	6.20	6.10	5.30	6.35	6.20	5.50	5.10	4.75	4.80	4.50	4.80	7.90	7.40	7.10	7.00	6.20	6.10	5.30	6.35	6.20	5.50	5.10	4.75	4.80	4.50	4.80	
Breadth of caudal fin.....	5.00	4.90	4.90	5.00	4.80	4.70	4.15	4.75	4.60	4.50	4.80	4.60	4.10	4.00	4.35	5.00	4.90	4.90	5.00	4.80	4.70	4.15	4.75	4.60	4.50	4.80	4.60	4.10	4.00	4.35	
Breadth between insertions.....	1.70	1.10	1.20	1.30	1.50	1.12	1.00	1.50	1.30	0.37	1.40	1.30	1.50	1.15	1.03	1.70	1.10	1.20	1.30	1.50	1.12	1.00	1.50	1.30	0.37	1.40	1.30	1.50	1.15	1.03	
Breadth of body.....	6.00	4.90	5.30	5.70	5.50	4.90	4.90	5.75	5.50	5.40	5.50	5.15	4.70	4.85	4.85	6.00	4.90	5.30	5.70	5.50	4.90	4.90	5.75	5.50	5.40	5.50	5.15	4.70	4.85	4.85	
Breadth of head, at eyes.....	1.50	1.30	1.40	1.50	1.42	1.20	1.18	1.60	1.50	1.58	1.40	1.55	1.40	1.40	1.30	1.50	1.30	1.40	1.50	1.42	1.20	1.18	1.60	1.50	1.58	1.40	1.55	1.40	1.40	1.30	
Circumference of head, in front of eyes.....	1.18	1.19	1.18	1.22	1.20	1.11	1.11	1.23	1.20	1.19	1.21	1.19	1.15	1.08	1.15	1.18	1.19	1.18	1.22	1.20	1.11	1.11	1.23	1.20	1.19	1.21	1.19	1.15	1.08	1.15	
Diameter of largest tentacular suckers.....	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	
Diameter of largest of 3d pair of arms.....	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	
Length of pen.....	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	
Breadth of pen.....	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	0.11	0.12	0.12	0.11	0.11	0.08	0.08	0.15	0.13	0.13	0.16	0.12	0.11	0.06	0.10	
Proportions:																															
Fin-length to mantle-length.....	1.51	1.64	1.60	1.57	1.66	1.63	1.79	1.57	1.51	1.56	1.60	1.73	1.66	1.62	1.61	1.51	1.64	1.60	1.57	1.66	1.63	1.79	1.57	1.51	1.56	1.60	1.73	1.66	1.62	1.61	
Fin-breadth to mantle-length.....	2.40	2.30	2.32	2.20	2.14	2.12	2.28	2.10	2.04	1.91	1.72	1.79	1.95	1.82	1.79	2.40	2.30	2.32	2.20	2.14	2.12	2.28	2.10	2.04	1.91	1.72	1.79	1.95	1.82	1.79	
Breadth to length of fin.....	1.58	1.51	1.40	1.40	1.29	1.29	1.27	1.34	1.34	1.22	1.06	1.03	1.17	1.12	1.10	1.58	1.51	1.40	1.40	1.29	1.29	1.27	1.34	1.34	1.22	1.06	1.03	1.17	1.12	1.10	
Circum. of body to mantle-length.....	2.00	2.38	2.09	1.92	1.89	2.04	1.93	1.74	1.70	1.59	1.50	1.60	1.70	1.60	1.60	2.00	2.38	2.09	1.92	1.89	2.04	1.93	1.74	1.70	1.59	1.50	1.60	1.70	1.60	1.60	
Circum. of head to mantle-length.....	1.00	3.11	3.38	3.25	2.94	3.44	4.13	2.35	1.98	2.26	2.32	2.32	2.46	2.46	2.46	1.00	3.11	3.38	3.25	2.94	3.44	4.13	2.35	1.98	2.26	2.32	2.32	2.46	2.46	2.46	
Diam. large tent. suckers to length.....	0.66	61.04	71.87	50.00	51.50	90.90	86.36	43.50	47.00	45.36	39.52	43.42	53.33	91.25	51.66	0.66	61.04	71.87	50.00	51.50	90.90	86.36	43.50	47.00	45.36	39.52	43.42	53.33	91.25	51.66	
Length of dorsal arms to length.....	3.43	3.70	3.45	3.38	3.01	3.57	3.51	2.78	2.76	3.05	2.51	2.61	2.58	2.77	2.77	3.43	3.70	3.45	3.38	3.01	3.57	3.51	2.78	2.76	3.05	2.51	2.61	2.58	2.77	2.77	

The specimens in this table were selected from those that are best preserved. 1G is from New Haven, measured while fresh; 1V to 17V are from Vineyard Sound, recently preserved and in good condition; a' is from Noank, Conn.; 5G is from Cape Ann, Mass., measured before preservation; An. is a specimen from Cape Ann; the latter and 8V, 10V have abnormally small suckers.

C.—Table illustrating variations due to growth, sex, locality and state of preservation. (Measurements in inches)

