POPULAR ILLUSTRATIONS

OF THE

LOWER FORMS OF LIFE:

COMPRISING

I.—THE PROTOPHYTON.
II.—THE PROTOZOON.
III.—THE CŒLENTERATA.

BY

C. R. BREE, M.D., F.L.S., F.Z.S.,

Senior Physician to the Essex and Colchester Hospital,

AUTHOR OF "THE BIRDS OF EUROPE NOT OBSERVED IN THE BRITISH ISLES;" "SPECIES NOT TRANSMUTABLE, NOR THE RESULT OF SECONDARY CAUSES," &C., &C., &C.

LONDON:
HORACE COX, 346, STRAND, W.C.

1868.

CONTENTS.

PART III.—THE CŒLENTERATA.

CHAPTER I.

CHAPTER II.

CHAPTER III.

CHAPTER IV.

CHAPTER V.

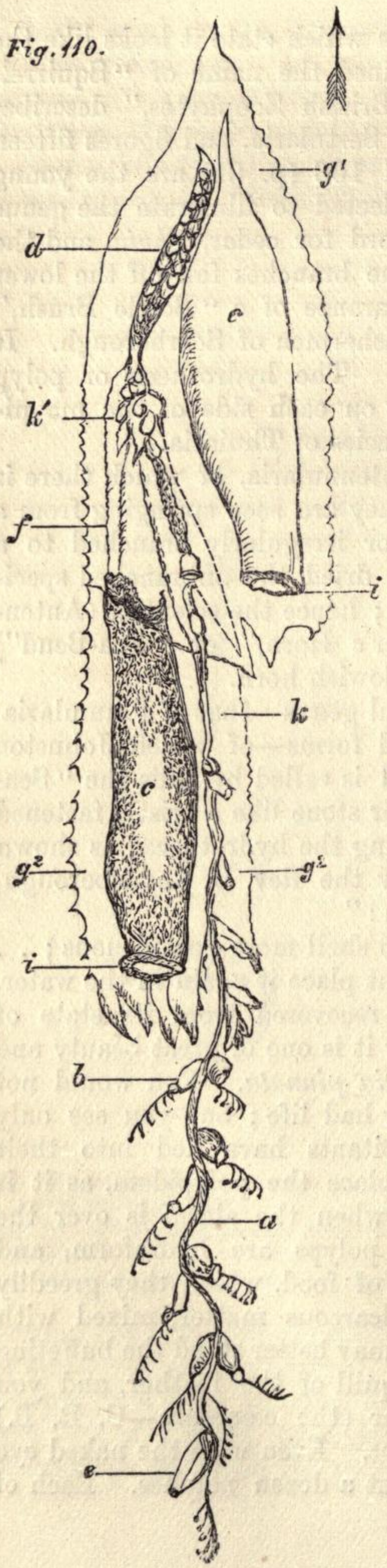
CHAPTER VI.

CHAPTER VII.

CHAPTER VIII.

CHAPTER IX.

Fig. 110.



these is the house or cell of a polyp; so that in a good specimen we see a kind of marine village, which, under the teaching of God, has been beautifully constructed by the thousand inhabitants it contains."

The last genus in the British forms of the order Sertularidæ is illustrated in Fig. 109 (p. 82). They are called Campanularia because the Hydrothecæ are bell-shaped. Johnston figures three real, and figures one and describes two doubtful species—six in all—as inhabiting our coasts. The species figured looks in a natural state like a small plant rising from a single stem, and branching off into the shape of a "horse's tail," which is the popular name given to it by Ellis.

The Calycophoridæ.