	♂ A. I.	♂ 1 G.	♂ a'.	♂ c'.	♂ 6 V.	♂ 3 G.	♂ 2 G.	♂ b'.	♂ 4 G.	♂ 5 G.	♀ g'.	♀ An.
<i>Loligo Pealei</i> ♂ and ♀.												
Typical form and var. borealis.												
Tail to tip of dorsal arms.....	20.75	17.30	15.20	15.75	15.50	15.20	14.70	14.60	13.10	12.20	9.75	10.20
Tail to tip of 2d pair arms.....	21.25	17.70	15.50	16.00	16.00	16.00	15.10	14.80	13.70	12.60	10.05	10.50
Tail to tip of 3d pair arms.....	21.75	18.00	16.00	15.70	16.50	16.30	15.80	15.30	--	13.40	10.50	10.85
Tail to tip of 4th pair arms.....	21.05	17.40	15.30	16.00	15.75	16.00	15.10	15.10	14.10	12.70	10.00	10.50
Tail to tip of tentacular arms.....	24.50	23.00	17.50	20.00	20.50	20.50	19.00	16.90	13.20	15.00	12.50	13.50
Tail to base dorsal arms.....	17.25	13.80	12.00	12.75	12.50	12.30	11.90	.90	10.10	9.35	8.00	8.20
Tail to center of eye.....	.25	12.60	11.20	12.00	11.70	11.75	11.00	10.70	9.50	8.75	7.20	7.50
Tail to mantle edge, above.....	16.25	12.00	11.00	11.00	11.50	11.00	10.50	10.60	8.90	8.00	7.20	7.30
Tail to mantle edge, below.....	15.00	11.00	10.25	--	10.50	10.25	9.75	9.75	--	7.30	6.55	6.70
Tail to insertion of fin.....	9.80	7.90	7.00	7.00	7.00	6.90	6.50	6.60	5.40	4.80	4.35	4.50
Tail to outer angle of fin.....	7.00	5.50	4.75	5.00	--	4.80	4.40	4.50	3.75	3.50	3.15	3.30
Breadth of fin.....	6.85	5.00	5.00	5.00	5.00	4.90	4.50	4.80	4.30	4.10	3.80	4.10
Between insertion.....	2.10	1.70	1.50	1.20	1.20	1.20	1.30	1.48	1.40	1.50	1.20	1.15
Outer angle to insertion.....	4.60	3.25	3.40	3.00	--	3.30	3.20	3.25	2.75	2.70	2.25	2.50
Circumference of body.....	7.20	6.00	5.70	--	4.40	4.40	4.75	5.30	4.10	4.20	4.25	4.80
Breadth of head, at eyes.....	1.75	1.50	1.50	1.35	1.30	1.30	1.30	1.30	1.40	1.40	1.20	1.40
Breadth of siphon, at cartilages.....	1.30	1.15	1.18	.98	--	--	1.05	1.10	1.95	--	.80	--
Aperture of siphon.....	.45	.35	.40	.40	--	--	.35	.40	.30	--	--	--
Length of dorsal arms.....	3.70	3.50	3.25	3.00	3.10	3.25	2.90	3.10	3.00	3.10	2.00	2.20
Length of 2d pair arms.....	4.20	4.10	3.50	3.20	3.40	3.50	3.30	3.35	3.50	3.30	2.30	2.50
Length of 3d pair arms.....	4.40	4.30	4.00	3.35	3.90	3.75	3.80	3.80	3.90	4.10	2.60	2.85
Length of 4th pair, from base.....	4.10	3.80	3.35	3.25	3.40	3.60	3.40	3.30	3.30	3.60	2.40	2.70
Length of tentacular arms.....	7.10	9.25	5.25	7.00	7.25	8.00	7.00	5.50	7.50	8.50	4.40	6.10

TABLE C.—Continued. (Measurements in inches.)

<i>Loligo Pealei</i> ♂ and ♀. Typical form and var. <i>borealis</i> .	♂ A. 1.	♂ 1 G.	♂ α'.	♂ c'.	♂ 6 V.	♂ 3 G.	♂ 2 G.	♂ 4 G.	♀ 5 G.	♀ g'.	♀ An.
Length of tentacular club	.290	.280	.260	2.00	2.40	2.60	2.50	2.50	2.50	1.50	1.85
Breadth of tentacular club	.90	.40	.75	.40	.50	.40	.35	.40	.40	.35	.30
Breadth of dorsal arms	.35	.30	.31	.28	.24	--	.20	.27	--	.20	.23
Breadth of 2d pair arms	.50	.35	.33	.30	.34	--	.30	.37	--	.30	.33
Breadth of 3d pair arms	.50	.40	.45	.41	.35	--	.33	.43	--	.27	.30
Breadth of 4th pair arms	.40	.35	.35	.32	.35	--	.32	.30	--	.28	.28
Breadth of tentacular arm	.30	.15	.20	.20	.17	--	.12	.20	--	.18	.15
Diameter of eye (external)	1.20	1.10	1.00	--	--	.80	.80	.65	.65	--	--
<i>Diameter of suckers:</i>											
Largest of tentacular arms	.25	.18	.22	--	.16	.17	.15	.20	.15	.12	.12
Largest of dorsal arms	.13	.08	.11	--	.10	.09	.09	.10	.10	.07	--
Largest of 2d pair arms	.15	.11	.13	--	.11	.11	.10	.12	.11	.10	--
Largest of 3d pair arms	.15	.11	.14	--	.12	.11	.11	.13	.10	.10	.10
Largest of 4th pair arms	.12	.08	.10	--	.08	.08	.07	.09	.08	.06	--
<i>Proportions:</i>											
Fin-length to mantle	1.65	1.51	1.57	1.57	1.64	1.59	1.61	1.64	1.66	1.65	1.62
Fin-breadth to mantle-length	2.37	2.40	2.20	2.20	2.30	2.24	2.33	2.06	1.95	1.89	1.78
Fin-breadth to fin-length	1.43	1.58	1.40	1.40	1.40	1.40	1.44	1.25	1.17	1.14	1.09
Dorsal arm to mantle	4.39	3.42	3.38	3.66	3.70	3.38	3.60	2.96	2.58	3.60	3.31
Circumference of body to length	2.25	2.00	1.92	--	--	2.50	2.20	2.17	1.90	1.69	1.52

A 1, typical form from Cape Cod, the largest specimen seen; An., g', 2 G to 5 G, = var. *borealis*, from Cape Ann, Mass.; α', b', from Noank, Conn., typical; 6 V., from Vineyard Sound, Mass.; c', typical, from New Haven. Those marked 1 G to 5 G were measured while fresh; the rest, after preservation in alcohol.

D.—Table illustrating variations in the males, due mostly to age, and mode of preservation. (Measurements in inches.)

	Y.	X.	Z.	R.	Q.	B.	E.	D.	S.	P.	G.	oo.	H.	J.	F.	k.	O.
Tail to end of longest sessile arms.....	16.70	16.15	16.30	15.25	14.81	--	14.00	13.65	13.20	14.00	12.40	12.80	12.75	12.30	11.80	12.00	10.90
Tail to mantle edge, above.....	12.00	12.30	11.30	11.30	10.75	10.50	10.50	10.00	9.90	10.10	9.65	9.15	9.10	9.15	8.90	8.30	8.25
Tail to mantle edge, below.....	10.7	11.00	9.35	10.40	9.30	9.75	9.80	--	8.80	9.00	8.10	8.40	8.20	8.50	8.20	7.25	7.50
Tail to insertion of fin.....	7.50	7.90	6.70	6.80	6.90	6.60	6.50	6.35	6.30	6.50	5.80	5.70	5.65	5.60	5.50	5.00	4.95
Tail to eye.....	12.40	11.60	12.00	11.50	10.91	--	10.40	10.15	9.50	10.30	9.20	9.20	9.20	9.20	8.90	8.40	8.00
Tail to base of dorsal arms.....	13.10	11.90	12.75	12.10	11.50	--	11.00	11.00	10.50	11.10	9.95	9.70	9.95	9.95	9.60	9.20	8.60
Eye to end of dorsal arms.....	3.75	3.80	3.20	2.80	3.40	--	3.40	2.80	3.40	3.30	2.70	3.20	3.15	2.50	2.50	3.10	2.55
Eye to end of 2d pair arms.....	3.95	4.10	3.90	3.10	3.55	--	3.60	3.15	3.50	3.55	2.90	3.40	3.20	2.80	2.80	3.30	2.80
Eye to end of 3d pair arms.....	4.30	4.55	4.30	3.70	3.90	--	4.00	3.50	3.70	4.10	3.20	3.50	3.35	3.11	2.90	3.60	2.90
Eye to end of ventral arms.....	4.15	4.30	4.00	3.40	3.60	--	3.50	3.20	3.40	4.10	3.00	3.20	3.30	2.90	2.80	3.20	2.70
Eye to end of tentacular arms.....	7.10	7.80	7.60	6.25	5.60	--	5.00	5.00	5.50	7.00	4.40	4.90	4.65	4.75	5.00	6.80	4.70
Breadth of head, across eyes.....	1.55	1.65	1.45	1.65	1.35	1.30	1.50	1.30	1.30	1.75	1.10	1.30	1.20	1.28	1.25	1.10	1.05
Breadth of head, in front of eyes.....	--	1.45	1.40	1.50	1.35	--	1.15	--	1.20	1.40	.80	1.25	1.05	1.05	1.05	1.00	1.00
Breadth of body.....	--	1.75	1.70	2.70	1.70	1.75	1.60	--	2.60	1.50	1.40	1.60	1.30	1.50	1.40	1.50	1.15
Breadth of fins.....	5.50	5.45	5.60	5.25	5.10	4.50	4.30	4.20	4.30	5.30	4.00	4.20	4.25	4.10	4.25	3.50	3.80
Circumference of body.....	5.45	5.40	5.00	5.15	4.80	--	4.75	4.60	4.80	5.10	4.00	4.75	3.85	4.50	4.25	4.50	3.70
Length of tentacular club.....	2.60	3.85	2.20	2.25	2.00	2.55	1.80	1.75	5.80	2.20	1.60	2.10	1.75	1.70	1.40	1.90	1.30
<i>Proportions:</i>																	
Length of fin to mantle.....	1.60	1.55	1.68	1.66	1.55	1.50	1.61	1.67	1.57	1.56	1.66	1.60	1.61	1.62	1.61	1.66	1.66
Breadth of fin to mantle.....	2.18	2.25	2.01	2.15	2.10	2.33	2.44	2.40	2.30	1.90	2.41	2.17	2.14	2.23	2.09	2.37	2.17
Breadth of fin to its length.....	1.36	1.44	1.19	1.30	1.35	1.46	1.51	1.51	1.46	1.23	1.45	1.35	1.32	1.36	1.29	1.42	1.30

TABLE D.—Continued. (Measurements in inches.)

<i>Loligo Pealei</i> (♂)	I.	L.	M.	N.	T.	α''.	W.	K.	f.	g.	h.	V.	β''.	c.	d.	e.
Tail to end of longest sessile arms.....	11.15	11.85	11.20	10.35	10.65	11.30	11.70	11.25	11.40	9.90	9.45	9.05	8.65	8.10	7.55	7.00
Tail to mantle edge, above.....	8.20	8.10	7.90	7.80	7.80	7.80	8.20	7.50	7.50	6.50	6.20	5.80	5.70	5.30	4.90	4.15
Tail to mantle edge, below.....	7.65	7.60	--	6.90	7.30	6.80	7.10	7.10	6.70	5.90	5.40	5.05	5.30	4.75	4.50	3.80
Tail to insertion of fin.....	4.95	4.90	5.00	4.80	4.80	4.60	5.00	4.55	4.40	3.75	3.50	3.40	3.20	3.00	2.60	2.20
Tail to eye.....	8.00	8.40	7.90	7.70	8.00	7.50	8.15	7.50	7.60	6.30	6.11	6.40	5.70	5.15	4.90	4.80
Tail to base of dorsal arms.....	8.30	7.90	8.40	8.40	8.40	8.90	8.70	8.25	8.10	7.00	6.55	6.75	6.40	5.75	5.25	4.95
Eye to end of dorsal arms.....	2.80	2.90	2.75	2.30	2.20	3.20	3.05	3.50	3.50	2.90	2.60	2.30	2.40	2.45	2.05	1.95
Eye to end of 2d pair arms.....	2.90	3.30	3.00	2.50	2.55	3.50	3.40	3.60	3.55	3.10	3.00	2.60	2.70	2.60	2.35	2.10
Eye to end of 3d pair arms.....	3.15	3.45	3.30	2.65	2.65	3.80	3.55	3.75	3.80	3.60	3.30	2.65	2.95	2.90	2.65	2.20
Eye to end of ventral arms.....	3.20	3.45	3.10	2.55	2.60	3.45	3.45	3.75	3.80	3.25	3.20	2.60	2.60	2.90	2.35	2.20
Eye to end of tentacular arms.....	6.10	6.30	6.00	3.60	4.20	7.00	6.20	5.65	6.30	6.80	5.30	5.10	6.80	5.45	4.60	4.60
Breadth of head, across eyes.....	1.30	1.00	1.20	1.10	1.15	1.40	1.25	1.20	1.20	1.25	1.10	.75	1.10	1.00	1.10	1.10
Breadth of head, in front of eyes.....	1.10	1.00	--	.90	1.00	1.35	1.20	1.05	1.25	1.10	.90	.75	.95	.95	.95	.95
Breadth of body.....	1.35	1.35	--	1.30	1.20	1.60	1.50	1.40	1.60	1.25	1.30	1.00	1.10	1.15	1.10	1.00
Breadth of fins.....	3.80	3.65	3.50	3.30	3.25	3.70	3.90	3.80	3.70	3.40	3.35	2.85	2.90	2.40	2.50	2.30
Circumference of body.....	4.20	3.80	3.15	3.60	3.40	4.65	4.60	4.05	4.30	3.80	4.15	3.40	3.45	3.35	3.20	2.90
Length of tentacular club.....	1.80	2.00	1.75	1.25	1.50	2.50	1.95	2.10	2.40	2.20	1.95	1.50	1.70	1.80	1.50	1.25
<i>Proportions:</i>																
Length of fin to mantle.....	1.65	1.65	1.58	1.62	1.62	1.15	1.64	1.64	1.70	1.75	1.77	1.70	1.78	1.76	1.88	1.90
Breadth of fin to mantle.....	2.16	2.21	2.25	2.36	2.40	2.06	2.10	1.97	2.03	1.91	1.85	2.18	1.96	2.20	1.96	1.80
Breadth of fin to its length.....	1.30	1.34	1.43	1.45	1.47	1.24	1.28	1.19	1.19	1.09	1.05	1.28	1.10	1.25	1.04	.96

Those marked D-W were taken in Vineyard Sound, May and June, 1876, and were preserved in too strong alcohol, some of them (as T-W) being very much contracted; X, Y, Z, were captured June 6, at the same place, and are in fair condition, though too much hardened by the alcohol. Those marked a-e were taken October 14, 1875, in the pounds at Wood's Holl, Vineyard Sound, and are well preserved; h and k are from Savin Rock, near New Haven; oo is from Noank, Conn.