The next phase in the morphology of the Hydrozoa is observed in a most interesting family of Zoophytes, found only far out at sea, and therefore termed oceanic. It will not be necessary for me to dwell long upon this or the next group, also oceanic—viz., Physophoridæ, inasmuch as specimens are not so accessible for examination to our sea-side ramblers. But they are very interesting and beautiful creatures notwithstanding. The

Fig. 110.—*Diphyes dispar* (magnified); *a*, the cœnosarc; *b*, the polyp with its single tentacle; *e*, the same, covered with its hydrophyllum; *c*, nectosac, or locomotive organ; *d*, the somatocyst; *f*, duct leading from the hydræcium, which, joining with others, forms the connection of the swimming floats and the somatic cavity; *g'*, the proximal nectocalyx, or "swimming float;" g^2, the distal nectocalyx; *i*, *i*, the mouth of the nectosac; *k*, the hydræcium; k^1, the hydræcial canal (after Huxley).

Calycophoridæ (cup-bearing Zoophytes), so called by reason of the "swimming-cup," or nectocalyx, to which the different parts of the animal are attached (Fig. 110, g^1 and g^2), are very singular-looking creatures, as may be seen by looking at Fig. 110, which represents the first member of the family ever discovered. They occur in various parts of the world, but especially in tropical seas. They are, however, abundant in the Mediterranean, and are sometimes found floating in the waters of our own coasts. I will endeavour to give the reader, by the assistance of the figure, a description of these Zoophytes, and here I shall call into requisition a knowledge of the terms given to the different parts of the compound animal.

Everybody is acquainted with the bright glistening "jelly fish" left on our shores by the receding tide, and many have reason to remember them on account of their stinging qualities. Now I have only mentioned these "jelly fish" in connection with our cup-bearing zoophytes in order that we may have an idea of their bodily consistence and character. They have no other connection with them except the ties of family, which we shall see by and by. I may here state, however, in parenthesis, that they who desire to get a sound knowledge of zoology must ignore such terms as "jelly *fish*" or "shell *fish*." These animals are not fish in any sense of the word. I should not have thought it necessary to make this apparently trivial remark had I not found that even educated men will sometimes keep up a delusive nomenclature because it is popular.

Well, then, the Calycophoridæ are animals possessing a body having the consistence and appearance of the Medusæ found on our sea-shores, but, as a general rule, the shape and appearance shown in Fig. 110. They consist in this family, the Dyphydæ, of two similarly formed "swimming cups," or nectocalyces, as they are called by Professor Huxley, g^1 and g^2 fitting into each other.

In the centre of these swimming cups are noticed the two long open tubular-looking bodies termed nectosacs (*c*). These are the organs of locomotion, and are formed of longitudinally-placed muscular fibres, by the contraction of which the water is expelled from the opening (*i*) in force, and, as a necessary consequence, the animal is propelled backwards in the direction of the arrow. At *d* will be noticed a chamber filled with inclosed spaces termed vacuoles, which give it a cellular appearance.

This is the proximal extremity of the cœnosarc (*a*), which is not, as I before mentioned, covered with a horny case like the Sertularidæ. This chamber is called by Huxley the *somatocyst*, and it will be observed that it is connected by a narrow neck with another dilated portion of the cœnosarc, which is, in fact, a chamber from which proceed the various ducts (*f*) which connect the organs of locomotion

with the somatic cavity. The cœnosarc now proceeds between the two swimming bells, and through the distal one, whence it floats freely in the water. It bears naked polypites (*b*), each having a single tentacle, and also polypites covered with a leafylike organ, termed hydrophyllum by Huxley (*e*).