K.—Table illustrating variations of the females, due mostly to age and mode of preservation. (Measurements in inches.)

	1V.	AA.	12V.	BB.	2V.	11V.	CC.	DD.	EE.	FF.	♀ U.	GG.	HH.
<i>Loligo Pealei</i> . ♀. Typical variety.													
Tail to mantle-edge, above.....	9.40	9.10	8.62	8.60	8.30	8.25	7.70	7.95	7.20	7.65	7.40	5.95	6.10
Tail to mantle-edge, below.....	8.50	7.70	--	7.70	7.60	--	7.00	7.20	6.65	6.80	5.20	5.30	5.50
Tail to origin of fin.....	6.20	5.20	5.50	5.30	5.10	4.75	4.70	4.70	4.40	4.20	4.80	3.60	3.65
Tail to center of eye.....	9.60	9.75	9.00	8.20	8.70	9.15	7.80	8.10	7.60	8.00	3.00	6.00	6.05
Tail to base of dorsal arms.....	10.50	10.10	9.75	9.40	9.50	9.75	8.20	9.05	8.80	8.30	5.20	6.70	6.50
Length of dorsal arms.....	--	--	2.82	--	--	3.15	--	2.10	--	2.35	5.70	1.53	1.76
Eye to tip of dorsal arms.....	4.00	3.05	--	3.60	4.15	--	2.60	2.95	3.10	2.80	1.90	2.20	2.20
Eye to tip 2d pair of arms.....	4.15	3.40	--	4.10	4.40	--	2.80	3.10	3.50	3.00	1.90	2.25	2.50
Eye to tip 3d pair of arms.....	4.90	3.55	--	4.15	5.20	4.85	3.20	3.40	3.60	3.20	2.20	2.40	2.80
Eye to tip 4th pair of arms.....	4.50	3.55	--	3.60	4.50	--	3.10	2.85	3.45	3.20	2.20	2.20	2.40
Eye to tip of tentacular arms.....	10.00	5.30	8.25	5.70	9.00	9.50	4.40	4.45	5.30	5.10	3.05	3.70	5.20
Length of club.....	2.15	2.00	2.30	2.35	2.10	2.55	1.65	1.60	1.75	1.90	1.00	1.30	1.55
Breadth of head at eyes.....	1.50	1.30	1.58	1.40	1.40	1.55	1.30	1.40	1.30	1.25	.90	1.10	1.05
Breadth of head in front of eyes.....	1.25	1.25	--	1.30	1.20	--	1.20	1.20	1.10	1.10	1.00	.95	.90
Circumference of head in front of eyes.....	--	--	3.80	--	--	3.55	--	3.55	--	3.50	2.55	2.90	3.00
Breadth of body.....	1.85	1.70	1.70	1.60	2.00	1.75	1.40	1.40	1.60	1.45	3.05	1.10	1.40
Breadth of caudal fins.....	4.60	5.15	4.50	4.70	4.80	4.60	4.10	4.10	4.00	3.60	.95	3.10	3.20
Breadth between insertions.....	--	--	1.37	--	--	1.30	--	--	--	--	--	--	--
Circumference of body.....	5.50	5.30	5.40	4.90	5.50	5.15	4.30	4.40	4.80	4.30	--	3.45	3.90
Diameter of large tentacular suckers.....	.20	.19	.19	.26	.21	.19	.15	--	.18	.18	--	.11	.15
Diameter of largest of 3d pair of arms.....	.13	.12	.13	.14	.16	.12	.10	--	.10	.12	--	.08	.10
<i>Proportions:</i>													
Fin-length to mantle.....	1:	1.75	1.56	1.62	1.62	1.73	1.63	1.69	1.63	1.82	1.73	1.65	1.67
Fin-breadth to mantle-length.....	1:	2.04	1.82	1.91	1.82	1.72	1.87	1.95	1.80	2.12	2.03	1.90	1.90
Breadth to length of fin.....	1:	1.34	1.00	1.22	1.12	1.06	1.14	1.14	1.10	1.16	1.17	1.16	1.14
Circumference to mantle-length.....	1:	1.70	1.71	1.59	1.75	1.50	1.79	1.80	1.50	1.77	--	1.72	1.56
Length of dorsal arms to mantle-length.....	1:	--	3.05	--	--	2.62	--	3.78	--	3.25	--	3.23	3.46
Tentacular suckers to mantle-length.....	1:	47.00	49.47	45.36	33.07	39.50	43.42	51.33	--	40.00	42.50	--	54.09

AA to HH were taken in the fish-pounds at Wood's Holl, Vineyard Sound, in June, 1876, and have been preserved in somewhat too strong alcohol. 1V to 12V were taken at the same place, May 28, 1880, and have been carefully preserved in alcohol of about 80 per cent.

F.—Table illustrating variations of males of var. pallida, due to growth, to the states of contraction when preserved, and to individual peculiarities. (Measurements in inches.)

	I	B	b	Z	A	c	G	E	i	d	e	h	k
<i>Loligo Pealei</i> , var. <i>pallida</i> ♂.													
Tail to edge of mantle, above.....	9.15	9.3	9.	8.7	8.5	8.2	8.	8.	7.95	7.65	7.7	7.9	7.55
Tail to edge of mantle, beneath.....	8.5	8.65	8.25	8.1	7.7	7.6	7.3	7.2	7.35	7.	7.	7.2	6.8
Tail to origin of fin.....	5.8	5.8	5.4	5.25	5.2	5.	5.05	4.9	5.	4.75	4.65	4.7	4.5
Tail to center of eye.....	9.85	9.6	9.3	9.2	8.8	8.7	8.7	8.4	8.3	8.	7.8	8.05	7.8
Tail to base of dorsal arms.....	10.7	10.6	10.25	9.75	9.5	9.6	9.5	9.1	9.35	8.65	8.7	8.8	8.7
Eye to end of dorsal arms.....	4.15	4.45	4.1	3.8	4.2	4.1	4.0	3.8	4.05	3.55	4.	3.5	3.4
Eye to end of 2d pair arms.....	4.7	5.2	4.4	4.3	4.4	4.45	4.2	4.	4.35	4.	4.1	3.9	3.75
Eye to end of 3d pair arms.....	5.2	4.7	4.7	4.55	4.8	5.2	4.5	4.3	4.8	4.3	4.55	4.45	4.15
Eye to end of 4th pair arms.....	5.	4.7	4.45	4.05	4.5	4.8	4.35	4.1	4.45	4.	4.3	4.05	3.8
Eye to end of tentacular arms.....	10.8	10.3	9.3	9.9	10.15	9.1	9.5	8.9	9.9	9.	9.3	8.75	6.7
Length of club of tentacular arms.....	2.8	2.9	2.6	2.5	2.8	2.75	2.6	2.15	2.5	2.65	2.7	2.6	2.6
Breadth of head across eyes.....	1.5	1.6	--	1.35	1.6	1.45	1.3+	1.2+	1.2	--	1.4	1.45	1.2
Breadth of head in front of eyes.....	1.2	1.4	1.2	1.15	1.4	1.3	1.2	1.	1.15	--	1.15	1.25	1.05
Breadth of body.....	1.80	2.00	--	1.70	1.6	--	2.10	1.60	--	--	--	1.65	--
Breadth of caudal fins.....	5.00	5.15	4.5	4.60	5.00	4.6	4.50	4.50	4.5	3.9	4.1	4.40	3.75
Circumference of body.....	5.5	5.75	5.	4.9	5.15*	5.25	5.25	4.7	5.1	5.	5.05	5.2	4.6
Diam. of largest suckers of club.....	.22	.24	--	.20	.21	--	.23	.18	--	--	--	.21	--
Diam. of largest suckers of 3d pair arms.....	.14	.13	--	.11	.13	--	.12	.12	--	--	--	.13	--
<i>Proportions:</i>													
Length of fin to length of mantle.....	1.57	1.60	1.66	1.65	1.66	1.64	1.58	1.63	1.59	1.61	1.65	1.68	1.67
Breadth of fin to length of mantle.....	1.83	1.80	2.00	1.88	1.70	1.78	1.77	1.77	1.76	1.96	1.87	1.79	2.01
Breadth of fin to its length.....	1.16	1.12	1.20	1.14	1.00	1.08	1.12	1.08	1.11	1.21	1.13	1.06	1.20
Large tentacular sucker to mantle.....	41.59	38.75	--	43.50	40.47	--	34.78	44.44	--	--	--	37.62	--
Circumference of body to mantle.....	1.66	1.61	1.80	1.77	1.65	1.56	1.52	1.70	1.55	1.53	1.52	1.51	1.64

All the specimens included in this table were taken nearly at the same time in the autumn of 1870, at Astoria, Long Island. The measurements are all from the specimens after they had been preserved in alcohol (of about 80 per cent.) for several years. They are only moderately contracted by the alcohol. They were sent to New Haven, in ice, before preservation, so that they were in a relaxed condition when put into alcohol.

TABLE F.—Continued. Table illustrating variations of males of var. pallida.

<i>Loligo Pealei</i> , var. <i>pallida</i> ♂.	J	f	V	W	l	a	K	L	M	Q	S	P
Tail to edge of mantle, above.....	7.3	7.1	6.6	7.	7.10	4.3	4.	4.	3.8	3.7	3.7	3.65
Tail to edge of mantle, beneath.....	6.7	6.5	6.1	6.2	6.30	3.8	3.4	3.4	3.2	3.2	3.3	3.2
Tail to origin of fin.....	4.4	4.	3.9	4.2	4.30	2.3	2.1	2.	2.	2.	1.8	2.
Tail to center of eye.....	7.7	7.55	7.	7.4	7.5	4.75	4.5	4.2	4.05	4.2	3.9	3.9
Tail to base of dorsal arms.....	9.15	8.3	7.3	8.15	1.8	5.2	5.	4.7	4.5	4.6	4.3	4.4
Eye to end of dorsal arms.....	3.7	3.7	3.1	3.5	3.7	2.3	2.	2.15	2.	2.1	1.8	1.8
Eye to end of 2d pair arms.....	4.	3.8	3.7	3.6	4.15	2.5	2.3	2.5	2.2	2.4	1.9	2.1
Eye to end of 3d pair arms.....	4.45	4.1	4.1	4.2	4.55	3.	2.55	2.7	2.5	2.7	2.3	2.6
Eye to end of 4th pair arms.....	4.3	3.8	3.6	4.	4.	2.7	2.2	2.65	2.45	2.4	2.3	2.2
Eye to end of tentacular arms.....	--	9.3	7.7	8.6	9.25	6.45	4.8	5.9	5.9	6.1	5.5	5.25
Length of club of tentacular arms.....	1.1+	1.25	1.2	1.2	1.20	1.5	1.3	1.45	1.3	1.2	1.2	1.
Breadth of head across eyes.....	1.1	1.1	1.1	1.	1.20	.9	.9	.9	.8	.8	.8	.8
Breadth of head in front of eyes.....	1.1	1.1	1.1	1.	.95	.75	.8	.75	.7	.7	.65	.7
Breadth of body.....	--	--	--	--	1.65	--	--	--	--	--	--	--
Breadth of caudal fins.....	4.1	3.95	3.3	4.	3.90	2.4	2.1	2.5	2.	2.	2.1	1.9
Circumference of body.....	4.7	4.45	4.6	4.75	4.80	3.6	3.3	3.6	3.1	3.25	3.35	3.25
Diam. of largest suckers of club.....	--	--	--	--	.21	--	--	--	--	--	--	--
Diam. of largest suckers of 3d pair arms.....	--	--	--	--	.13	--	--	--	--	--	--	--
<i>Proportions:</i>												
Length of fin to length of mantle.....	1.65	1.77	1.69	1.66	1.69	1.86	1.90	2.00	1.90	1.85	2.05	1.85
Breadth of fin to length of mantle.....	1.77	1.79	2.00	1.75	1.89	1.79	1.90	1.60	1.90	1.85	1.76	1.92
Breadth of fin to its length.....	1.07	1.01	1.18	1.05	1.12	.95	1.00	.80	1.00	1.10	0.85	1.05
Largest tentacular sucker to mantle.....	1.55	1.69	1.43	1.47	33.80	1.19	1.21	1.11	1.22	1.13	1.10	1.12
Circumference of body to mantle.....	1.55	1.69	1.43	1.47	1.47	1.19	1.21	1.11	1.22	1.13	1.10	1.12