Such is the beautiful provision by which the unattached or free Zoophyte is enabled to float or swim through the water. The natural size of the specimen figured is shown by the line by the side of the figure. Nothing can exceed the delicate beauty of these creatures when seen first in their native seas. The cœnosarc (*a*), with its naked and covered series of polypites (*b* and *e*), sometimes reaches a length of several inches, and has fifty or sixty or more of these bodies attached to it. They can be drawn entirely within the chamber (*k*), which is therefore called the house of the Hydra, or, in scientific language, the hydræcium. So delicate is this cœnosarc that sometimes we are told it can only be seen by the play of the light, and the slightest touch will make it separate from the floats. Cuvier thought these floats were two distinct individual animals, and hence he gave them the name of Diphyes. Professor Huxley has divided the order Calycophoridæ into four families. The first three are separated from each other by differences in the hydræcia and hydrophylla, which I need not enter into. The fourth has many swimming bladders instead of two, and the hydræcium (*k*, Fig. 110, p. 84) is incomplete. Professor Huxley's history of the "Oceanic Hydrozoa," published by the Ray Society, is a model of scientific detail and elaborate and accurate illustration. Although we cannot go through the voyage of the Rattlesnake with the learned Professor, we can imagine the patient investigation and the real love of science with which, during that survey, he dealt with the various new links in the great chain which came under his notice. And we cannot be too grateful to the man by whose labours the means of studying the beautiful inhabitants of the wide sea are brought within the reach of our library table.

CHAPTER III.

The Physophoridæ.

The Physophoridæ are, as their name expresses, "Bladder-bearing Zoophytes." The order is represented, but not typically, by the well-known singular creature called by sailors "the Portuguese man-of-war"—the *Physalia pelagica* of scientific naturalists. An oblong bladder-like body about the size of a goose's egg, or larger, with a

ridge-like back terminating in a point, which is movable at the will of the creature, with a fringe round the part in contact with the water, and a number of long blue tentacula, extending sometimes ten or twelve feet into the water; the beak end of the back a rich carmine, and the rest blue, while the sides and fringe are iridescent with yellow and green and blue, glittering in the warm tropical sun, and gilding this fairy of the sea with the rich colouring and harmonised tints which mark a thing of beauty. Such is the "Portuguese man-of-war," or "galley," or "frigate," which sometimes in countless thousands floats along at the mercy of the currents or the winds of the warm seas of the tropics.

Monsignor Virtue, R.C., Chaplain to the Forces, and now stationed in Colchester, informs me that this Zoophyte is very common on the shores of the islands of Bermuda, where, like the Medusæ on our own coast, it is thrown helpless by the receding tide. He says that he never saw there any of the yellow or green tints which are described and figured in the second volume of the *Intellectual Observer*, p. 233, by Mr. Noel Humphreys, from a British specimen; that the principal colourings are the amaranth crest, and the deep blue of the rest of the ridge and sides relieved by white. He also says that he never saw any specimen there having the number of tentacles figured by Mr. Humphreys, and that the full-grown size is considerably larger than a goose's egg, as stated by me on the authority of Dutertre in his description of the Antilles.

Mr. Bennett, in his "Gatherings of a Naturalist in Australia," where he gives a most interesting account of the Physaliæ, states the size of a full-grown specimen to be 5in. long, and the tentacula from 4ft. to 5ft., with the power of much greater extension. Mr. Humphreys does not give the dimensions of the specimens figured in the *Intellectual Observer*, nor does he say whether the figure, which is 37-10th in. by 1½in., is the natural size or not—an omission much to be regretted. The discrepancy, however, in size and colour in the description of this Zoophyte arises not only from the fact that they differ in both according to age, but that in the opinion of some naturalists they are divisible into several species. M. Eschscholtz describes three species of Physalia:

1. *P. Caravella*, which is 8in. by 2½in. of bright purplish red colour, with dark extremities and blue lines in the fold of the crest, Tentacles red, with dark purple acetubula; the smaller ones blue. Hab., Atlantic, from Azores to Brazil.

2. *P. Pelagica*.—2½in. long; when young, pale blue. In the adult both ends are green, and the crest purple in its highest part; tentacles blue, with dark acetubula. Hab., Atlantic, especially near Cape of Good Hope.

3. *P. Utriculus.*—Length, 3½in.; colour of the crest and middle part of the bladder, greenish; the two extremities blue. Hab., tropical region of Pacific.

Professor Huxley, who follows Eschscholtz in this division, expresses doubts whether these species are distinct or not; and he feelingly exclaims that the study of the species-making efforts of Von Olfers, Lesson, and Lamarck had only one result—that of producing a somewhat unpleasant vertigo. Mr. Bennett has given us the best account of the Physalis, for he had opportunities of examining any number of them on the Australian coasts, whereon they were cast after storms. I will give a brief *résumé* of his description.