G.—Table illustrating variations of females of var. pallida, due to growth, etc. (Measurements in inches.)

	j	Y	l	X	D	g	m	C	T	U	H	n	F	? sex O	R	N
<i>Loiigo Pealei</i> , var. <i>pallida</i> ♀.																
Tail to edge of mantle, above	8.4	8.15	7.	6.7	6.35	6.25	6.2	5.10	4.65	4.60	4.25	3.9	3.85	3.6	3.6	3.62
Tail to edge of mantle, beneath	7.65	7.35	6.3	6.	5.8	5.75	5.7	4.35	3.9	4.	3.7	3.4	3.35	3.2	3.2	3.1
Tail to origin of fin	5.15	4.8	4.3	4.2	3.9	3.7	3.60	2.8	2.55	2.5	2.30	2.	2.	2.	2.	1.95
Tail to center of eye	8.8	8.5	7.35	7.1	6.5	6.7	6.5	5.25	4.8	4.7	4.3	4.2	4.15	4.	4.	4.
Tail to base of dorsal arms	9.5	9.15	8.2	8.	7.3	7.4	7.15	6.	5.2	5.25	5.	4.45	4.6	4.5	4.3	4.3
Eye to end of dorsal arms	4.15	3.8	3.6	3.3	3.3	3.	3.	2.1	2.05	2.4	2.	1.3	1.9	1.6	1.8	1.8
Eye to end of 2d pair arms	4.5	4.4	4.	3.95	3.8	3.3	3.2	2.5	2.4	2.7	2.2	2.	2.2	2.2	1.9	1.9
Eye to end of 3d pair arms	5.	4.6	4.6	4.3	3.95	3.7	3.7	3.05	2.55	3.15	2.55	2.55	2.65	2.45	2.4	2.25
Eye to end of 4th pair arms	4.5	4.35	4.55	4.25	3.8	3.6	3.7	3.05	2.55	3.15	2.7	2.25	2.55	2.2	2.4	2.25
Eye to end of tentacular arms	10.1	9.3	9.8	9.1	8.9	7.8	8.3	7.1	5.5	6.5	5.45	5.15	5.9	5.2	5.3	5.1
Length of club to tentacular arms	2.9	2.45	2.7	2.6	2.2	2.	2.1	1.6	1.1	1.4	1.2	1.3	1.35	1.1	1.8	1.15
Total length, tail to end of tentacles	19.	17.8	17.1	16.2	--	14.45	15.	12.00	.9	11.2	--	9.2	--	9.35	9.25	9.15
Breadth of head across eyes	1.45	1.4	1.3	1.3	1.4	1.1	1.15	1.00	.8	1.	.9	.95	.9	.8	.9	.85
Breadth in front of eyes	1.3	1.3	1.2	1.2	1.1	.9	1.	.85	--	.85	.75	.8	.6	.7	.75	.70
Breadth of body	1.90	1.85	--	--	1.55	--	--	1.40	2.70	--	1.35	--	1.20	--	--	--
Breadth of caudal fins	4.8	4.40	4.1	4.6	4.1	3.5	3.60	3.10	3.75	2.8	2.65	2.45	2.25	2.1	2.25	2.05
Circumference of body	5.5	5.5	4.8	4.9	4.6	4.4	4.4	4.2	--	4.	--	3.5	3.5	3.2	3.25	3.05
Diam. of largest suckers of club	.25	.20	--	.22	.17	.18	.16	.15	--	.12	--	--	.08	--	--	--
Diam. of largest suckers of 3d pair arms	.12	.13	--	.12	.10	.11	.11	.8	--	.08	--	--	.05	--	--	--
<i>Proportions:</i>																
Length of fin to length of mantle	1.63	1.69	1.62	1.59	1.62	1.68	1.72	1.82	1.82	1.84	1.84	1.95	1.92	1.80	1.80	1.85
Breadth of fin to length of mantle	1.75	1.85	1.70	1.45	1.94	1.78	1.72	1.65	1.72	1.64	1.60	1.59	1.71	1.71	1.60	1.76
Breadth of fin to its length	1.07	1.09	1.04	.91	.95	1.05	1.00	.90	.94	.89	.86	.81	.88	.95	.88	.95
Largest tentacular sucker to mantle	33.60	40.75	--	30.45	37.35	34.72	38.75	34.00	--	38.33	--	--	48.12	--	--	--
Circumference of body to mantle	1.52	1.48	1.45	1.36	1.38	1.42	1.40	1.21	1.24	1.15	--	1.11	1.10	1.12	1.10	1.18

The specimens included in this table were all taken at Astoria, Long Island. The measurements are all from alcoholic specimens, as in Table F.

I.—Table to illustrate rate of growth of *Loligo Pealei*, young.

Locality.	Depth.	Date.	Length of mantle, in millimeters.	
			Young of the year.	Young of previous year.
Vineyard Sound	Surface	1875-76,		
Vineyard Sound	Surface	July 7	36=25-35mm; 3=45-48mm	10=75-100mm
Vineyard Sound	Surface	July 12	100+=10-20	
Vineyard Sound	Surface	July 15	4=50-68	9=70-100
Vineyard Sound	Surface	July 16	500+=10-25	
Vineyard Sound	Surface	July 28	500+=10-30	
Vineyard Sound	Surface	Aug. 2	200+=15-35	
Vineyard Sound	Surface	Aug. 21	26=27-52	
Vineyard Sound	Surface	Aug. 27	18=23-50	
Vineyard Sound	Surface	Aug. 28	38=25-50; 2=55-63	
Vineyard Sound	Surface	Aug. 28	30=25-45; 10=47-72	2♀=125-150; 1♂=175
Vineyard Sound	Surface	Sept. 15	3=45-50	2=125-138
Vineyard Sound	6-20	Oct. 13		1=188
Vineyard Sound	Surface	Oct. 20	4=88-100	4=112-125
Vineyard Sound	Surface	Nov. 1	1000=8-20; 3=75-82	1=152
Vineyard Sound	Surface	May 15		3=152-188
Vineyard Sound	Surface	June 3		80=62-100; 10=100-152
Newport, R. I.	Shore	1880,		
Newport, R. I.	8	July 27	4=28; 5=32-44	5=67-80; 1=95
Narragansett Bay	16-26	Aug. 6	5=45-50	3=84-100
Off Newport, R. I.	16-19	Aug. 7	54=15-33; 49=32-44; 5=50-62	3=89-108; 2=120-165
Off Newport, R. I.		Aug. 12	90=15-25; 15=30-40	

TABLE I.—Continued. Table to illustrate rate of growth of *Loligo Pealei*, young.