The bladder (*a*, Fig. 111, p. 90) is about five inches long in adult specimens, and the dependent tentacula (*b*) are several feet in length, but capable of being extended much farther to seize any victim which may be within reach thereof. The bladder is tough, slightly elastic, and semi-transparent. Its lower part is of a light blue colour, streaked or veined almost imperceptibly with delicate green pencillings, the crest and beak being of a rich carmine, changing in different lights to a brown, green, or purple. These colours soon fade when out of the water, except the tentacles, which retain their rich purple colour for a considerable time. Mr. Bennett says the creature has no power of guiding its bladder-like float, but is at the mercy of wind and tide, and that it cannot collapse or distend its bladder by the exclusion or admission of air. The long tentacles appear like a connected series of globules containing fluid, having a sucker at the free end, which they can fix tightly on their prey, benumbing it at the same time. This is not, however, done by the exudation of a glutinous substance, as described by Mr. Bennett, but by the agency of a vast number of thread cells, from 1-50th to 1-300th of an inch in diameter, which send out threads, as already described by the Hydra (Figs. 115 and 116, p. 91). The Physalis has the power with these threads of inflicting great pain on the human hand, round which they will entwine themselves if carelessly taken hold of, as M. Dutertre tells us he did in one instance to his cost, the pain produced causing him to call out most lustily. Mr. Bennett also, with true scientific zeal, purposely exposed himself to one of their unfriendly squeezes. He seized hold of the bladder, and immediately the creature lifted up its tentacles and wound them round his hand and fingers, giving him no little pain and some difficulty in getting rid of their embraces. He says the violent stinging continued so long as the smallest particle of tentacle remained attached to his hand. There were also constitutional disturbances afterwards, such as quick pulse, fever, impeded action of

the muscles of the chest, which were stiff, as in rheumatism, causing painful dyspnœa.

In the specimen of Physalis caught off the Isle of Wight there was a fish entangled in the tentacula; and Mr. Bennett had the opportunity of watching in his, taken under similar circumstances, the progress of absorption of the digesting fish. As it shows all the principal parts very well, I have figured the small variety called by Eschscholtz *P. utriculus*, and which is drawn from life, and very minutely described by Professor Huxley in his monograph of the "Oceanic Hydrozoa." When the long tentacles (*b*) have come in contact and seized and benumbed—say a small fish—they shorten themselves by assuming a corkscrew form, and the prey is then brought up to the polypites, which are seen with their open mouths at *c*, and which are erroneously called small tentacles by those who do not correctly follow the morphology of the Hydrozoa. The prey being brought within convenient distance, each polypite applies his sucker-like mouth, and the feast begins. Mr. Bennett describes the passage of particles of the fish, as seen through the transparent tissues along the absorbents. In reality he saw them passing into the stomach of the polypites, just as he might witness the same process in the fresh-water Hydra.

Like the Calycophoridæ, many of the Physophoridæ have swimming cups; but, in addition, they possess a remarkable organ called a pneumatophore, which is, in fact, a chamber filled with air, by which they float permanently in the water. Mark here the design shown in the formation of the last two orders of Zoophytes. The cup-bearers move voluntarily through the water, and are provided with an apparatus for that purpose. The air-bag would be to them an incumbrance; but, as the bladder-bearers have no such organs of locomotion, they are provided with an apparatus which, being filled with a fluid lighter than water, keeps them permanently afloat. Now, this pneumatophore is generally placed at the proximal end or apex of the Physophorid; and, as it cannot always be seen in drawings of the animals, I have given a diagram from Professor Green's excellent manual of the Cœlenterata, which will illustrate the position of this organ in all the genera, and at the same time show how the order we are now dealing with differs from the last (Fig. 117, p. 91). This pneumatophore is diagnostic of the Physophoridæ. In the "Man-of-war" it constitutes the greater part of the larger bladder-like cœnosarc (*a*, Fig. 111, p. 90). It contains within it another bag, called by Huxley a pneumatocyst, which has an opening communicating with the external air. There are two series of tentacles, the long dependent (*b*), and the shorter ones (*d*). At the base of each tentacle there is a fleshy cœcal bag (*e*), which is covered externally,

Fig 111.