Locality.	Depth.	Date.	Length of mantle, in millimeters.	
			Young of the year.	Young of previous year.
Off Point Judith, R. I.	16	1880.		
Off Point Judith, R. I.	19	Aug. 13	60=17-38: 20=38-55	1=115: 1=102
Narragansett Bay	4-12	Aug. 14	133=16-33: 8=38-44	2=86-87: 2 ♀=105-112
Off Buzzard's Bay	21	Aug. 16	33=23-55: 14=50-70: 3=75-82	3=83-95
Narragansett Bay	6	Aug. 17	72=12-28: 5=30-42	-----
Off Block Island	13	Aug. 23	2=48-53: 3=70-80	-----
Off Block Island	5	Aug. 24	9=24-36: 8=40-55	-----
Narragansett Bay	14	Aug. 27	1 ♂=84	1 ♀=110
Narragansett Bay	3-6	Aug. 31	7=38-46: 2=60-62	-----
Off Cuttyhunk Island	17	Sept. 1	2=32-46: 11=50-52	-----
N. lat. 39° 48' 30". W. long. 70° 54'.	252	Sept. 3	23=32-50: 4=56-58: 1=82	2=130-140
Off Block Island	18	Sept. 13	14=16-30	-----
Off Chesapeake Bay	18	Sept. 20	20=42-55: 10=55-72: 1=110	-----
		Nov. 16	32	-----
<i>Var. borealis:</i>		1878.		
Massachusetts Bay	10	Aug. 29	1=31	-----
Massachusetts Bay	42	Sept. 16	1=38	-----
Massachusetts Bay	47	Sept. 21	6=28-38: 1=50: 5=62	-----
Massachusetts Bay	43	Sept. 26	2=31-38	-----
		1879.		
Off Cape Cod	15½	Sept. 9	2=38	-----
Off Cape Cod	42	Sept. 26	1=75	-----
Cape Ann	Shore	Oct., '80	5 ♂ 3 ♀=110-156	-----

J.—Specimens examined, mostly adult. To illustrate distribution, etc.

[In last column *ad.* = adult; *br.* = breeding; *in.* = length of mantle in inches; *j.* or *juv.* = young; *lg.* = large.]

No.	Locality.	Fath.	When Collected.	Received from	Specimens. Sex. No.
	<i>Typical variety.</i>				
--	New Haven, Conn.	--	1867	Mr. Hoopes	1 ♂
--	New Haven, Conn.	--	----	G. H. Perkins	1 ♂
--	Near New Haven	Shore	1870	A. E. Verrill	4 ad.
<i>h, k.</i>	Near New Haven	Shore	1874	A. E. Verrill	♂ 4 ad.
<i>c'</i>	Near New Haven	Shore	1876	A. E. Verrill	6 ad.
1G	New Haven harbor	Shore	May 18, 1880	A. E. Verrill	♂ 1 lg. br.
--	Long Island	Shore	----	C. C. Byrne	1 juv.
<i>a', b', oo</i>	Noank, Conn.	Shore	August, 1874	U. S. Fish Com.	♂ 3 large
--	Noank, Conn.	3-4	August 5, 1874	U. S. Fish Com.	4 young
--	Noank, Conn.	6-8	August 24, 1874	U. S. Fish Com.	8 juv.
--	Vineyard Sound, Ms.	Shore	July and Aug., '71	U. S. Fish Com.	72 ad.
--	Vineyard Sound, Ms.	5-8	July and Aug., '71	U. S. Fish Com.	30 ad.
--	Menemsha	Shore	August, 1874	V. N. Edwards	♂ 1. ♀ 2
--	Vineyard Sound	Shore	July and Aug., '75	U. S. Fish Com.	7 ad.
--	Vineyard Sound	5-12	July 12-26, 1875	U. S. Fish Com.	Eggs & y'ng
--	Vineyard Sound	5-16	Aug. 4, 5, 1875	U. S. Fish Com.	Young
--	Vineyard Sound	6-20	Sept. 15, 1875	U. S. Fish Com.	5 young
<i>f, g.</i>	Vineyard Sound	Shore	October 13, 1875	V. N. Edwards	♂ 5-7.5 in.
<i>a-e</i>	Vineyard Sound	Shore	October 14, 1875	V. N. Edwards	♂ 5-7 in.
--	Vineyard Sound	Shore	October 14, 1875	V. N. Edwards	♂ 5 large
--	Vineyard Sound	Shore	October 20, 1875	V. N. Edwards	5=4-5 in.
--	Vineyard Sound	Shore	Nov. 1, 1875	V. N. Edwards	1=6 in.
--	Vineyard Sound	Shore	April 30, 1876	V. N. Edwards	♂ 10 : ♀ 3
--	Vineyard Sound	Shore	May 15, 1876	V. N. Edwards	3=6-7 in.
D-W	Vineyard Sound	Shore	May and June, '76	V. N. Edwards	♂ 15 : ♀ 4 ad.
--	Vineyard Sound	Shore	June 3, 1876	V. N. Edwards	♂ 3=5-6 in.
X. Y. Z.	Vineyard Sound	Shore	June 6, 1876	V. N. Edwards	♂ 3 large
AA-HH	Vineyard Sound	Shore	June, 1876	V. N. Edwards	39 ad. : ♀ 12
1V-60V	Vineyard Sound	Shore	May 28, 1880	V. N. Edwards	♂ 48 : ♀ 12 br.
--	Narragansett Bay	Shore	1880	Samuel Powell	10 ad.
A1	Hyannis, Mass.	Shore	August, 1880	----	♂ 1 very lg.
--	Narragansett Bay	Shore	July 27, 1880	U. S. Fish Com.	♂ j. = 3-3.7 in.
--	Off Newport, R. I.	16-26	August 7, 1880	U. S. Fish Com.	5j. = 3.5-6.5 in.
--	Off Pt. Judith, R. I.	19	August 14, 1880	U. S. Fish Com.	2j. = 1.1-1.4 in.
--	Off Cuttyhunk Island	17	Sept. 3, 1880	U. S. Fish Com.	2=5.1-5.5 in.
--	South of Block Island	252 (?)	Sept. 13, 1880	U. S. Fish Com.	14 juv.
--	Off Chesapeake Bay	18	Nov. 16, 1880	Z. L. Tanner	32 juv.
	<i>Variety borealis.</i>				
An.1-3.g	Annisquam, Mass.	Shore	July, 1878	A. Hyatt	♀ 3 ad. br.
--	Glouce'r, M., tide-pool	Shore	July, 1878	A. E. Verrill	2 juv.
--	Massachusetts Bay	47	Sept. 21, 1878	U. S. Fish Com.	11 juv.
--	Off Cape Cod	42	Sept. 26, 1879	U. S. Fish Com.	1 juv.
--	Provincetown, Mass.	Shore	July, 1879	J. H. Blake	3 large
2G-15G	Cape Ann, Mass.	Shore	May 18, 1880	A. H. Clarke	15 ad. br.
--	Cape Ann, Mass.	Shore	October, 1880	A. H. Clarke	♂ 5 : ♀ 3 juv.
--	Salem, Mass.	Shore	----	J. H. Emerton	♂ 1 : ♀ 2 ad.
	<i>Variety pallida.</i>				
A-Z	Astoria, N. Y.	Shore	Nov.-Dec., 1870	Robt. Benner	♂ 17 : ♀ 9
<i>a-t</i>	Astoria, N. Y.	Shore	Nov.-Dec., 1870	Robt. Benner	♂ ♀ 20 ad.
1-10	Astoria, N. Y.	Shore	Nov.-Dec., 1870	Robt. Benner	♂ ♀ ad.
--	Gr't Egg Harbor, N.J.	Shore	1872	A. E. Verrill	1, bass stom.