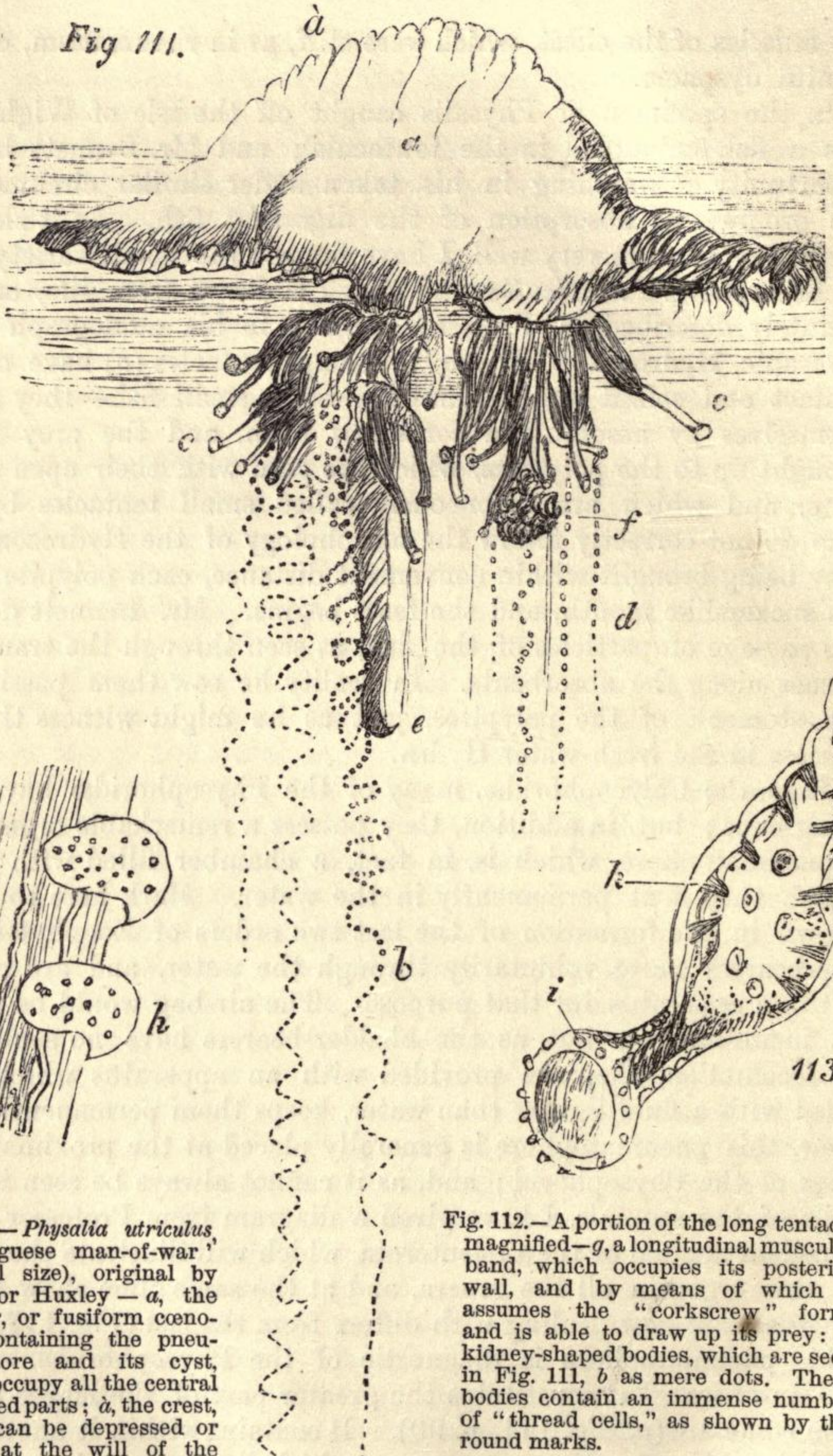


Fig. 111.—*Physalia utriculus*, "Portuguese man-of-war" (natural size), original by Professor Huxley — *a*, the bladder, or fusiform cœnosarc, containing the pneumatophore and its cyst, which occupy all the central unshaded parts; *à*, the crest, which can be depressed or raised at the will of the animal—*b*, the long tentacles (reduced one inch in the figure)—*d*, the short ones—*c*, the polypites—*e*, the tentacular sac - *f*, velvety masses, which consist of small polypites and their tentacles.

Fig. 112.—A portion of the long tentacle magnified—*g*, a longitudinal muscular band, which occupies its posterior wall, and by means of which it assumes the "corkscrew" form, and is able to draw up its prey: *h*, kidney-shaped bodies, which are seen in Fig. 111, *b* as mere dots. These bodies contain an immense number of "thread cells," as shown by the round marks.

Fig. 113.—A polypite magnified — *i*, "thread cells," which are seen studding the margin of the mouth and neck—*k*, villi on the endoderm of stomach, which is shown to contain particles of food (after Huxley).

like the tentacles and polypites, with thread cells, which the animal can at will discharge, paralysing its victim or enemy. The "Portuguese man-of-war," therefore, consists of a large bladder-