K.—Specimens examined. Eggs and recently hatched young of *Loligo Pealei*.

Locality.	Fath.	When collected.	Received from	Eggs or Embryos.
Near New Haven	Shore	June 19, 1871	J. E. Todd	Well developed.
Vineyard Sound	5-10	July, Aug. '71	U. S. Fish Com.	All stages.
Long Island Sound	4-8	August, 1874	U. S. Fish Com.	Well developed.
Fisher's Sound	Surface	July 28, 1874	U. S. Fish Com.	Just hatched.
Nantucket Sound	8-12	July 26, 1874	U. S. Fish Com.	Partly developed.
Vineyard Sound	8-16	Aug. 5, 1875	U. S. Fish Com.	Partly developed.
Vineyard Sound	5-10	July, Aug. '75	U. S. Fish Com.	All stages.
Vineyard Sound		Sept. 6, 1875	U. S. Fish Com.	New-laid.
Near New Haven	Shore	June 11, 1880	S. I. Smith	Near hatching.
Off New Haven		Aug. 3, 1880	J. F. Fowle	Half developed.
Gardiner's Bay		June 28, 1880	Sch. G. H. Bradley	New-laid.
Off Newport, R. I.	8	Aug. 6, 1880	U. S. Fish Com.	Fresh and well developed.
Off Newport, R. I.	22-26	Aug. 7, 1880	U. S. Fish Com.	New-laid and hatching.
Off Newport, R. I.	4½	Aug. 16, 1880	U. S. Fish Com.	New-laid and partly dev.
Narragansett Bay	6	Aug. 23, 1880	U. S. Fish Com.	Fresh-laid.
Narragansett Bay	12½	Aug. 31, 1880	U. S. Fish Com.	Partly developed.

In the Gulf of Mexico, this species appears to be replaced by another species (*Loligo Gahi* D'Orbigny). Of this we have several specimens, collected on the west coast of Florida, at Egmont Key, near Tampa Bay, by Col. E. Jewett and Mr. W. T. Coons. This species is closely allied to *L. Pealei*, but has a more slender form, with the caudal fin shorter and narrower in proportion to the length of the mantle. The pen has a shorter and broader shaft and a narrower and more oblong blade, which has parallel, thickened and darker colored portions between the midrib and margins. The tentacular suckers have their horny rings more coarsely and equally toothed, there being only a partial alternation of larger and smaller teeth.

Along our southern coast, from Delaware Bay to Florida, a much shorter and relatively stouter species (*Loligo brevis* Bv.) occurs, which might be mistaken, by a careless observer, for the present species. In addition to its shorter body, it has very different large tentacular suckers, with the teeth on the horny rim coarser and all of similar form and size. Its pen is also shorter and relatively broader, and different in structure.

Notes on the Visceral Anatomy.

PLATE XL, FIGURES 1-3a. PLATE XLI, FIGURE 1, ♀.

The gills (*g*) are large and highly organized in this species, although considerably smaller than in *Ommastrephes*. The bases of the gills are situated somewhat in advance of the middle of the mantle-cavity, and their tips, in fresh specimens, extend forward nearly to the base of the siphon (*f*). The branchial chamber, behind the heart,

is divided into two chambers by a median, thin, membranous partition.

The branchial chamber is separated from the visceral cavity by a thin, translucent membrane, through which there are two circular openings (*u*), one a short distance in advance of the base of each gill; through these the secretions of the urinary organs (*r, r'*) are doubtless discharged. Internally the visceral cavity is divided into several compartments by folds of thin membrane. The largest of these chambers contains the stomach and its cœcal lobe (*S, S'*). When the branchial cavity is opened on the ventral side, as in Pl. XL, fig. 1, and the thin membranes covering the viscera are removed, the renal organs (*r, r'*) are seen, as large and conspicuous organs, especially if the venous system has been injected with a colored fluid. These organs are situated below, above, and in front of the heart, but two pyriform glands (*r', r'*), which are firmer and have a more compact structure than the rest, extend along the posterior venæ-cavæ. The anterior ones, in front of the heart, consist of a number of groups or clusters of lobulated glandular follicles, developed upon the posterior part of the anterior vena-cava and upon its saccular divisions, on the hepatic veins, on the intestinal veins, and on other large veins going toward the branchial auricles (*au*). Two of the larger divisions (*r, r*), which are elongated, and lie below and across the heart and large efferent vessels (*bo*) returning from the gills, arise as direct forks of the vena-cava, which divides just in front of the origin of the intestine; these forks pass each side of the intestine and each gives off a dorsal branch, which runs up along the basal part of the intestine and joins the large saccular renal vessels that lie above the heart, on each side. These dorsal, renal vessels extend backward beyond the heart; they receive the blood from the gastric veins posteriorly and from two hepatic veins anteriorly; laterally, they communicate directly with the branchial auricles.

The ventricular heart (*H*) is a rather large, muscular, median, somewhat unsymmetrical organ, varying in shape according to the state of contraction. Usually it is more or less obliquely four-cornered, with the right side largest and the posterior end more or less conical. From the posterior end arises a large artery, the posterior aorta, which gives off, close to its origin, two small arteries; one of these is median, and goes forward to the ink-sac, passing below the heart; two branches, close to its origin, go to the renal organs (*r, r*), on each side; the other, arising laterally, goes to the prostate gland and other organs connected with it, (Pl. XL, fig. 2, *po*). A little farther back