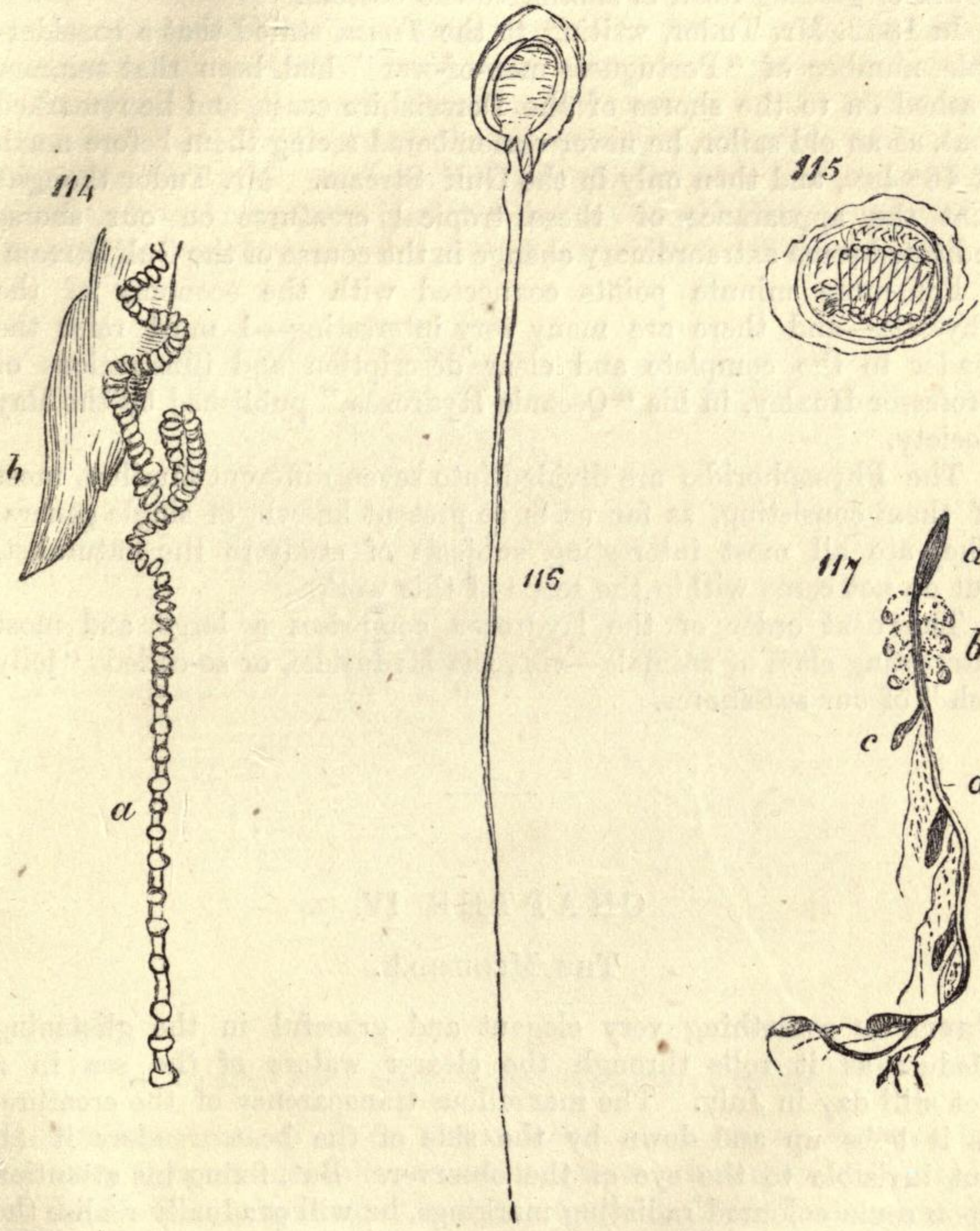


Fig. 114.—A tentacle of *P. utriculus* (*a*), as it is attached to its basal sac, *b*.
Fig. 115.—One of the "thread cells" magnified.
Fig. 116.—The same after it has discharged its thread.
Fig. 117.—Diagram of *Physophorid*; *a*, the pneumatophore; *b*, the necto-calices; *c*, the polypite and its tentacle; *d*, the cœnosarc.

like cœnosarc containing a pneumatophore and its pneumatocyst. From the cœnosarc depend the polypites (*c*), the tentacles (*b* and *d*),

and the cœcal appendages (*e*). It has the power of contracting and dilating its crest, and can turn over or perform somersaults on the surface of the sea, but when adult it has not, as far as is known, the power of guiding itself or sinking to the bottom.

In 1862, Mr. Tudor, writing to the *Times*, stated that a considerable number of "Portuguese men-of-war" had been that summer washed on to the shores of the Dorsetshire coast, and he remarked that, as an old sailor, he never remembered seeing them before north of 48° lat., and then only in the Gulf Stream. Mr. Tudor thought that the appearance of these tropical creatures on our shores indicated some extraordinary change in the course of the Gulf Stream.

For more minute points connected with the economy of the Physalia—and there are many very interesting—I must refer the reader to the complete and clear description and illustrations of Professor Huxley, in his "Oceanic Hydrozoa," published by the Ray Society.

The Physophoridæ are divided into seven different families, most of them consisting, as far as is at present known, of single genera. They are all most interesting subjects of study to the naturalist, but do not come within the scope of this work.

The next order of the Hydrozoa comprises a large and most interesting class of animals—viz., the Medusidæ, or so-called "jelly fish" of our sea-shores.

CHAPTER IV.

The Medusidæ.

There is something very elegant and graceful in the glistening Medusa as it rolls through the clearer waters of the sea in a hot still day in July. The marvellous transparency of the creature, as it bobs up and down by the side of the boat, renders it all but invisible to the eye of the observer. But, fixing his attention upon some coloured radiating markings, he will gradually realise the fact that he is looking upon a semi-globular living thing, with a central body and several tentaculæ dependent from its rim. If, again, the observer goes on to the shore at night, or sails along the warm coasts of Italy, he may see hundreds of thousands of bright sparks of light, or it may be balls of fire as large as small oranges, moving through the water. In the day observation the weather must be still and calm; for his nocturnal visit, the sea should be